Environment Effects Statement

Western
Renewables
Link

TECHNICAL REPORT

R Contaminated Land Impact Assessment

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Western Renewables Link
EES Technical Report R
Contaminated Land Impact Assessment

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This document is to be read in full. No excerpts are to be taken as representative of the findings without appropriate context.

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Glossary

Term	Definition
ANZG	Australian and New Zealand Guidelines (for Fresh and Marine Water Quality)
AS	Australian Standard
ASS	Acid Sulfate Soil
ASR	Acid Sulfate Rock
AusNet	AusNet Transmission Group Pty Ltd
CEMP	Construction Environmental Management Plan
Construction Footprint	The Construction Footprint is indicative and contained within the Project Area and encompasses the land required to facilitate construction of the Project, including the vegetation removal required to achieve the operational safety clearance zone for the transmission line. The construction footprint includes: ▪ The existing Bulgana, Sydenham, and Elaine terminal station sites. ▪ The new 500kV terminal station near Bulgana and 220kV connection to the existing Bulgana Terminal Station ▪ The temporary laydown areas ▪ The temporary intermediate laydown areas and workforce accommodation facilities located at Ballan and Lexton ▪ Tower assembly areas ▪ Stringing pads ▪ Temporary hurdle locations, including the installation of stay blocks, poles, cross beams and protective netting ▪ Distribution line crossovers ▪ Access tracks (both temporary and permanent) ▪ Vegetation clearance required to maintain safe clearances and fuel load requirements around transmission line infrastructure.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DC	Direct Current
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
Defence	Australian Government Department of Defence
DEECA	Department of Energy, Environment and Climate Action
DELWP	The former Department of Environment, Land, Water and Planning
DTP	Department of Transport and Planning
DJSIR	Department of Jobs, Skills, Industry and Regions (formerly Department of Jobs, Precincts and Regions)
DSI	Detailed Site Investigation
EAO	Environmental Audit Overlay
Environment Effects Act	*Environment Effects Act 1978*
EES	Environment Effects Statement
EIL	Ecological Investigation Level
Environment Protection Act	*Environment Protection Act 2017*
EPA Victoria	Environment Protection Authority Victoria
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*

Term	Definition
EPR	Environmental Performance Requirements
ERS	Environment Reference Standards
GED	General Environmental Duty under the *Environment Protection Act 2017*
GQRUZ	Groundwater Quality Restricted Use Zone
Groundwater HSL	Groundwater Health Screening Levels as defined by the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013)
HIL	Health Investigation Level
HIL A	Health Investigation Level A as defined by the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (as amended in 2013). Residential with garden / accessible soil (home-grown produce less than 10% fruit and vegetable intake (no poultry), also includes childcare day care centres, pre-schools and primary schools.
HIL B	Health Investigation Level B as defined by the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (as amended in 2013). Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
HIL C	Health Investigation Level C as defined by the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013). Public open space such as parks, playgrounds, playing fields (such as ovals), secondary schools and footpaths. This does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate
HIL D	Health Investigation Level D as defined by the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (as amended in 2013). Commercial / industrial includes premises such as shops, offices, factories and industrial sites.
HSL	Health Screening Level
IWRG	Industrial Waste Resource Guideline
kV	kilovolt
LGA	Local Government Area
LiDAR	Light Detection and Ranging
m bgl	Metres below ground level
NEM	National Electricity Market
NEPM 2013	*National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013)*
OEMP	Operational Environmental Management Plan
PAH	Polycyclic aromatic hydrocarbon
PASS	Potential Acid Sulfate Soil
PCRZ	Public Conservation and Resource Zone
Planning and Environment Act	*Planning and Environment Act 1987*
PFAS	Per- and poly-fluoroalkyl substances
PPRZ	Public Park and Recreation Zone

Term	Definition
Principal Contractor	During the construction stage, there will be multiple principal contractors and sub-contractors involved in the delivery of the different project components. This EES refers to Principal Contractor as a catch all term for the contractor responsible for the works.
Project Area	The Project Area encompasses all areas that would be used to support the construction and operational components of the Project considered in the EES. The Project Area is contained within the Project Land and encompasses the following: ▪ Permanent infrastructure: - Transmission tower structures - Upgrade and connection to the Bulgana Terminal Station - Connection to the Sydenham Terminal Station - An upgrade of Elaine Terminal Station - The new 500kV terminal station near Bulgana - Access tracks required for operation ▪ Temporary construction areas and infrastructure: - Distribution line crossovers - Hurdles - Laydown areas - Stringing pads - Access tracks - Tower assembly areas - Workforce accommodation facilities.
Project Land	The Project Land encompasses all land parcels that could be used for the purpose of temporary Project construction and permanent operational components. The Project Land corresponds with the extent of the Specific Controls Overlay proposed in the draft Planning Scheme Amendment for the Project. This generally includes the entire land parcel intersected by a Project component.
Proposed Route	The Proposed Route is approximately 100 to 170m wide and encompasses the nominal future easement for the proposed new transmission line (including a buffer either side), and the terminal station areas. The Proposed Route is located within the Project Area.
PSI	Preliminary Site Investigation
PSR	Priority Sites Register
Salinity	The concentrations of salts in water or soils
SEPP Land	State Environment Protection Policy (Prevention and Management of Contaminated Land)
SMP	Spoil Management Plan
SYTS	Sydenham Terminal Station
VLR	Victorian Landfill Register
WASS	Waste Acid Sulfate Soil
Water Act	*Water Act 1989*
220kV	220kV transmission line
500kV	500kV transmission line

Executive summary

The Western Renewables Link (the Project) proposes a new transmission line starting at Bulgana, near Stawell in Victoria's west, and extending approximately 190km to Sydenham in Melbourne's north-west. The Project will enable the connection of new renewable energy generated in western Victoria into the National Electricity Market and increase the Victorian transmission capacity. The Project is being delivered by AusNet Transmission Group Pty Ltd (AusNet).

This Contaminated Land Impact Assessment forms part of the Environment Effects Statement (EES) prepared for the Project in accordance with the *Environment Effects Act 1978*. This report and the methodology applied in preparing it respond to the requirements set out in the EES scoping requirements, with a view to assessing contaminated issues, including any potential changes to the existing environment within the 'study area' developed around the Project Area.

Overview

The Project extends from Bulgana in western Victoria to Sydenham in Melbourne's north-west. It consists of the 190km proposed transmission line route, with a connection to Sydenham Terminal Station, any additional disturbance areas including laydown areas and workforce accommodation facilities, vehicle access tracks and upgrades to existing terminal stations. The Project Area is wider than the transmission line easement itself as the area encompasses a range of route options that have been considered through the design stage.

For the purposes of this impact assessment, a study area has been defined which includes the Project Area as described above and a 500m buffer from the boundary of the Project Land. The 500m buffer has been designated to identify potentially contaminating activities within the vicinity of the Project Land that may adversely impact the Project and impacts that may require mitigation.

The Project has the potential to interact with existing contamination in soil and groundwater, Acid Sulfate Soil (ASS) and Acid Sulfate Rock (ASR) during earthworks (such as levelling at terminal stations) or construction (such as tower footings). These activities could potentially mobilise contaminants, potentially impacting human health, the environment and other environmental values if they are not planned and managed with respect to the contamination encountered. The construction and operation activities of the Project also have the potential, through spills and leaks, to impact environmental values within the study area.

Contaminated land is defined in the *Environment Protection Act 2017* as land where waste, a chemical substance, or a prescribed substance is present in a concentration above the background level and creates a risk of harm to human health or the environment. This report documents the existing conditions as it relates to land contamination (includes groundwater) and provides an assessment of potential Project impacts and recommendations for appropriate control measures to mitigate potential impacts during the construction, operation and decommissioning stages of the Project.

Existing conditions

Potential sources of contamination identified within the Project Land included agricultural land use, historic gold mining, sand and gravel quarries, rail yards, the Melton Aerodrome, a closed private landfill and illegally dumped solid inert waste. These contaminating activities have the potential to cause soil and groundwater contamination. The Sydenham end of the Project Land is also located within the recommended 200m buffer distance of an inert waste landfill as per Table 5.2 of the Environment Protection Authority (EPA) publication 788.3 (EPA Victoria, 2015) for placement of buildings and structures.

Potential ASS and ASR are found across the study area, with high probability of occurrence in isolated locations surrounding Glendaruel (within City of Ballarat), Dean Reservoir, Moorabool Reservoir, Hepburn Lagoon, Bolwarrah Weir, Pykes Creek Reservoir and Merrimu Reservoir (within Shire of Hepburn and Shire of Moorabool).

Soil investigations were previously conducted at the Bulgana and Sydenham Terminal Stations, the Crowlands Substation, and several opportunistic sites located within the study area. These soil investigations did not identify significant contamination in the study area.

Impact assessment key findings

The potential impacts of the Project were measured against the existing conditions by assessing the significance of the expected residual impacts, after taking into consideration mitigation measures, including before and after application of proposed mitigation. Identified impacts, mitigation strategies and significance of residual impacts are summarised for Project construction and operational stages in Table ES-1and Table ES-2, respectively.

Table ES-1. Summary of Residual Impacts – Construction Stage

Impact	Significance of pre-mitigated impact	Relevant EPR	Mitigation strategy	Significance of residual impact
Potential to encounter unexpected contamination during construction, leading to increased spoil management costs	Minor	**CL1**	Investigations and requisite soil testing for waste management purposes will significantly reduce the potential to encounter unexpected contamination during construction.	Negligible
Potential risk to human health and the environment from spoil excavation and stockpiling	Moderate to Major	**CL2, CL3**	Development and implementation of a CEMP and SMP to manage spoil management will align earthworks with requirements of the EPA, WorkSafe Victoria and other relevant stakeholders.	Negligible
Mobilisation of contaminants leading to degradation of local environment	Major	**CL2, CL3**	A critical aspect of the requisite CEMP and SMP detailed above pertains to immobilisation of ground contamination where it has been identified, and site hygiene best practice, regardless the contaminant status of the material being managed.	Negligible
Potential spill of oils, chemicals, and solid and liquid waste during construction	Minor	**CL2**	Communication of and adherence to the CEMP will significantly reduce the likelihood of new ground contamination during the construction stage of the Project.	Negligible

Table ES-2. Summary of Residual Impacts – Operational Stage

Impact	Significance of pre-mitigated impact	Mitigation strategy	Significance of residual impact
Potential risk to human health and the environment from exposure to reused contaminated spoil	Minor	Implementation of AusNet's contaminated soils and environmental management procedures (refer to Section 8.2), which describe the processes for management and re-use of contaminated soil, and processes for management of spill of oils, chemicals, and soil and liquid waste	Negligible
Potential spill of oils, chemicals, and soil and liquid waste during operation	Moderate		Negligible

The impact assessment identified that the key issues from decommissioning activities that have potential to cause land and groundwater contamination are largely similar to construction and operation. As such, if relevant construction and operational stage control measures are implemented, residual impacts resulting from Project decommissioning activities that have potential to cause land and groundwater contamination are considered to be negligible.

Based on the spatial relationship of the Project Land to other proposed projects or proposed project expansions, cumulative impacts are expected to result in negligible residual impacts.

Environmental Performance Requirements

Three EPRs have been recommended in order to meet the EES evaluation objectives which include:

- **CL1: Minimise contaminated land impacts through investigation and design**. Prior to the commencement of construction, undertake assessments consistent with *Schedule A – Recommended general process for assessment of site contamination* of the NEPM 2013 in areas of planned ground disturbance prior to any earthworks to inform detailed design and preparation of the CEMP
- **CL2: Develop and implement contaminated land management and mitigation measures for construction**. Prior to the commencement of construction and as part of the CEMP, develop and implement management and mitigation measures for contaminated land consistent with the EPA, WorkSafe Victoria, and any other relevant regulatory requirements
- **CL3: Develop and implement a Spoil Management Plan**. Prior to commencement of construction and as part of the CEMP, develop and implement a Spoil Management Plan (SMP) in consultation with EPA, including preparation of a management sub-plan to manage ASS and ASR.

An additional EPR that applies to the Project decommissioning more broadly, but is also relevant to contaminated land, is also included in Section 11.

Conclusion

The Project has potential to interact with contamination in soil and groundwater, ASS and ASR if construction and earthworks are not planned and managed with respect to contamination levels and relevant legislation and guidelines. This report assesses and provides mitigation measures related to the potential impacts on the Project construction and operation of existing contamination within the study area. The report also assesses the potential for project activities to cause contamination of the receiving environment. Further details on impacts identified for contaminated land are presented separately in the following sections.

This assessment has concluded that the environmental objective to “maintain the functions and values of aquatic environments, surface water and groundwater quality and stream flows and prevent adverse effects on protected beneficial uses.” will be met assuming the implementation of the mitigation measures to achieve the EPRs.

1. Introduction

1.1 Background

The Western Renewables Link Project (the Project) proposes a new transmission line starting at Bulgana, near Stawell in Victoria's west, and extending approximately 190km to Sydenham in Melbourne's north-west (refer to the Project Area presented in Section 3.1). The Project will enable the connection of new renewable energy generated in western Victoria into the National Electricity Market and increase the Victorian transmission capacity. The Project is being delivered by AusNet Transmission Group Pty Ltd (AusNet).

The Project was originally referred to the former Minister for Planning under the *Environment Effects Act 1978* (Environment Effects Act) on 9 June 2020 by AusNet and it was determined that an Environment Effects Statement (EES) was required. On 22 August 2023, the Minister for Planning determined that the Project has the potential to cause significant environmental effects and that an EES was required to inform decision-makers in the granting of key approvals for the Project. In summary the key changes in the new proposed project scope are:

- The urgent Sydenham Terminal Station Rebuild will be assessed and approved separately. A connection into the Sydenham Terminal Station forms part of Western Renewables Link scope
- The 220kV portion of the transmission line is proposed to be upgraded to 500kV
- The new terminal station north of Ballarat will no longer be required
- A new 500kV terminal station near Bulgana will be required, including a new 220kV connection to the existing Bulgana Terminal Station.

The Commonwealth Government’s Department of Agriculture, Water and the Environment (DAWE) — now Department of Climate Change, Energy, the Environment and Water (DCCEEW) — confirmed that the Project is a ‘controlled action’ and will require assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Commonwealth has determined that it will use the bilateral assessment agreement and rely on the Victorian Government’s assessment process under the Environment Effects Act to inform an approval decision under the EPBC Act.

1.2 Purpose of this report

The purpose of this report is to assess the potential contaminated land impacts associated with the Project and to define the Environmental Performance Requirements (EPRs) necessary to determine the environmental outcomes that the Project must meet, to be achieved through the implementation of mitigation measures during construction, operation and decommissioning, and address the EES evaluation objectives.

Contaminated land is defined in the *Environment Protection Act 2017* (Environment Protection Act) as ‘land’[1] where waste, a chemical substance, or a prescribed substance is present in a concentration above the background level and creates a risk of harm to human health or the environment’. This definition implies the distinction between land where chemical substances are ‘above background’ and land that is ‘contaminated’, i.e., where there is an unacceptable risk to human health or the environment.

Land is defined in the Act and means: *‘any land, whether publicly or privately owned, and includes: any buildings or other structures permanently affixed to the land; and groundwater’*. The definition includes groundwater; therefore, this Technical Report should be read in conjunction with the Groundwater Impact Assessment.

Potential sources of land contamination within the study area can be divided into two general categories - ‘diffuse’ and ‘point’ sources:

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[1] The term ‘land’ would normally include all subsurface soil and geological structures and groundwater. This also extends to the presence of ‘substances’ on the surface, and this could include ‘substances’ within buildings and structures ‘permanently affixed’ on the surface.

- **Diffuse sources** of land contamination are inputs and impacts which occur over a wide area and are not easily attributed to a single source. They are often associated with broad land uses (e.g., historical gold mines and agricultural practices).
- **Point sources** are a single, identifiable source of land contamination (e.g., a landfill, airport, quarries and industrial properties).

At a practical level, the identification and management of contaminated land is a necessary consideration in the planning, construction and long-term maintenance of infrastructure projects as related to potential risks associated with the:

- Health and safety of construction and maintenance workers, members of the public, future infrastructure users, and ecosystems potentially affected by the infrastructure project.
- Durability of construction materials associated with corrosive ground conditions.
- Management of excavated soils and excess groundwater, including disposal or use of soil as fill material.
- Mobilisation of existing groundwater contamination (if any) in adjacent areas.

Acid sulfate soils (ASS) is used to describe soil which contains metal sulfides. Acidity can be naturally occurring in soils, sediments and rock from a variety of sources, including organic acids and the oxidation of metal sulfides. Latent acidity can be produced by the excavation of these materials containing metal sulfides, via aeration and oxidation of sulfides, and may result in the formation of sulfuric acid. The formation of acid can also result in the mobilisation of metals from the soil, sediment or rock.

EPA Victoria (2009a) states that the occurrence of metal sulfides in rock is not restricted to the type, age or depositional environment and metal sulfides can be found in most rocks, generally at very low concentrations. The concentration of metal sulfides in rocks is determined by the geological processes of its formation. Metal sulfides are often associated with ore deposits (e.g., coal), base metals (e.g., copper, lead, tin, zinc) and with Cambrian to Middle Devonian aged gold-bearing sediments found throughout the State of Victoria (EPA Victoria 2009a). Acid sulfate rock (ASR) has been used to describe rock which contains metal sulfides in this report.

In Victoria, soil, sediment or rock containing metal sulfides in exceedance of criteria specified by EPA Victoria (2009a) are known as ASS and ASR and require management to minimise impacts to the environment from such acidity.

The Project's activities have the potential to encounter existing contamination, ASS and ASR, that if not planned or managed with respect to relevant legislation and guidelines has the potential to pose risk of harm to human health or the environment.

1.3 Structure of the report

The report is structured as follows:

- **Introduction** (this section) which provides background details for the Project and outlines the purpose and structure of the Contaminated Land Impact Assessment.
- **EES scoping requirements** (Section 2) where the EES scoping requirements relevant to contaminated land are set out, and an indication of where each component of the EES scoping requirements has been considered and addressed in the Contaminated Land Impact Assessment.
- **Project description** (Section 3), where Project components and activities relevant to the assessment are explained including the locations and activities with the highest associated contaminated land impacts.
- **Legislation, policy and guidelines** (Section 4) which lists the Commonwealth, state and other documents relevant to the assessment.
- **Method** (Section 5) where the approach applied to assess potential contaminated land impacts associated with the Project is explained.

- **Existing conditions** (Section 6) which identifies background conditions, potential sources of land contamination within the study area, based on review of publicly available information and previous contaminated land investigations. A preliminary Conceptual Site Model (CSM) was developed which was used to determine potential contaminant exposure pathways and receptors.
- **Impact assessment** (Section 7 to Section 8), where initial and residual contaminated land impacts during the construction, operation and decommissioning of the Project, including potential cumulative impacts from other nearby developments and projects are evaluated. Measures to mitigate or otherwise effectively manage the potential impacts are also presented here.
- **Environmental Performance Requirements** (Section 11) which set out the environmental outcomes to be achieved through the implementation of mitigation measures during the construction, operation and decommissioning. While some EPRs are performance based to allow flexibility in how they will be achieved, others include more prescriptive measures that must be implemented. Compliance with the EPRs will be required as a condition of the Project's approval.
- **Conclusions** (Section 12) where the objectives, methods, outcomes and recommendations of the assessment are presented.

1.4 Related studies

This report should be read in conjunction with the following related technical reports, from which this report draws specific information:

- **Technical Report Q: Geology and Soils Impact Assessment** describes the geology and soil conditions within the Project Area, as well as natural earth processes such as erosion, transportation and deposition of sediment.
- **Technical Report S: Groundwater Impact Assessment** discusses the impact of foundations and earthworks on groundwater and identifies environmental values and users of groundwater that require protection within the Project Area.
- **Technical Report E: Land Use and Planning Impact Assessment** describes the existing land uses, and potentially contaminating land uses within the Project Area.
- **Technical Report T: Surface Water Impact Assessment** identifies the impact of the Project to users of surface water and the environmental values that require protection within the Project Area.

2. EES scoping requirements

The Scoping Requirements – Western Renewables Link Environment Effects Statement (DTP, 2023) detail the matters to be investigated, assessed and documented in the EES for the Project and are referred to in this report as the EES scoping requirements.

2.1 EES evaluation objectives

The EES scoping requirements specify evaluation objectives which provide a framework to guide an integrated assessment of environmental effects of the Project, in accordance with the Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978, Eighth edition, 2023. The evaluation objectives identify desired outcomes in the context of key legislative and statutory policies, as well as the principles and objectives of ecologically sustainable development and environmental protection, including net community benefit.

The evaluation objective relevant to the contaminated land assessment is set out in Section 4.6 of the EES scoping requirements (Catchment values and hydrology) - Western Renewables Link Environment Effects Statement:

> *Maintain the functions and values of aquatic environments, surface water and groundwater quality and stream flows and prevent adverse effects on protected beneficial uses.*

In order to meet the evaluation objective, it is necessary to understand the potential impact of the Project on functions and values of contaminated land and ASS impacts prior to construction, operation and decommissioning of the Project so that impacts can be appropriately avoided or mitigated. Understanding potential impacts requires an impact assessment, for which the starting point is a clear understanding of the existing conditions.

This report aims to identify the contaminated land and ASS impacts within the study area so that the Project's interaction with potential contaminated land and ASS during construction, operation and decommissioning of the Project can be appropriately managed via EPRs.

2.2 Assessment of specific environmental effects

The EES scoping requirements set out the key issues that the Project poses to the achievement of the evaluation objective, together with the features and values of the existing environment that are to be characterised – these are referred to as the 'existing conditions'. The scoping requirements also list potential effects of the Project and identify where mitigation measures may be required.

The scoping requirements pertaining to contaminated land are set out in Section 4.6 (Catchment values and hydrology) of the scoping requirements. These are reproduced in Table 2.1, together with directions to the reader as to where these items have been addressed in this report (and other reports as applicable).

Table 2.1: Contaminated land scoping requirements

Aspect	Scoping requirement	Relevant sections
Key issues	Potential for the project to have significant impact on waterways, floodplains and wetland systems.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.
	Potential for adverse effects on nearby and downstream water environments due to changed water quality or impacts on groundwater or waterway conditions during construction.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.

Aspect	Scoping requirement	Relevant sections
	Potential for adverse effects on the functions, values and beneficial uses of groundwater due to the project’s activities, including water extraction, interception or diversion of flows, discharges or seepage from tower foundations or other earthworks and changes to salinity.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.
	Potential for disturbance of contaminated, saline, dispersive or acid sulfate soils.	Key issues related to ASS and contaminated soils are discussed in Sections 6.12, 8 and 9. For discussion on key issues related to saline and dispersive soils refer to Technical Report Q: Geology and Soils Impact Assessment for detail.
	Potential for erosion resulting from construction and operation due to vegetation loss or other factors.	Refer to Technical Report Q: Geology and Soils Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail. Refer to Technical Report A: Biodiversity Impact Assessment for detail.
Existing environment	Characterise the groundwater (including depth, quality and availability to licence/use) and surface water environments and drainage features in the project area of interest and its environs.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail. Technical Report A: Biodiversity Impact Assessment describes associated terrestrial and aquatic habitat within the study area.
	Characterise the interaction between surface water and groundwater within the project and broader area.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.
	Characterise the wetland systems in the project area of interest and its environs including the extent, types and condition of wetlands that could be impacted by the project, having regard to terrestrial and aquatic habitat, including as habitat corridors or linkages.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail. Refer to Technical Report A: Biodiversity Impact Assessment for detail.
	Characterise soil types and structures in the study area and identify the potential location and disturbance of dispersive, acid sulfate, saline or potentially contaminated soils, or soils of other special characteristics that could affect or be affected by the project.	Existing conditions relating to ASS and potentially contaminated soils are discussed in Section 6 and disturbance is discussed in Sections 6.12, 8 and 9. Refer to Technical Report Q: Geology and Soils Impact Assessment for detail on location and disturbance of dispersive, saline and soils with other special characteristics.
Mitigation measures	Identify and evaluate aspects of project works and operations, and proposed design refinement options or measures, that could avoid or minimise significant effects on water and catchment environments.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.
	Describe further potential and proposed design options and measures that could avoid or minimise significant effects on beneficial uses of surface water, groundwater and downstream water environments during the project’s construction and operation, including response measures for environmental incidents.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.

Aspect	Scoping requirement	Relevant sections
	Describe further potential and proposed design options and measures that could avoid or minimise significant effects on soil stability.	Refer to Technical Report Q: Geology and Soils Impact Assessment for detail.
	Describe available options for treatment or disposal of the various categories of solid and liquid wastes generated by the project.	Mitigation measures proposed, including a CEMP and SMP are outlined in Section 7 to 10 and the process for categorising solid and liquid waste for reuse, treatment or disposal is outlined in Section A.5 of Appendix A. Refer to Technical Report S: Groundwater Impact Assessment for key outcomes as they relate to groundwater.
Likely effects	Assess the potential effects of the project on surface water and groundwater environments and beneficial uses, including on permanent and ephemeral waterways, floodplains and wetland systems in or near the Project Area of interest and its environs, considering appropriate climate change scenarios.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.
	Identify and assess potential effects of the project on soil stability, erosion and the exposure and disposal of contaminated or hazardous soils (e.g., acid sulfate soils).	The potential effects of the Project on exposure and disposal of contaminated or hazardous soils (e.g. ASS) is discussed in Sections 6.12, 8 and 9. Refer to Technical Report Q: Geology and Soils Impact Assessment for detail on the potential effects of the Project on soil stability and soil erosion.
	Identify potential environmental effects resulting from the generation, storage, treatment, transport and disposal of solid and liquid wastes, including soil, from project construction and operation.	The potential effects from the Project resulting from the generation, storage, treatment, transport, and disposal of solid and liquid waste, including soil are discussed in Sections 7 and 8. Reference should also be made to Technical Report S: Groundwater Impact Assessment. Reference should also be made to Technical Report T: Surface Water Impact Assessment.
Performance criteria	Describe proposed measures to manage and monitor effects on catchment values and identify likely residual effects.	Refer to Technical Report S: Groundwater Impact Assessment for detail. Refer to Technical Report T: Surface Water Impact Assessment for detail.
	Describe contingency measures for responding to unexpected but foreseeable impacts such as disturbance of acid sulfate, saline, dispersive or contaminated soils.	Contingency measures are described in Sections 6.12, 8 and 11. Refer to Technical Report Q: Geology and Soils Impact Assessment for detail on contingency measures relevant to saline and dispersive soils.

3. Project description

3.1 Project overview

The Project aims to address the current constraints of the western Victorian transmission network by providing the additional capacity, reliability and security needed to drive the development of further renewable electricity generation in western Victoria. By doing so, the Project supports the transition from coal-generated electricity to renewables and the efficient connection of renewable electricity into the National Electricity Market.

The Project comprises the construction and operation of a new approximately 190km overhead double circuit 500kV transmission line between Bulgana in Victoria's west and Sydenham in Melbourne's north-west. To support the connection of the new transmission line, the following works are proposed:

- The construction and operation of a new 500kV terminal station near Bulgana and a 220kV transmission line connection to the existing Bulgana Terminal Station
- Expansion of the existing Bulgana Terminal Station
- Connection works at the Sydenham Terminal Station including the modification of a bay and a bay extension with associated infrastructure
- Upgrade of the existing Elaine Terminal Station, through the diversion of an existing line
- Protection system upgrades at connected terminal stations.

The Project's main features are summarised in Figure 3.1 and the location is shown in Figure 3.2.

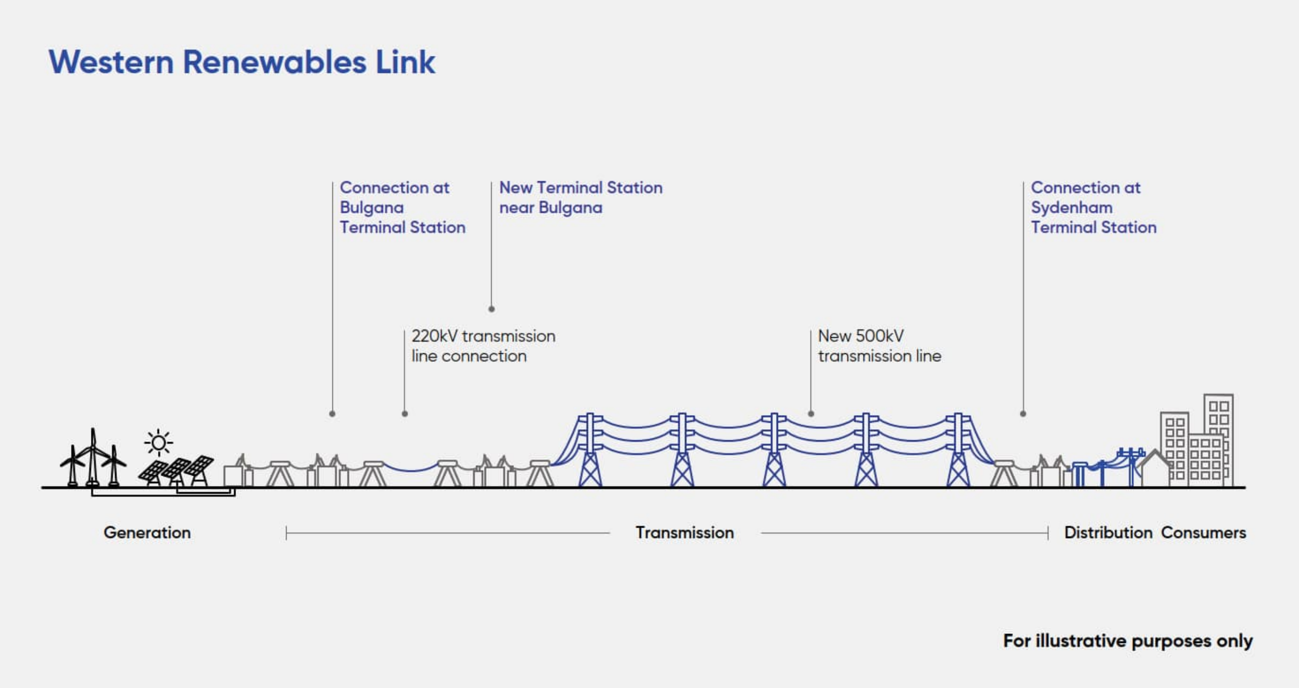


Figure 3.1: Western Renewables Link (Source: AusNet, 2024)

The Project can be described by the following key terms:

- **Project Land**: The Project Land encompasses all land parcels that could be used for the purpose of temporary Project construction and permanent operational components. The Project Land is shown in Figure 3.2.
- **Project Area**: The Project Area is contained within the Project Land and encompasses all areas that would be used to support the construction and operation of the Project. The Project Area is shown in Figure 3.2.

- **Proposed Route**: The Proposed Route is approximately 100 to 170m wide and encompasses the nominal future easement for the proposed new transmission line (including a buffer either side), and the terminal station areas. The Proposed Route is located within the Project Area.

The Proposed Route commences at the existing Bulgana Terminal Station with a 220kV transmission line connection to the new 500kV terminal station approximately 2.3km to the north-east. The Proposed Route then runs from the new 500kV terminal station to the north of the existing Ballarat to Horsham transmission line, where it runs parallel to the existing transmission for approximately 60km. East of Lexton, the Proposed Route deviates from the Ballarat to Horsham transmission line, passing through the northern section of the Waubra Wind Farm between Mount Bolton and Mount Beckworth. Continuing east, the Proposed Route passes south of the Berry Deep Lead gold mining precinct and north of Allendale and Kingston. North of Kingston the Proposed Route turns south-east to Mount Prospect. From Mount Prospect to near Dean, the Proposed Route is adjacent to the existing Ballarat to Bendigo transmission line. Near Dean, the Proposed Route deviates from the existing transmission line to run south, then east through Bolwarrah, Bunding and Myrniong to Darley. The Proposed Route then continues eastward crossing Merrimu Reservoir north of Long Forest and along the northern boundary of MacPherson Park at Melton, connecting to the existing electricity network at the Sydenham Terminal Station.

The Project crosses six local government areas (LGAs), namely:

- Shire of Northern Grampians
- Shire of Pyrenees
- City of Ballarat
- Shire of Hepburn
- Shire of Moorabool
- City of Melton.

For the purposes of this Contaminated Land Impact Assessment, the ‘study area’ adopted was applied to identify potential contaminated land that could impact the Project through contaminant migration. This is further discussed in Section 5.2.

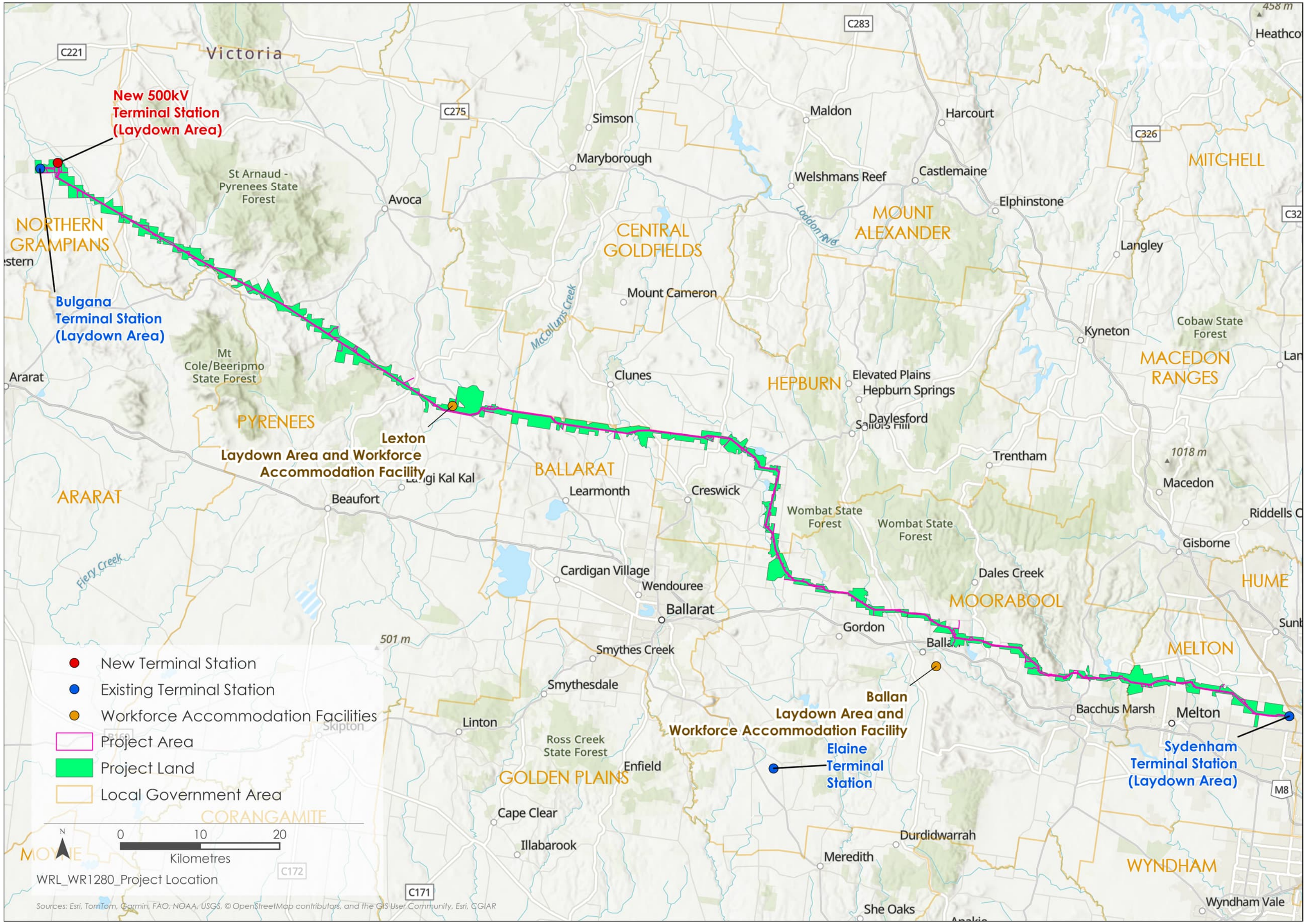


Figure 3.2: Project location (Source: Jacobs, 2025)

3.2 Project infrastructure

The Project includes both permanent and temporary infrastructure, as described in sections 3.2.1 and 3.2.2. The Project has been progressively refined from an initial broad area of interest as described in **EES Chapter 5: Project development**.

3.2.1 Permanent infrastructure

The proposed Project includes the construction of infrastructure listed in Table 3.1. Further detail is provided in **EES Chapter 6: Project description**.

Table 3.1: Project infrastructure – key components*

Double circuit lattice towers	418 double circuit towers
Single circuit lattice towers	36 single circuit towers (18 sets of two side-by-side)
Approximate length of 500kV transmission line route	Approximately 190km, between Bulgana in Victoria's west to Sydenham in Melbourne's north-west.
Approximate length of 220kV transmission line route	Approximately 2.5km, between the existing Bulgana Terminal Station to the new terminal station.
Terminal Stations	A new 500kV terminal station and associated infrastructure near Bulgana to be connected to the existing Bulgana Terminal Station via a 220kV connection.
	Expansion of the existing Bulgana Terminal Station to support connection of the new 500kV terminal station near Bulgana.
	A connection to the Sydenham Terminal Station, including the modification of a 500kV bay and a new 500kV bay extension with associated infrastructure
	Relocation and diversion of existing 220kV transmission lines at Elaine Terminal Station.

* Note: These figures are approximate and subject to final detailed design, which will consider further landholder consultation and geotechnical, site and other investigations.

For the safe and reliable operation of the transmission line, an easement is needed for the operation of the transmission line, and other related infrastructure to protect public safety and to provide access for maintenance and repair purposes. The transmission line easements will typically be between 70 and 100m wide for the Project.

The transmission line design requirements are specified by the Australian standard AS/NZS 7000:2016 Overhead Line Design and AusNet's Electricity Safety Management Scheme. Key assumptions and considerations of the transmission towers that will form part of the Project and have been used as the basis of this report are described below.

- Transmission towers (towers) support the overhead conductors (wires or lines) at the required height above the ground to meet regulations and safety requirements. The preferred tower configuration will be a galvanised steel lattice structure similar to those found elsewhere across Victoria and within the national network. The typical tower height for the Project is between 60 to 80m.
- Each tower has four footings which will typically be 1.8m in diameter and 9m deep. The four footings base width will be between 10 to 17m wide. During construction, ground disturbance around each tower will typically be no greater than 50 by 70m.
- The spacing or span length between each tower is determined by the height from the ground that the conductors need to be to achieve the required ground clearance in the middle of the span. Typical span length is between 450 to 550m for the transmission line. Longer span lengths are possible over sensitive areas or to avoid impacts, however longer spans require taller towers to provide safe ground clearances and

wider easements to allow for greater sway of the conductors. Similarly, where it is difficult to achieve the required ground clearance in the middle of the span, due to topography or obstacles, the tower span may be reduced.

- Each span comprises 26 conductors, made up of 12 conductors on each side of the tower cross arms and two ground wires across the top of the tower. Each conductor is approximately 32mm thick and made of aluminium wire strands with a steel core.

As part of the Project, the existing Bulgana Terminal Station will be upgraded to support the connection of the new 500kV terminal station into the existing 220kV switchyard. The new 500kV terminal station will support the connection of the Project transmission line and future connections. The new terminal station will require additional land to the north-east of the existing Bulgana Terminal Station.

Upgrades required at Elaine Terminal Station will involve the relocation of existing 220kV transmission lines and diversion of an existing 220kV line into the terminal station. The footprint of the terminal station will not change, and all new equipment will be approximately the same height and scale as existing structures and equipment at the Elaine Terminal Station.

Connection works are proposed at Sydenham Terminal Station. The existing Sydenham Terminal Station will be re-built through the Sydenham Terminal Station Rebuild Project, prior to the Project works. The Project will connect into Sydenham through the modification of a 500kV bay and new 500kV bay extension.

3.2.2 Temporary infrastructure

During construction there will be additional work areas, including vehicle access tracks, temporary tower stringing pads, distribution line crossover points, potential hurdle locations, temporary laydown areas and workforce accommodation facilities.

Temporary laydown areas associated with the terminal stations and the transmission line will be used to sort materials, pre-assemble Project components and store equipment, vehicles and other supplies that support construction activities. Temporary fencing, gates, security systems and lighting will also be installed at the laydown areas. The Project will establish five laydown areas; two of which will be located at existing terminal station sites (Bulgana and Sydenham), one at the new 500kV terminal station near Bulgana, and an additional two sites at intermediate locations between the stations south-east of Lexton and south-east of Ballan. The two intermediate laydown areas are required for the construction of the transmission line. The size of each site (including workforce accommodation facilities) will vary depending on storage requirements. The site south-east of Lexton will be up to approximately 12ha and the site south-east of Ballan will be up to approximately 24ha.

AusNet proposes to utilise temporary construction workforce accommodation facilities to accommodate construction workforce personnel. Two facilities are proposed; one in each of the western and eastern portions of the Project, co-located with each of the intermediate laydown areas. Each facility will have capacity for up to 350 personnel and will provide individual accommodation units, a communal kitchen and meals area, laundry, gym facilities, mobile and Wi-Fi boosters and serviced cleaning. The layouts of the proposed accommodation facilities will be determined by the Principal Contractor.

3.3 Summary of key Project activities

3.3.1 Construction

Construction of the Project will include preparatory activities (e.g., site investigations, establishment of laydown areas etc.), establishment of temporary infrastructure (such as water and wastewater infrastructure and power supplies), construction of towers and transmission line stringing works; construction works at terminal stations; site rehabilitation works; and pre-commissioning activities.

The overall construction duration of the Project is approximately two years. This schedule is dependent on adjustments required to deliver the Project and the granting of approvals within certain timeframes. For tower assembly and transmission line stringing, work will not be constant, with specialist crews following each other along the route doing specific jobs (clearing, site preparation, tower construction, conductor stringing, site rehabilitation, etc). As each work crew leaves a site (or property) there may be days, weeks, or possibly months of inactivity until the next crew arrives. The cumulative duration of construction work at each tower (i.e., time on each property) will be approximately 9 to 22 weeks (over a two-year period). Once construction is complete, site rehabilitation will occur and commissioning activities will include final inspections and other safety and pre-operational checks. Construction of the Project is anticipated to commence in late 2026 and be completed by late 2028.

Key activities associated with the construction of towers include:

- Site preparations, including necessary vegetation clearance
- Construction of vehicle access tracks and minor upgrades to existing roads and tracks
- Tower foundation construction
- Tower structure assembly and erection
- Transmission line stringing works
- Commissioning
- Site rehabilitation.

The works proposed at the new 500kV terminal station near Bulgana, the existing Bulgana Terminal Station and Sydenham Terminal Station will be constructed over a period of approximately 20 months, with key activities including:

- Site preparations, access and necessary vegetation clearance
- Earthworks
- Construction of footings, foundations and drainage systems
- Installation of structures and equipment
- Commissioning
- Landscaping and rehabilitation.

3.3.2 Operations

The operation and maintenance of transmission lines are subject to stringent regulatory controls to ensure public safety and the uninterrupted supply of electricity. All transmission line operators are required to comply with these controls and provide regular reports to the relevant authorities, including Energy Safe Victoria.

The key operation stage activities for the transmission line include:

- Scheduled inspections of the transmission line and easement (either by vehicle patrols or LiDAR/aerial surveys)
- Ongoing vegetation management to maintain safety clearances under the transmission line
- Tower maintenance inspections
- Repairs and maintenance to address issues found in above inspections.

While the terminal stations are operated remotely, staff are present at stations for inspections or maintenance. Routine inspections will occur bi-monthly, with personnel checking the overall condition of the terminal station’s assets.

3.3.3 Decommissioning

The Project’s transmission line is designed for a service life of 80 years, while the terminal station works have been designed for a minimum life of 45 years. The terminal station works will be maintained and upgraded to enable the terminal stations to remain operational for the service life of the transmission line. At the end of the service life of the transmission line, the infrastructure will either be decommissioned or upgraded to extend its service life to maintain the security and reliability of the transmission network as determined by the network planner at that time. In the event of decommissioning the key activities may involve:

- Lowering the overhead transmission line and ground wires to the ground and cutting them into manageable lengths to roll onto drums or reels for disposal as scrap metal
- Removing insulators and line hardware from structures at the site and disposal at an approved waste facility
- Dismantling towers in manageable sections, removing from the site and selling steel as scrap
- Excavation of footings below finish surface level
- Decommissioning and removal of terminal stations
- Easement restoration and rehabilitation, where required.

3.3.4 Activities relevant to the Contaminated Land Impact Assessment

Activities relevant to the contaminated land impact assessment will include:

- Site preparation and earthworks activities, including:
    - Stripping of topsoil and vegetation
    - Trenching
    - Stockpiling of topsoil or soil for reuse
    - Adding crushed rock.
- Construction of temporary laydown areas
- Construction of foundations for transmission towers and terminal stations (including chemical storage, refuelling plant and machinery, concrete batching, commissioning transformers and shunt reactors)
- Construction of temporary and permanent access tracks
- Construction of temporary hardstands to facilitate transmission tower construction
- Below ground works, including distribution line cross-overs, that may intercept groundwater and require dewatering.

Generally, contaminated land should be considered prior to any ground disturbance. Three general ground disturbance activities have been identified during pre-construction: temporary laydown area preparation, establishment of worker accommodation facilities, and installation of distribution line crossovers. Section 3.3.4.1 and Section 3.3.4.2 further describe the pre-construction activities that have implications for the Contaminated Land Impact Assessment.

3.3.4.1 Intermediate laydown areas and worker accommodation facilities

The Project will establish two collocated laydown area and worker accommodation facilities at the following locations to service the eastern and western portion of the route:

- Ingliston Road, Ballan (SPI: 1/LP147408)
- Sunraysia Highway, Lexton (SPI: 60/PP2989 and 61/PP2989).

The designated areas allow for worker lodging, storage of materials, sorting as well as pre-assembly of terminal station materials and transmission line materials.

Construction of these temporary laydown areas and worker accommodation facilities typically involves:

- Removing topsoil and vegetation, where required, using graders or tracked bulldozers

- Stockpiling of topsoil for reuse
- Levelling the ground surface using a roller
- Adding crushed rock
- Trenching for the installation of temporary services
- Installation of temporary building footings and foundations
- Rolling the ground for compaction.

3.3.4.2 Distribution line crossovers

Distribution line crossover services are proposed to be placed underground, where they intersect with the Project easement. AusNet has completed a design process to determine the most appropriate location for placement and construction techniques. This work has considered surrounding land uses and the need to avoid areas of significant environmental and cultural heritage values. The detailed design and construction of each distribution line crossover point will be undertaken by Powercor.

Typical buried distribution services involve trenching an area of approximately 600mm wide and 1m deep. Trenches are expected to be 100 to 300m long with an impact area around 3 to 4m wide. The temporary impact of this trenching work will vary and is highly dependent on the location and terrain. The impacts associated with trenching and installation of these crossovers have been assessed as part of this EES.

4. Legislation, policy and guidelines

This section provides an overview of key Commonwealth and state legislation relevant to contaminated land matters, including identifying primary and likely secondary approval requirements for the Project.

4.1 Commonwealth legislation

Table 4.1: Key Commonwealth legislation relevant to contaminated land

Legislation	Relevance to this report
Environment Protection and Biodiversity Conservation Act 1999	
The EPBC Act provides the legal framework to protect and manage matters of national environmental significance, which includes world heritage properties; national heritage places; wetlands of international importance (Ramsar); listed threatened species and communities; listed migratory species; Commonwealth marine areas; the Great Barrier Reef Marine Park; nuclear actions; and water resources, in relation to coal seam gas and large coal mining development. Any project that is likely to have a significant impact on matters of national environmental significance must be referred to the Commonwealth Minister for the Environment and Water via DCCEEW for a decision on whether the project is a 'controlled action' requiring assessment and approval under the EPBC Act.	The Project was referred to the Commonwealth Minister for the Environment, who determined that the Project is a 'controlled action' requiring assessment and approval under the EPBC Act before it can proceed. The Minister's referral decision (EPBC 2020/8741) issued on 2 September 2020 determined that the Project is a 'controlled action' due to its potential to have a significant impact on listed threatened species and communities, and further stipulates that the Project will be assessed under the assessment bilateral agreement between the Commonwealth and Victorian Governments. The proposed action referred was varied on 20 November 2024 to reflect the Project description. Under the Victorian *Environment Effects Act 1978*, the EES process is an accredited assessment process under the bilateral (assessment) agreement.
National Environmental Protection Council Act 1994 **(National Environmental Protection Council Act)**	
The National Environmental Protection Council Act established the National Environmental Protection Council to develop, implement and assess the effectiveness of National Environmental Protection Measures (NEPM). The National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013) (NEPM 2013) has been recognised as the primary national guidance document for the assessment of site contamination in Australia.	Further assessment (e.g., site walkover inspection / ground truthing, or targeted sampling and analysis) may be required in potential contaminated areas, particularly those with high potential for contamination (e.g., historical gold mines, quarries and landfill), to inform the environmental conditions. The assessment of potential risks and impacts from soil and groundwater contamination from the Project on human health and the environment needs to give consideration to the requirements of the NEPM 2013.

4.2 State legislation

Table 4.2. Key state legislation relevant to contaminated land

Legislation	Relevance to this report
Environment Effects Act 1978 **(Environment Effects Act)**	
The *Environment Effects Act 1978* (Environment Effects Act) provides for the assessment of projects that are capable of having a significant effect on the environment by enabling the Minister administering the Act to decide that an EES should be prepared. An EES may be required where: ▪ There is a likelihood of regionally or State significant adverse environmental effects. ▪ There is a need for an integrated assessment of social and economic effects of a project or relevant alternatives.	On 22 August 2023, the Minister for Planning determined that the Project requires assessment through an EES under the Environment Effects Act, due to matters as set out in the Statement of Decision on Referral No. 2023R-04, and summarised below: ▪ The area of interest for the project supports significant environmental values, and other social values, potential aggregate impacts on which are of at least regional significance.

Legislation	Relevance to this report
▪ Normal statutory processes would not provide a sufficiently comprehensive, integrated and transparent assessment. The process under the Environment Effects Act is not an approval process in itself; rather it is an assessment process that enables statutory decision-makers to make decisions about whether a project with potentially significant environmental effects should proceed.	▪ Multiple alignment and design alternatives for the project within the area of interest require rigorous and transparent assessment and refinement. ▪ An EES responds to community interest in project siting, alignment and design alternatives by providing appropriate opportunities for public input. The Minister for Planning issued the EES scoping requirements in November 2023 (Section 2), which have informed this assessment.
***Planning and Environment Act 1987* (Planning and Environment Act)**	
The Planning and Environment Act regulates the use and development of land in Victoria. The Planning and Environment Act sets out the framework and procedures for preparing and amending planning schemes, obtaining planning permits, settling disputes, enforcing compliance with planning schemes, and other administrative procedures.	The construction and operation of the Project would occur in the municipalities of Northern Grampians, Pyrenees, Ballarat, Hepburn, Moorabool and Melton and is subject to a range of planning controls under planning schemes for these municipal areas. The Planning Policy Framework of these planning schemes provides for the following Contaminated Land clause: Clause 13 Environmental Risks and Amenity ▪ Clause 13.04 Soil Degradation a) Clause 13.04-1S Contaminated and potentially contaminated land
***Ministerial Direction No. 19 Preparation of Amendments that may significantly impact the environment, amenity and human health (10 October 2018)* (Ministerial Direction No. 19)**	
Ministerial Direction No.19 requires the planning authority to seek the advice of the EPA Victoria when preparing planning scheme reviews and planning scheme amendments that could significantly impact the environment, amenity and human health.	This Direction has a broader remit relating to the preparation and content of amendments that may significantly impact the environment, amenity and human health. This consultation requirement is triggered when a planning scheme amendment is being prepared that may: ▪ Allow the use or development of potentially contaminated land, and / or trigger the requirements of Ministerial Direction No. 1 or The Environment Protection Act. ▪ Allow the use or development of land that could result in water, noise, air or land pollution impacts on the environment, amenity or human health, including as defined by State Environment Protection Policies (noting these have been superseded by the Environment Reference Standard (ERS)). This Direction provides the guidance on identifying the potential impact that may be caused by the Project to environment and human health, in the context of contaminated land. Further detail of MD No.19 can be found in Section A.2 in Appendix A.2.
***Environment Protection Act 2017* (Environmental Protection Act)**	
The Environment Protection Act came into effect on 1 July 2021. A principal feature of the Environment Protection Act is the establishment of the General Environmental Duty (GED) for business, industry and the community to prevent harm to human health and the environment. Obligations to manage contaminated land within the context of the GED include: ▪ Identification of any contamination a person should reasonably know about and assess that contamination. ▪ Management of contamination by minimising the risks to human health and the environment so far as reasonably practicable.	The GED requires identification of all risks and implementation of effective control measures. This guides the approach to managing impacts from potentially contaminated land during the Project from construction through to decommissioning. The Environment Protection Act also includes other relevant duties relating to land contamination, including a duty to notify contamination and a duty to manage contaminated land. The duty to manage contaminated land (Section 39) requires a person in management or control of land to minimise risks of harm to human health or the environment from the presence of contamination in land or groundwater. Under the duty to notify of

Legislation	Relevance to this report
▪ Notifying people who may be affected by the contamination. The new statutory regime also includes other relevant duties relating to land contamination, including a duty to notify contamination and a duty to manage contaminated land.	contamination (Section 40), where 'notifiable contamination' is present on land a person in management or control of the land has a duty to notify EPA Victoria. Should the Project intersect any existing contamination, management and notification may be required under the Environment Protection Act. Further details on the Environment Protection Act and the GED can be found in Section A.3.1 in Appendix A.
Environment Protection Regulations 2021 **(Environmental Protection Regulations)**	
Under the Environmental Protection Regulations, contaminated land and waste disposal are regulated through the new subordinate instruments, namely the Environment Protection Regulations and the Environment Reference Standard.	The Environment Protection Regulations (EPA Victoria, 2021a) impose obligations in relation to environmental protection, pollution incidents, contaminated land and waste, including in relation to on-site wastewater management systems and amongst other things, details activities and other matters requiring permissions under the Environment Protection Act. Further details on the Environment Protection Regulations can be found in Section A.4 in Appendix A.
Water Act 1989 **(Water Act)**	
The Water Act provides the legal framework for managing Victoria's water resources with the purpose of promoting the orderly, equitable and efficient use of water resources to make sure that water resources are conserved and properly managed for sustainable use for the benefit of present and future Victorians. The Water Act regulates impacts to surface water and groundwater resources.	In the context of groundwater, this Act establishes the Department of Energy, Environment and Climate Action (DEECA) as the authority responsible for the sustainable, efficient, equitable management and allocation of groundwater. For groundwater in the Project Area DEECA has delegated this responsibility to Southern Rural Water, Grampians Wimmera Mallee Water and Goulburn Murray Water, whose responsibilities include licensing any extraction from and injection to the groundwater system. Groundwater dewatering and recharge through bores requires a licence from these authorities (for construction of bores and for pumping from / to bores) if required. This is relevant in the event groundwater bores are required to be installed to sample groundwater for contamination pre-construction or during construction.

4.3 Policy, guidelines and standards

Table 4.3: Policy, guidelines and standards relevant to contaminated land

Policy, Guidelines and Standards	Description	Relevance to this report
Australian Standard 4482.1-2005: Guide to the Investigation and Sampling of sites with Potentially Contaminated Soil. Part 1: Non-Volatile Substances and Semi-Volatile Compounds	This Standard provides guidance on collecting sufficient and reliable information for the assessment of potentially contaminated sites, that may be contaminated by non-volatile and semi-volatile compounds. It includes guidance on the formulation of data quality objectives and designing a sampling plan to meet investigation objectives.	These Standards guide the approach to assessing risks and managing impacts on and from potentially contaminated land from construction to decommissioning of the Project. These standards will be incorporated within the CEMP and Operational Environmental Management Plan (OEMP) of the Project.
Australian Standard 4482.2-1999: Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 2: Volatile Substances.	This Standard provides guidance on collecting sufficient and reliable information for the assessment of potentially contaminated sites, that may be contaminated by volatile compounds. It includes guidance on the formulation of data	

Policy, Guidelines and Standards	Description	Relevance to this report
	quality objectives and designing a sampling plan to investigation objectives.	
Australian Standard 2159-2009: Piling-design and installation	This Standard sets out minimum requirements for the design construction and testing of piled footings for the transmission towers.	The design of the transmission towers will need to consider potentially corrosive ground conditions (e.g., corrosive soil and groundwater) in accordance with this standard. Intrusive geotechnical investigations are proposed to inform detailed design sampling. Sampling for these investigations should have regard to analysis for material durability parameters in accordance with this Standard.
Environment Reference Standard (Victorian Government, 2021b)	The Environmental Reference Standard replaced the State Environment Protection Policies (SEPP). It is not a compliance standard but will be used by the EPA Victoria when considering licence applications as it provides a baseline from which to assess 'harm' (as defined in the Environment Protection Act).	Parts 4 and 5 of the ERS relate to the protection of environmental values for land and waters (including groundwater). The ERS establishes indicators and objectives for land and waters (including groundwaters) that should be considered when undertaking contaminated land investigations. The indicators and objectives for the soil and groundwater investigations that should be considered for the Project are detailed in Sections A.4 and A.6 of Appendix A.
Industrial Waste Resource Policies	The Industrial Waste Resource Policies require the management of industrial waste materials in accordance with the waste hierarchy principle.	Under this principle, the IWMPs provide the regulatory framework for identification, handling, management and disposal of industrial waste materials, including contaminated soils and ASS. Implementation of the Industrial Waste Resource Policies by industry is primarily achieved through the Industrial Waste Resource Guidelines (IWRG). The principal IWRGs that are of relevance to the investigation, assessment and management of soil are: ▪ Publication 1828.3: Waste disposal categorises – characteristics and thresholds (EPA Victoria, 2024) ▪ IWRG655.1 – Acid sulfate soil and rock (EPA Victoria, 2009a) ▪ IWRG701 – Sampling and analysis of waters, wastewaters, soils and wastes (EPA Victoria, 2009c) ▪ IWRG702.2 – Soil sampling (EPA Victoria, 2024) Further detail on the guidelines that have been adopted for waste classification can be found in Section A.5 in Appendix A.
EPA Victoria (2020d) publication 1741.1: Industry guidance: supporting you to comply with the general environmental duty	This document outlines that under the GED, a person engaging in an activity is required to have a reasonable knowledge about the risks that the activity poses and how to address them. This knowledge is referred to as the 'state of knowledge'.	This publication guides the approach to assessing risks and managing impacts on and from potentially contaminated land from construction to decommissioning of the Project. This report forms part of the 'state of knowledge' with respect to the GED.
EPA Victoria (2020b) Publication 1834.1: Civil Construction, Building and Demolition Guide	This document provides guidance to support activities and projects of all scales and complexity to help inform the decisions and steps to reduce or eliminate risk. It contributes to industry state of knowledge and is not a compliance document.	This publication guides the approach to assessing risks and managing impacts on and from potentially contaminated land from construction to decommissioning of the Project. This publication will

Policy, Guidelines and Standards	Description	Relevance to this report
		be incorporated within the CEMP and OEMP of the Project.
EPA Victoria (2021f) publication 1977: Assessing and controlling contaminated land risks: A guide to meeting the duty to manage for those in management and control of land	Publication 1977 Identifies that a person in management or control is required to comply with the duty to manage contaminated land if all the following circumstances apply: 1) You are a person in management or control of land (e.g., landholder or Principal Contractor); and 2) The land or groundwater is contaminated within the meaning of Section 35 of the Environment Protection Act; and 3) There are reasonably practicable actions that can be taken to minimise the risks of harm associated with the contamination.	This publication addresses the management of potential adverse impacts to human health and the environment associated with the presence of contamination including steps needed to identify and assess the risk of harm. This publication will be incorporated within the CEMP and OEMP of the Project.
EPA Victoria (2021b) Publication IWRG822.4: Waste Codes	This publication forms part of EPA Victoria's guidance for the management of industrial wastes regulated under the Environment Protection Regulations. The publication assists waste producers, consigners, transporters and receivers to identify waste codes for use in EPA Victoria's Waste Tracker. The publication also assists in identifying which wastes are classified as 'reportable priority wastes (RPW)'. RPW must be reported to EPA Victoria every time the waste changes hands, producers, accredited consigners, transporters, drivers and receivers of RPW must use EPA Victoria's Waster Tracker to complete transactions. Information required by each waste handler is detailed in Schedule 7 – Reportable priority waste transaction details of the Environment Protection Regulations.	These publications guide the approach to assessing risks and managing impacts on and from potentially contaminated land from construction to decommissioning of the Project. These publications will be incorporated within the CEMP and OEMP of the Project.
EPA Victoria (2021h) Publication 1968.1: Guide to classifying industrial waste	Provides guidance on classifying industrial waste under the Environment Protection Act and Environment Protection Regulations 2021.	
EPA Victoria (2021j) Publication 2008.1: Notifiable contamination guideline: Duty to notify of contaminated land	This publication provides guidance on what notifiable contamination is, how to interpret the circumstances that make contamination notifiable and EPA Victoria's expectations for completing the notification process.	
EPA Victoria (2021k) Publication 1820.1: Construction - guide to preventing harm to people and the environment	This publication outlines how to manage risks of harm to human health and the environment for pollution and waste that may be generated by construction activities. This guide outlines legal obligations of the construction industry, including the GED, and what actions that may be taken to comply the Environment Protection Act.	
EPA Victoria (2021l) Publication 1940: Contaminated land: Understanding section 35 of the Environment Protection Act 2017	This publication provides information on how EPA Victoria defines contaminated land, and the principles and standards, including the ERS and NEPM (2013), that EPA Victoria regards as applicable to the identification of contaminated land. The publication also provides guidance on	

Policy, Guidelines and Standards	Description	Relevance to this report
	how to determine whether land location falls within the definition of contaminated land.	
EPA Victoria (2018) Publication 1698: Liquid storage and handling guidelines	This guide outlines the principles for preventing harm to the environment and human health when storing and handling liquid substances. The guide covers topics including risk management, primary containment, secondary containment (including bunding), requirements for dangerous goods and hazardous substances, spill prevention, maintenance and incident response.	
EPA Victoria (2015) 788.3 - Siting, design, operation and rehabilitation of landfills	This publication presents the best practice environmental management measures for landfills in Victoria as set by EPA Victoria. The publication provides information on the potential impacts of landfills to the environment and human health and how they can be avoided, minimised or mitigated.	One landfill has been identified as being within the study area and within the recommended buffer distance described in this publication. This is further discussed in Section 6.4.3.
EPA Victoria (2021m) Contaminated Land Policy. Publication 1915.	This policy provides an explanation of the duties under the Environment Protection Act that are relevant to contaminated land and the role the duties play in reducing risk of harm to human health and the environment. The policy also outlines how EPA Victoria will implement and approach determining compliance with the duties under the Environment Protection Act.	This policy guides the approach to assessing risks and managing impacts on and from potentially contaminated land from construction to decommissioning of the Project. This policy will be incorporated within the CEMP and OEMP of the Project.
EPA Victoria (2021i) Publication 2001: Guidance for the cleanup and management of contaminated groundwater	Outlines the concept of minimisation of risk of harm to human health and the environment in the context of the cleanup of contaminated groundwater. This guideline is aimed at assisting environmental auditors in preparing audits under the Environment Protection Act. The guideline is also aimed at assisting planning and other statutory Authorities and consultants undertaking site investigations.	This guides the approach to assessing risks and managing impacts on and from potentially contaminated land during the Project. Should contaminated groundwater be intercepted by the Project and require cleanup this guideline should be incorporated into site investigations, planning and management activities.
EPA Victoria (2021) Planning Practice Note 30: Potentially Contaminated Land	Development of land provides an opportunity to address contamination and mitigate any risks posed to human health, the environment, and building and structures. Contaminated land can often be safely used and developed following appropriate remediation, provided any necessary controls to manage residual contamination are implemented. This practice note provides advice about the role of the planning system and applies to situations where a planning approval or control applies.	This provides planning guidance on how to identify potentially contaminated land, the appropriate level of assessment of contamination in different circumstances. This practice note provides advice about the role of the planning system and applies to situations where a planning approval or control applies.
EPA Victoria (2023) EPA Designation – Classification of PFAS-impacted soil	Sets out the waste classification for soil impacted by PFAS.	Referenced for comparison of soil investigation data for the soil investigation described in Section 6.2.

Due to the release of the Environment Protection Act on 1 July 2021, guidance documents, policies and standards may be progressively updated by responsible authorities, particularly EPA Victoria. Jacobs has taken reasonable care to consider the most currently available guidance, policies and standards where available. However, new guidance, policies and standards may have been released following the publication of this report. Therefore, consideration should be given to the most current version of guidance documents, policies and standards for assessment and management of impacts during future stages of the Project.

5. Method

5.1 Overview

This section describes the method that was used to assess the potential impacts of the Project. Risk screening was applied to prioritise the key issues for impact assessment. Measures to avoid, minimise and manage potential effects have then been developed to address these impacts. The following sections outline the method adopted for the Contaminated Land Impact Assessment.

5.2 Study area

The study area for the Contaminated Land Impact Assessment includes the Project Area as described in Section 3.1 and a 500m buffer from the boundary of the Project Land, as shown in Figure 5.1. The 500m buffer was applied to identify potential contaminated land that could impact the Project through contaminant migration.

5.3 Existing conditions

The existing conditions assessment was used to characterise the current condition and values of the physical, biological and social environment. The study of existing contaminated land conditions comprised desktop-based research of publicly available information; review of relevant reports provided by AusNet; and review of previous information and data provided to Jacobs. Consistent with the EES scoping requirements the study of existing conditions was to:

- Review publicly available databases, including:
  - Aerial photographs
  - Current and historic mining and extractive activities
  - Victorian Landfill Register
  - EPA Victoria Priority Site Register
  - EPA Victoria Environmental Audits database
  - Publicly available information identifying potential sources of PFAS contamination.
- Review Groundwater Quality Restricted Use Zones (GQRUZs), as declared by EPA Victoria
- Review the Atlas of Australia Acid Sulfate Soils
- Review previous contaminated land investigations conducted within the study area by AusNet (refer to Section 6.2)
- Develop a preliminary CSM, identifying potential sources of contamination; contaminants of concern; migration pathways and potential receptors.

5.4 Risk screening

A risk screening process was undertaken to identify the contaminated land-related risks associated with the design, construction, operation and decommissioning of the Project and to provide for the appropriate level of investigation. The outcomes of the risk assessment identified the key issues that were taken forward into the impact assessment phase (see Sections 7.1, 8.1 and 0). Risk screening is conducted by developing a preliminary conceptual site model (CSM). This process is described in further detail in Section 6.10.

DATA SOURCES
Jacobs, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Figure 5.1: Study area (Source: Jacobs, 2025)

5.5 Impact assessment method

5.5.1 Overall methodology

The method for assessing contaminated land impacts was largely based on the direct interaction, or potential for interaction, of the Project with existing land contamination and ASS. The primary task of the impact assessment involved a review of detailed design information against the existing conditions to identify whether Project components such as infrastructure and construction methods:

- Have the potential to disturb contaminated soil and groundwater and ASS
- Have the potential to impact environmental values of soil and groundwater within the study area
- Are likely to intersect the water table or impact groundwater quality.

The method for the Contaminated Land Impact Assessment included:

- Identifying key issues (as described in Section 5.4) to be addressed in the impact assessment
- Development of mapping which displays the location of identified potentially contaminating activities or land uses (past or present) in the study area that may impact or may be impacted by the construction and operation stages of the Project
- Development of mapping which displays the likelihood of encountered ASS in the study area that may impact the construction and operation stages of the Project
- Identifying potential impacts of Project construction, operation, and decommissioning including the likely extent, magnitude and duration of changes to contaminated land impacts according to the impact ratings developed for contaminated land summarised below
- Measuring potential impacts of the Project against the existing conditions by assessing the significance of the impacts, taking into consideration mitigation measures. Mitigation measures to reduce the potential impacts have been recommended in accordance with the mitigation hierarchy (avoid, minimise, manage, rehabilitate and offset) and these have then informed the development of Environmental Performance Requirements (EPRs)
- Identifying any other potential developments that could lead to cumulative impacts when considered together with the Project
- Preparing EPRs to define the environmental outcomes to be achieved through the implementation of mitigation measures during construction, operation and decommissioning. While some EPRs are performance based to allow flexibility in how they will be achieved, others include more prescriptive measures that must be implemented. Compliance with the EPRs will be required as a condition of the Project's approval
- Applying the relevant conditions for workforce accommodation facilities from the draft Incorporated Document, to avoid, minimise and manage impacts associated with these sites
- Determining the residual impacts associated with the construction, operation, and decommissioning of the Project, and evaluating their significance in accordance with the criteria described above.

Table 5.1 shows the specific ratings applied when assessing the relevant aspects of the potential contaminated land impacts. These criteria were used to assess the overall residual impacts of the Project's activities on contaminated land.

Table 5.1: Criteria for determining significance of contaminated land impact

Rating	Contaminated land impact ratings
Negligible	No observed impact on human health, the environment or existing land-use due to the negligible presence or disturbance of soil or groundwater contamination or ASS.
Minor	Potential short-term impact to human health, the environment or existing land-use due to the presence or disturbance of soil or groundwater contamination or ASS.
Moderate	Ongoing (for the life of the Project), infrequent impact to human health, the environment or existing land-use due to the presence or disturbance of soil or groundwater contamination or ASS.
Major	Human health, the environment or existing land-use significantly compromised by the presence or disturbance of soil or groundwater contamination or ASS.
Severe	Irreversible damage to human health, the environment or existing land-use caused by the presence or disturbance of soil or groundwater contamination or ASS.

5.5.2 Pre-construction and construction

The impact assessment for the pre-construction and construction stages focused on the potential for the disturbance of contaminated land, groundwater, or ASS that may result in harm to human health or the environment, existing land-use or assets. This includes consideration of pre-construction and construction activities that have potential to inadvertently impact environmental values within the study area, such as through spills and leaks. The significance of impacts was determined using criteria outlined in Table 5.1.

This methodology for the contaminated land impact assessment included:

- Identification of relevant Project components such as infrastructure and construction methods that have the potential to interact with contaminated land, groundwater, or ASS
- Proposal of appropriate mitigation measures and EPRs that can be implemented during construction to manage the identified impacts
- Assessing residual impacts following the application of management and mitigation measures.

5.5.3 Operation

The operation of the Project infrastructure may require ongoing management to mitigate impacts on the environment with respect to contaminated land, groundwater, or ASS. The impact assessment methodology included further assessment of the interaction of infrastructure with contaminated land, groundwater, or ASS, and proposal of appropriate mitigation measures. The significance of impacts was determined using criteria outlined in Table 5.1. Residual impacts were assessed following the application of management and mitigation measures.

5.5.4 Decommissioning

The decommissioning of the Project infrastructure will result in similar potential impacts to the construction stage and therefore the same methodology was adopted as described above in Section 5.5.2 to assess impacts during decommissioning.

5.5.5 Cumulative impacts

Cumulative impacts were considered with other relevant future projects in the vicinity of the Project Area. This assessment included evaluation of relevant future projects that have a spatial and temporal relationship to the Project and are likely to cause significant disturbance in relation to contaminated land throughout the Project service life. **EES Chapter 4: Environmental assessment framework and approach** details the criteria used to determine the projects to be considered in the cumulative impact assessment and lists all projects that were identified for the assessment.

5.6 Stakeholder engagement

Stakeholders and the community were consulted to support the preparation of this report and to inform the development of the Project and understanding of its potential impacts.

Table 5.2 lists specific engagement activities that have occurred in relation to contaminated land, with more general engagement activities occurring at all stages of the Project. Feedback received during community consultation sessions is summarised in Section 5.7relevant to the Contaminated Land Impact Assessment.

Table 5.2: Stakeholder engagement undertaken for the Contaminated Land Impact Assessment

Stakeholder	Matters discussed
EPA Victoria	▪ Consideration of aspects of the General Environmental Duty including State of Knowledge and other relevant contaminated land duties. The General Environmental Duty and other contaminated land duties under the Environment Protection Act that should be considered for the Project are outlined in Section A.3. ▪ Any dewatered groundwater should be considered as 'waste' as defined by the Environment Protection Act and will need to be managed in accordance with the Environment Protection Regulations. The management measures for disposal of dewatered groundwater are outlined in Section 7. ▪ Discussion of mitigation strategies if groundwater is unexpectedly encountered during construction. This should be the foundation for the Environmental Management Framework and CEMP subsequently. The dewatering impact and proposed mitigation measures are outlined in Section 7.

5.7 Community feedback

In addition to consultation undertaken with specific stakeholders, consultation has been ongoing with the community throughout the design development and the EES process. Feedback relevant to the Contaminated Land Impact Assessment is summarised in Table 5.3, along with where and how those topics are addressed in this report.

Table 5.3: Community consultation feedback relevant to the Contaminated Land Impact Assessment

Matter raised	Where matter has been addressed
Location of former gold mining concentrated around Creswick North, Allendale and Bolwarrah	Refer to Section 6 for a summary of existing conditions relevant to former mining and extractive activities and Section 7.2 for a description of potential impacts during construction and proposed mitigation measures.

5.8 Assumptions and limitations

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that observations and conclusions as expressed in this report may change.

The following assumptions, limitations and uncertainties apply to this impact assessment:

- The Contaminated Land Impact Assessment is limited to publicly and readily available information and is based on conditions that existed at the time the assessment was completed. Its findings and conclusions may be affected by the passage of time, by man-made events (e.g., construction on or adjacent to the Project Land boundary) and by new releases of hazardous substances into the environment.
- Historic land use information presented is limited to observations made from a series of aerial photographs publicly available on DEECA historic photo maps. Based on the primarily agricultural land use and scale of the Project Land this approach is considered satisfactory, however it is possible that contamination events

prior to these dates or sites not observable at the scale of the photographs may not have been identified as part of this assessment.

- The compiled data may not include all landfill sites. As acknowledged by EPA Victoria, there is a lack of consolidated data on historic Victorian landfills.
- The compiled data may not include all current and historical mining and extractive industries sites. The datasets are maintained by DJSIR and DEECA and updated from time to time.
- The identification of potential for ASS via Australian Atlas of Acid Sulfate Soil mapping is provisional for areas where analytical data was not available when mapping was prepared. Australian Atlas of Acid Sulfate Soil mapping maintained by CSIRO in many cases is based on desktop assessment, noted to be high level and references several other datasets including geological mapping.
- The Priority Sites Register (based on EPA Victoria data as of 20 May 2024) does not list all known contaminated sites in Victoria. A site should not be presumed to be free of contamination if it does not appear on the Register.
- The interpretation of subsurface conditions and the nature and extent of contamination in this report is based on field observations and chemical analytical data from the limited and widely spaced sampling locations. It is possible that contamination exists in areas that were not investigated, sampled or analysed.

The purpose of this Impact Assessment is to identify current and/or historical contaminating activities within the study area that would be unfeasible to manage by implementing current best practice during construction and operational Project stages. The study-area scale existing conditions assessment has not been scoped to be consistent with contaminated land assessment methodologies set out in NEPM 2013 and does not constitute a preliminary site investigation (PSI) or detailed site investigation (DSI). Consistent with EPR CL1 (see Section 11), where required, PSI and/or DSI works will be undertaken consistent with NEPM 2013 prior to construction.

Opportunistic sampling will occur as part of geotechnical investigations for the Project which is targeting tower locations.

5.9 Data sources

Publicly available data sources used in the preparation of the Contaminated Land Impact Assessment are summarised in Table 5.4.

Table 5.4: Publicly available data sources used for Contaminated Land Impact Assessment

Data	Source
Historical aerial photographs	DEECA (2021b) Historic photo maps 1945 – 1947 (as available) https://services.land.vic.gov.au/DELWPmaps/historical-photomaps/
Current and historical mining activities	DJSIR (2024) current mining licences and leases and DEECA (2024b) historical mining activity https://discover.data.vic.gov.au/dataset/current-mining-licences-and-leases https://discover.data.vic.gov.au/dataset/historical-mining-activity
Current extractive activities	DEECA (2024a) Current Extractive Industry Tenements https://discover.data.vic.gov.au/dataset/current-extractive-industry-tenements
Victorian Landfill Register	EPA Victoria (2024a) Victorian Landfill Register (VLR) – location polygons https://discover.data.vic.gov.au/dataset/epa-victoria-victorian-landfill-register-vlr-location-polygons
EPA Victoria Priority Site Register	EPA Victoria (2024b) Priority Sites Register (PSR) – location polygons https://discover.data.vic.gov.au/dataset/epa-victoria-priority-sites-register-psr-location-polygons
EPA Victoria Environmental Audits database	EPA Victoria (2024g) Environmental Audit Reports – location polygons https://discover.data.vic.gov.au/dataset/epa-victoria-environmental-audit-reports-location-polygons
PFAS registers	PFAS and contaminated land investigation sites. Australian Government Department of Defence (Defence 2021a; 2021b)

Data	Source
	https://www.defence.gov.au/id/derp/VIC.asp https://www.defence.gov.au/environment/pfas/default.asp Airservices (2021) Australia National PFAS Management Program sites. Airservices Australia https://www.airservicesaustralia.com/community/environment/pfas/ EPA Victoria (2024c; 2024d; 2024e; 2024f) https://www.epa.vic.gov.au/for-community/current-projects-issues/cfa-training-sites/cfa-training-sites-epas-role https://www.epa.vic.gov.au/for-community/current-projects-issues/pfas-contamination-at-department-of-defence-sites https://www.epa.vic.gov.au/for-community/current-projects-issues/pfas-in-maribyrnong-catchment https://www.epa.vic.gov.au/for-community/environmental-information/pfas/pfas-in-the-environment
Atlas of Australian Acid Sulfate Soils (CSIRO 2013)	CSIRO (2013) https://www.asris.csiro.au/
VicPlan Planning Scheme Overlay	DEECA (2024c) https://mapshare.vic.gov.au/vicplan/
Groundwater Quality Restricted Use Zones	EPA Victoria (2024h) https://discover.data.vic.gov.au/dataset/epa-victoria-groundwater-quality-restriction-use-zones-gqruz-location-polygons
Mercury and gold mining in Victoria	Davies et. al. 2015. Mercury use and loss from gold mining in nineteenth-century Victoria. The Royal Society of Victoria, 127, p. 44-45, CSIRO Publishing 2015.

6. Existing conditions

6.1 Introduction

Existing conditions within the study area are presented in the following sections. The study area has been subdivided by LGA to aid discussion. Where similar potentially contaminating conditions have been identified the discussion has been combined.

The NEPM 2013 establishes the first stage of investigations for contaminated sites as a primarily desktop review to understand the history and existing conditions within the study area and to develop a preliminary CSM. The preliminary CSM will identify potential sources of contamination and any pathways for contamination to reach receptors under the land use scenario. The purpose of the desktop review is to identify discrete sites within the study area where the Project may affect or be affected by potentially existing contamination.

6.2 Summary of previous contaminated land investigations

The following sections provide a summary of previous contaminated land investigations undertaken by AusNet at or within vicinity of the study area. The locations of the contaminated land investigations relative to the study area are presented in Figure 6.1.

6.2.1 Bulgana Terminal Station: Phase one environmental site assessment

Jacobs reviewed the findings of a phase one environmental site assessment report undertaken at the Bulgana Terminal Station, located on Vances Crossing Road, Joel Joel (A.S. James, 2019). The report included a review of the site's history and a limited soil sampling program.

The site history review indicated that the area now covered by the existing Bulgana Terminal Station and remainder of the AusNet land was historically used for agricultural purposes. The terminal station was constructed in 2018.

A total of 27 boreholes were advanced to a maximum depth of 3.5 metres below ground level (m bgl), with samples collected between 0.3 and 2.5m bgl. The investigation concluded that the soil conditions within the investigation area were a low contamination risk and suitable for commercial and industrial land use. The site history review conducted by A.S. James Pty Ltd (2019) indicated that the area now covered by the existing Bulgana Terminal Station and remainder of the AusNet land, was historically used for agricultural purposes. Whilst the remainder of the AusNet land, grassed areas to the north and west of existing terminal station, was not included in the scope of the A.S. James Pty Ltd investigation, it is anticipated that the soil in these areas is likely to exhibit similar quality to the baseline soil quality reported within the terminal station area due to the historic land use for agricultural purposes.

Groundwater was not investigated in this phase one environmental site assessment report. The report stated that no underground storage tanks, fuel lines or vent pipes were identified during the investigation and historical site activities were unlikely to have impacted the underlying groundwater.

6.2.2 Crowlands Substation Project: Preliminary soil assessment

Jacobs undertook a preliminary soil assessment of a portion of land located at Spring Flat Road, Crowlands, now the current Crowlands substation, located within the study area (Jacobs, 2017b). The assessment was undertaken prior to development of the current Crowlands substation site. The objectives of the assessment were to identify current and historical potentially contaminating land uses and potential types and sources of contamination, provide an indication of potential risks to construction workers and provide an indication of potential waste soil classification for on-site reuse or offsite disposal. The only potential sources of contamination identified was former agricultural land use (use of fertilisers and operation/maintenance of heavy machinery). Accordingly, Jacobs applied a broad testing suite for potential contaminants including metals, total recoverable hydrocarbons, benzene, toluene, ethylbenzene and xylene, polycyclic aromatic hydrocarbons, organochlorine pesticides, polychlorinated biphenyls, cyanide, fluoride, volatile organic compounds, vinyl chloride, pH and phenols.

A total of 12 shallow sampling locations were advanced to a maximum depth of 0.5 to 1.0m bgl. Jacobs concluded that there were no exceedances of adopted human health and ecological or waste criteria and site spoil may be suitable for onsite reuse based on the limited soil sampling undertaken at the site.

A desktop review indicated that the depth to groundwater was variable from less than 5m bgl to greater than 50m bgl in the vicinity of the current Crowlands substation site. Groundwater was not observed during the soil investigation. The investigation was undertaken prior to construction and operation of the current Crowlands substation.

Although, no upgrade works are planned for the current Crowlands substation the data collected from this previous investigation provides an indication of the potential condition of surrounding soils with an agricultural land use (grazing) and is located within the study area.

6.2.3 Desktop review of mining-related impacts

La Trobe University has prepared two desktop reports investigating potential gold mining impacts within areas of cultural heritage sensitivity across the Project. The reports focus on areas of cultural heritage sensitivity from Bulgana to Waubra (La Trobe University, 2020) and from Waubra to Sydenham (La Trobe University, 2022).

The objective of the reports was to assess the likelihood that mining sludge had been deposited within areas of cultural heritage sensitivity and to identify any other evidence of impacts to areas of cultural heritage sensitivity resulting from gold mining. La Trobe University found that areas of sludge deposition are easiest to identify where stratigraphy is exposed, such as banks of creeks and rivers, gullies and drainage ditches and presenting as a distinct horizon from underlying flood plain deposits.

Table 6.1 below summarises the results of the two reports, identifying 10 locations with an either evidenced or moderate potential for sludge deposition. Refer to Figure 7 in La Trobe University (2020) and Figures 7a and 7b in La Trobe University (2022), located in Appendix B, for the individual locations.

Table 6.1. Summary of potential gold mining impacts within the Project

Potential for Sludge Deposition	No. Locations - Bulgana to Waubra	No. Locations – Waubra to Sydenham
Evidenced	Nil	5
Moderate	2	3
Some	5	5
Negligible	15	71
TOTAL	**22**	**85**

Identification or investigation of the potential for contaminated land to be present within those areas was not part of La Trobe University's scope. La Trobe University does not make comment on the likelihood or nature of contamination that may be present within the sludge in these areas.

Due to the known association of historic gold mining practices and contamination of land, groundwater and surface water from such practices (DoH, 2013; Davies et. al., 2015), and the absence of site contamination data, Jacobs considers those sites identified by La Trobe University to be potentially contaminated.

6.2.4 Preliminary soil investigation and site walkover

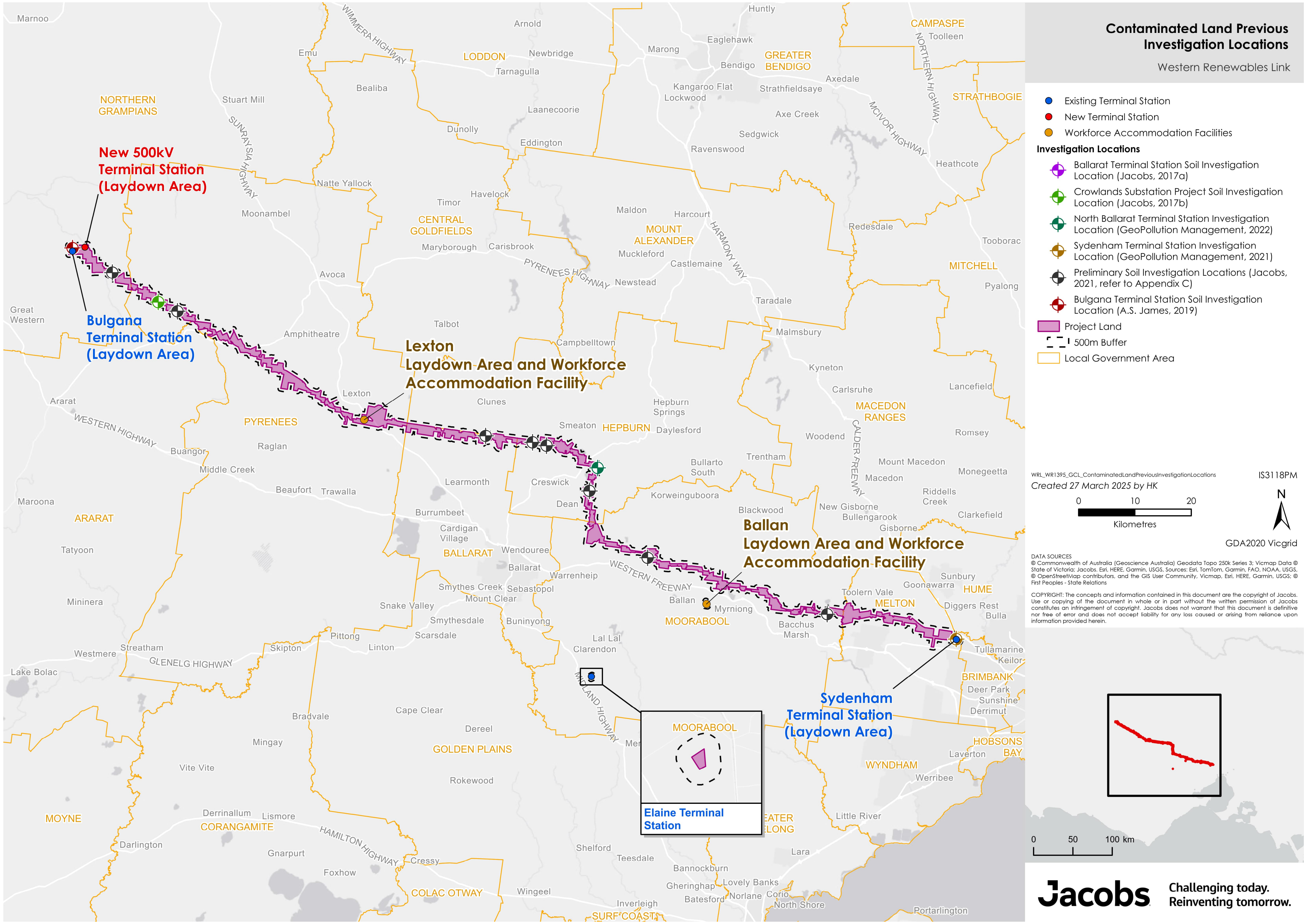
The objective of the soil investigation was to undertake opportunistic soil sampling of potential sources of contamination identified by the initial desktop study. This included data collection as part of discrete site visits to inform this Contaminated Land Impact Assessment. The purpose of this investigation was to understand the variability of soil conditions across the site area.

Soil sampling by shallow hand auger was proposed at a total of 21 locations to provide initial indication of potential contamination. The potential sources of contamination included agricultural land use, historic gold mining, quarry waste, ASS, an EPA illegal dumping priority site and existing terminal station. Due to access constraints from private landholders and security concerns the total number of sampling locations was reduced to eight locations.

Based on limited soil sampling and site observations made since 2021, the following conclusions were made:

- The soil investigated is likely to be moderate to mildly aggressive to concrete and non-aggressive to steel, however this assessment is based on data from select borehole locations.
- The net acidity excluding acid neutralising capacity in a sample of alluvium soil at two locations was reported at levels elevated above the guideline levels. This suggests that ASS may be present within alluvium sediments within the study area.
- The soil investigated indicated that copper, nickel and vanadium were detected above the ecological screening criteria. Further investigation would be required to confirm whether these metals are naturally elevated.
- Excavated material across the Project Area will require classification and management in accordance with Victorian regulatory requirements and the GED. This includes assessment to understand the source areas, volumes and condition of spoil, definition and implementation of controls for the protection of the environment during excavation, temporary storage and transport of spoil, and identification of appropriate management options including all relevant permits and approvals.
- As part of field work investigations, some contaminants of potential concern were observed (refer to Section 6.12).

Further details of the investigation can be found in the Jacobs Memorandum located in Appendix C.



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DATA SOURCES
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Figure 6.1: Soil investigation locations within the study area (Source: Jacobs, 2025)

6.3 Acid sulfate soils

A search of the Atlas of Australian Acid Sulfate Soils was undertaken using the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Australian Soil Resource Information System to identify the potential occurrence of ASS within the study area (CSIRO, 2013). The Atlas of Australian Acid Sulfate Soils is a national geospatial dataset of ASS mapping that uses risk assessment to determine the probability of occurrence of ASS. The probability may be based on site data collected during the formation of the Atlas of Australian Acid Sulfate Soils or prediction based on the anticipated soil / sediment properties, vegetation, landforms or knowledge of the authors (CSIRO, 2013). The Atlas of Australian Acid Sulfate Soils applies probabilities as high, low, extremely low or no probability of encountering ASS as described in Table 6.2 and a confidence of 1 to 4 based on the level of analytical data or absence of analytical data used to determine the probability, as described in Table 6.4.

Table 6.2: Probability and description applied to ASS categories in the Atalas of Australia Acid Sulfate Soils

Code	Probability corresponding to code	Description of probability
A	High probability of occurrence.	>70% chance of occurrence in the geospatial mapping layer.
B	Low probability of occurrence.	6 to 70% chance of occurrence in the geospatial mapping layer.
C	Extremely low probability of occurrence.	1 to 5% chance of occurrence in the geospatial mapping layer.
D	No probability of occurrence.	Less than 1% chance of occurrence in the geospatial mapping layer.

(Source: CSIRO, 2013)

The confidence of the geospatial mapping layer defined by the Atlas of Australian Acid Sulfate Soils is described in Table 6.3.

Table 6.3: Confidence descritpion applied to ASS categorises in the Atlas of Australian Acid Sulfate Soils

Code	Confidence description
1	All required analytical and morphological data were available to assign the geospatial mapping layer.
2	Analytical data was incomplete, though sufficient were available to assign the geospatial mapping layer.
3	No analytical data was available, though confidence is fair and has based on a knowledge of similar soils in similar environments to assign the geospatial mapping layer.
4	No analytical data was available, and classification on a knowledge of similar soils in similar environments to assign the geospatial mapping layer.

(Source: CSIRO, 2013)

The probability of encountering ASS based on the Atlas of Australian Acid Sulfate Soils is summarised in Table 6.4 and illustrated in Figure 6.2.

Table 6.4: Probability of encountering acid sulfate soils in the study area as identified by the Australian Atlas of Acid Sulfate Soil

LGA	Study area covered by this category	Category	Probability, confidence and description
Shire of Northern Grampians; Shire of Pyrenees; City of Ballarat; Shire of Hepburn; Shire of Moorabool	All of Shire of Northern Grampians and much of Shire of Pyrenees, City of Ballarat, Shire of Hepburn and Shire of Moorabool. The category also covers Elaine Terminal Station (Unnamed Road off Murphys Road, Elaine), Bulgana Terminal Station (off Vances Crossing Road, Joel South), and the proposed new Bulgana and North Ballarat Terminal Stations sites.	Bn(p4)	Low probability of occurrence of potential ASS generally within the upper 1m in wet / riparian areas occurring with soil types sodosols, chromosols and dermosols. Mapping layer provided by CSIRO (2013) is provisional and not based on analytical data.
Shire of Pyrenees; City of Ballarat; Shire of Hepburn; Shire of Moorabool; City of Melton	Isolated areas surrounding Mount Lonarch, Bolwarrah, Rocklyn, Mount Bolton, Glenlofty, Crowlands, majority of City of Melton including Project Area up until western boundary of existing Sydenham Terminal Station.	Cn(p4)	Extremely low probability of occurrence of potential ASS generally within the upper 1m in wet / riparian areas occurring with soil types sodosols, chromosols and dermosols. Mapping layer provided by CSIRO (2013) is provisional and not based on analytical data.
City of Ballarat	Isolated areas surrounding Glendaruel, north of Learmonth.	Ak(p4)	High probability of occurrence of subaqueous material in lakes, as potential ASS and / or monosulfidic black ooze. Mapping layer provided by CSIRO (2013) is provisional and not based on analytical data.
Shire of Hepburn; Shire of Moorabool	Isolated areas surrounding Dean Reservoir, Moorabool Reservoir, Hepburn Lagoon, Bolwarrah Weir, Pykes Creek Reservoir and Merrimu Reservoir.	An(p4)	High probability of occurrence of potential ASS generally within the upper 1m in wet / riparian areas occurring with soil types sodosols, chromosols and dermosols. Mapping layer provided by CSIRO (2013) is provisional and not based on analytical data.
Shire of Moorabool	Isolated areas between Ballan and Glendale, surrounding Myrniong and west of Merrimu Reservoir.	Co(p4)	Extremely low probability of occurrence of potential ASS generally within the upper 1m in wet / riparian areas with soil type vertosols. Mapping layer provided by CSIRO (2013) is provisional and not based on analytical data.
Shire of Moorabool; City of Melton	Isolated areas surrounding Merrimu, Long Forest, Coimadai and Lerderderg State Park.	Cq(p4)	Extremely low probability of occurrence of potential, with potential ASS generally occurring within the upper 1m in wet / riparian areas with soil types kandosols, ferrosols, tenosols, rudosols, podosols and kurosols. Mapping layer provided by CSIRO (2013) is provisional and not based on analytical data.
Shire of Moorabool	Isolated area in Merrimu Reservoir, Merrimu.	Aq(p4)	High probability of occurrence of potential ASS generally within the upper 1m in wet / riparian areas occurring with soil types sodosols, chromosols and dermosols. Mapping layer provided by CSIRO (2013) is provisional and not based on analytical data.

(Source: CSIRO, 2013)

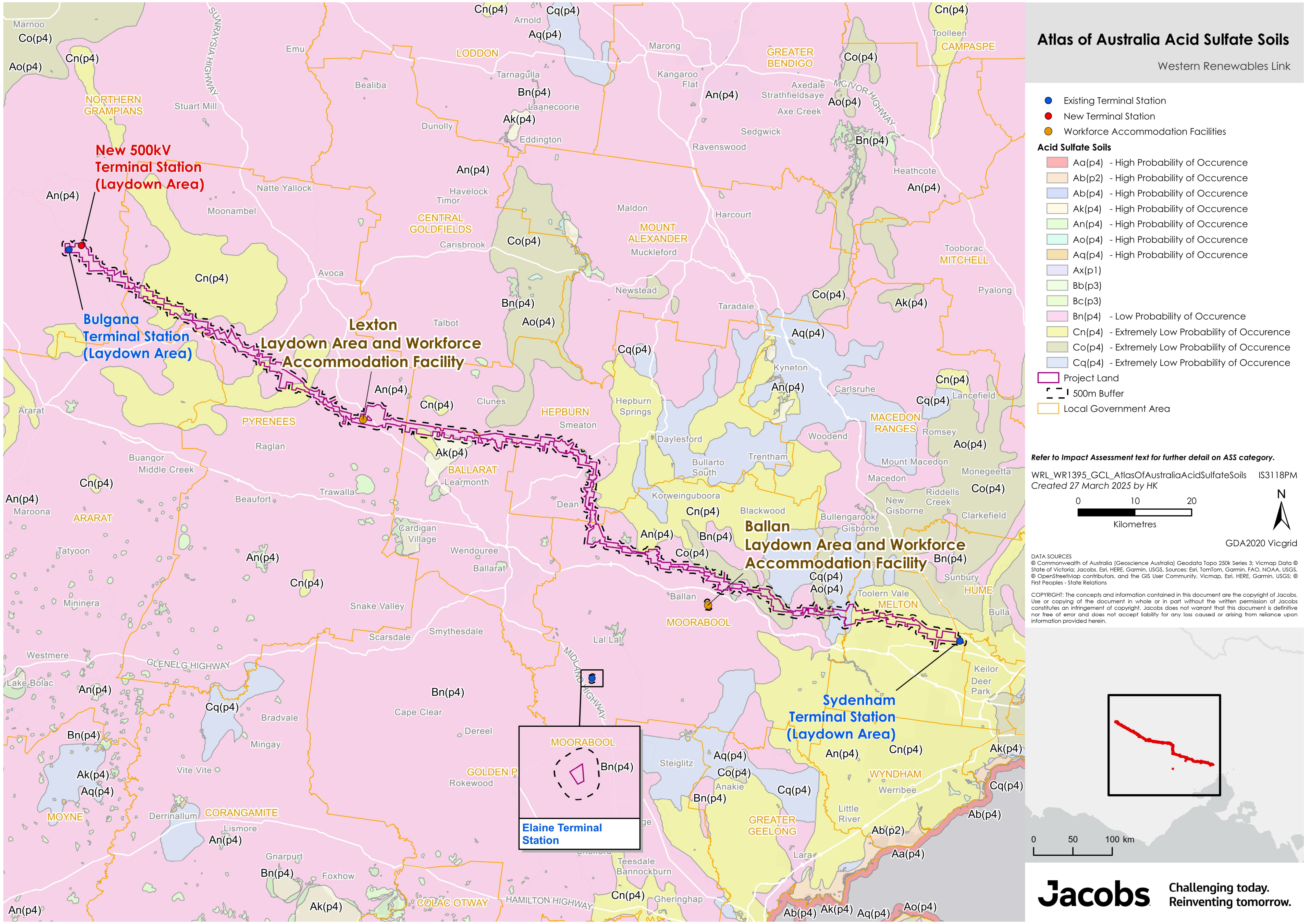


Figure 6.2: ASS within the study area (Source: CSIRO, 2013)

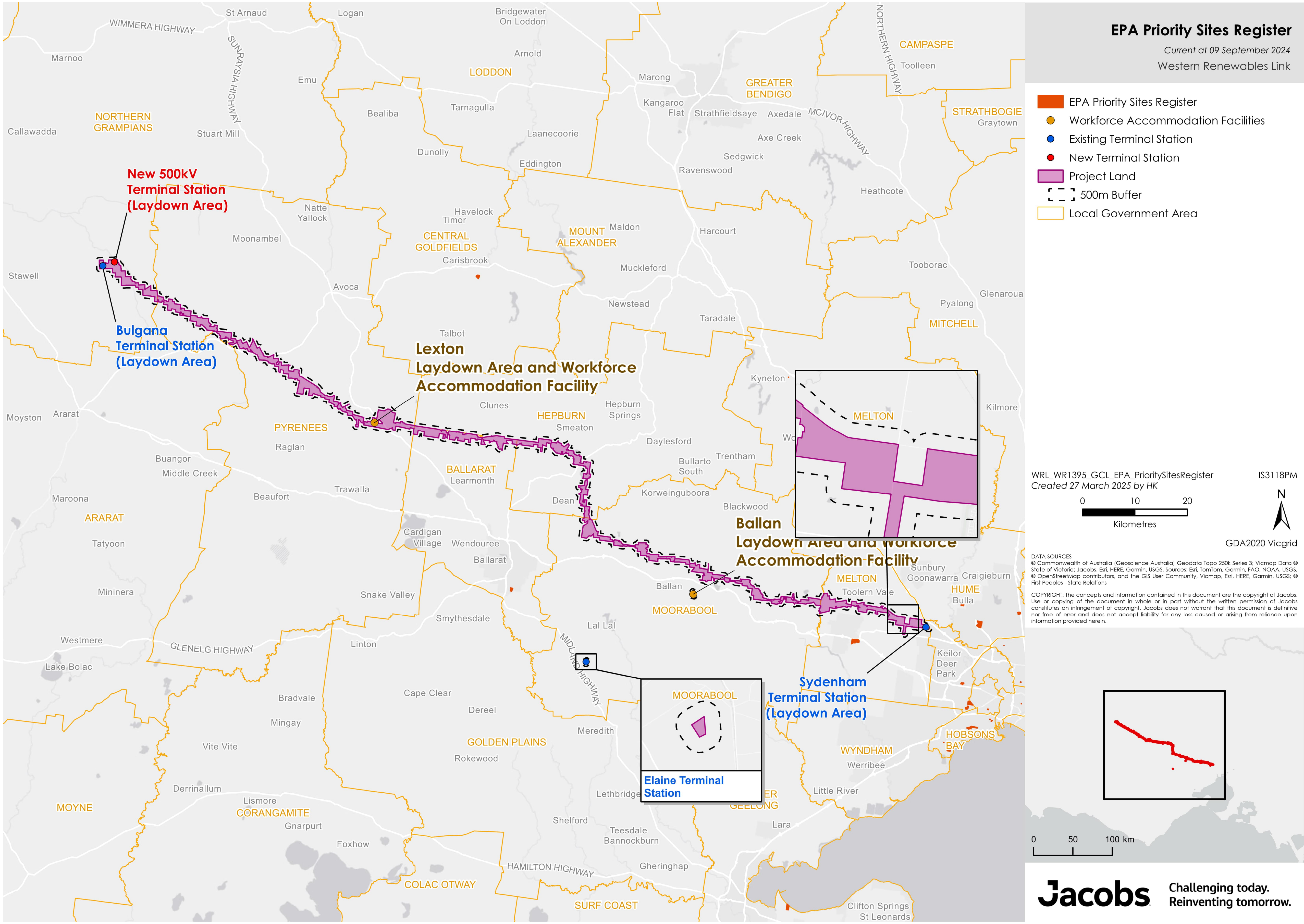
6.4 EPA Victoria records review

The following sections provide a summary of Jacobs review of EPA Victoria records of potential contaminated land sites within the study area.

6.4.1 EPA Victoria priority sites register

Jacobs undertook a search of the EPA’s Priority Sites Register (PSR) dated 20 May 2024 (EPA Victoria, 2024b), which lists those sites for which EPA has legislative requirements for active management of land and / or groundwater contamination. The PSR lists clean up and pollution abatement notices issued under the former Environment Protection Act, environmental action, improvement, and prohibition notices as well as site management orders issued under the Environment Protection Act. Sites on the PSR within the study area are illustrated in Figure 6.3. A copy of the PSR is provided in Appendix D.

No sites on the PSR were identified in the study area.



DATA SOURCES
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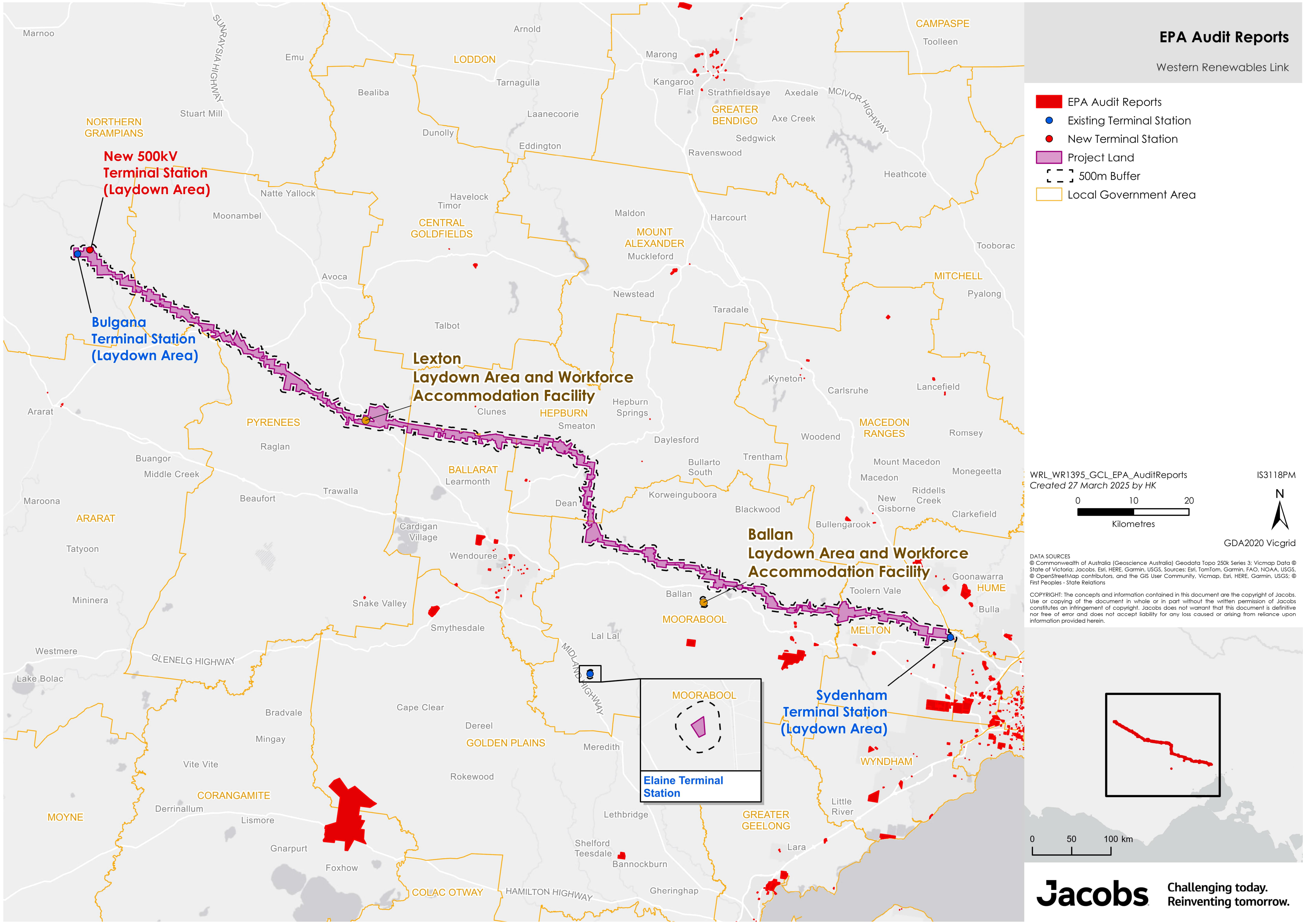
Figure 6.3: EPA PSR sites within the study area (Source: EPA Victoria, 2024b)

6.4.2 EPA Victoria completed audits and declared groundwater quality restricted use zones

Jacobs undertook a search of EPA Victoria’s completed environmental audits (EPA Victoria, 2024g) and GQRUZs (EPA Victoria, 2024h) on 20 May 2024. These sites are illustrated in Figure 6.4 and Figure 6.5.

No completed audits or declared GQRUZ sites were identified within the study area.

A closed landfill is located within the study area near the Sydenham Terminal Station. This closed landfill is located within Brimbank City Council LGA. A search of EPA Victoria records did not identify a completed audit or declared GQRUZ at this closed landfill.



DATA SOURCES
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Figure 6.4: Completed EPA Victoria Audits within the study area (Source: EPA Victoria, 2024g)

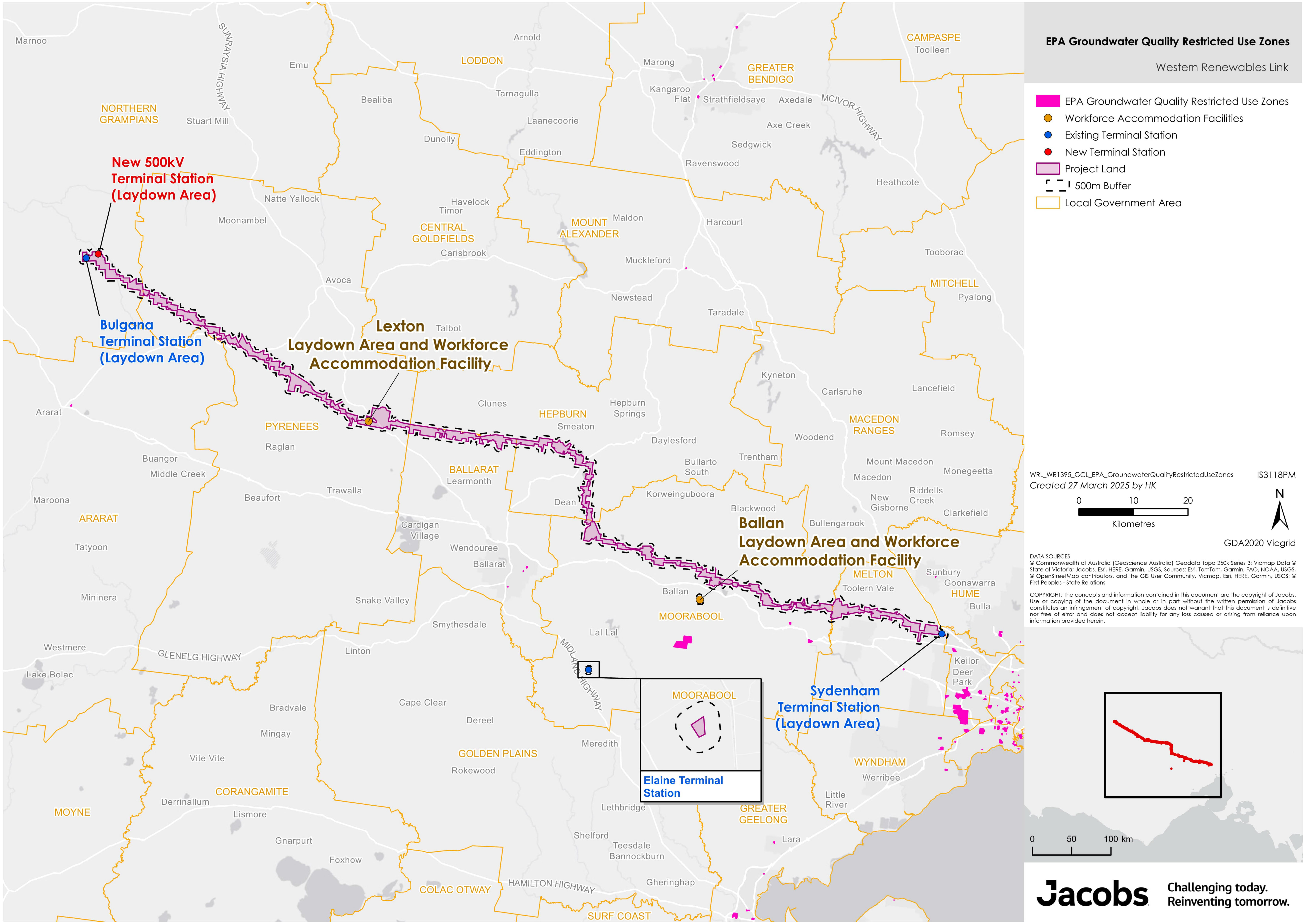


Figure 6.5: Declared GQRUZ within the study area (Source: EPA Victoria, 2024h)

6.4.3 Victorian Landfill Register

Jacobs undertook a search of EPA Victoria's Victorian Landfill Register (VLR) (EPA Victoria, 2024a) on 20 May 2024. As summarised in Table 6.5, the search found no operating landfills listed on the VLR in the study area. One closed landfill was identified at the eastern extent of the study area, in the Brimbank City Council LGA. Sites listed on the VLR are illustrated in Figure 6.6.

Table 6.5: Landfills within the study area

LGA	No. of sites within study area	Operating status of landfill	Name and address of landfill	Waste type for landfill
Brimbank City Council	1	Closed	Name not available, 377 Calder Highway, Calder Park, VIC 3037	Not available

(Data source: Victorian Landfill Register (EPA Victoria, 2024a))

A search of EPA's licence database on 20 May 2024 identified a current EPA licence 11789 issued to Calder Park Raceway Pty Ltd, at 377 Calder Highway, Calder Park. EPA Victoria licence 11789 allows Calder Park Raceway Pty Ltd to operate a landfill for solid inert waste and shredded tyres to be deposited to land. Under EPA publication 788.3 (EPA Victoria, 2015) the landfill would be considered a type 3 solid inert waste landfill. Consideration of Table 5.2 of EPA publication 788.3 should be made during design and construction as the eastern portion of the Project Land falls within the recommended 200m buffer distance for placement of buildings and structures.

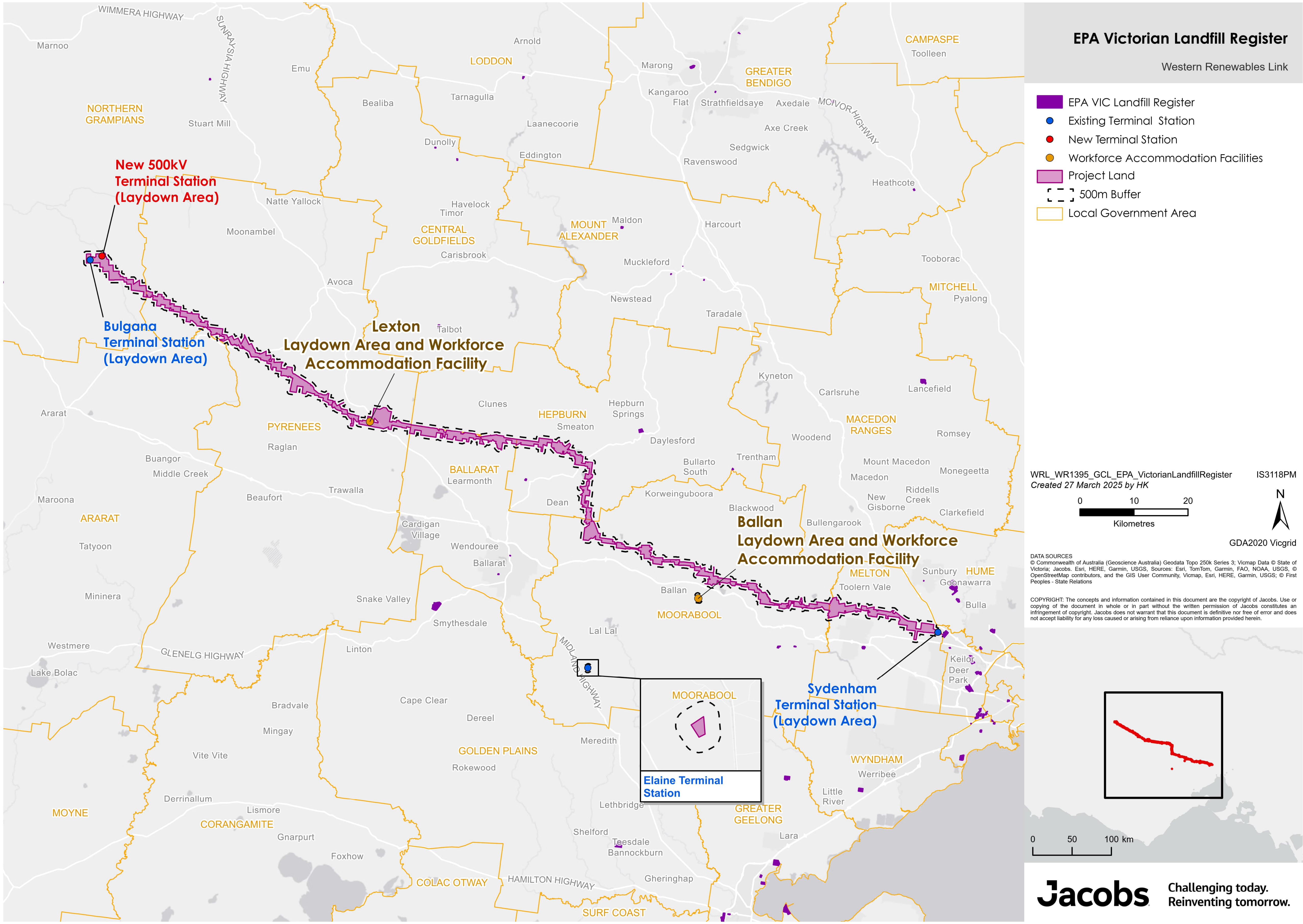


Figure 6.6: Landfills registered on the VLR within the study area (Source: EPA Victoria, 2024a)

6.5 Publicly available information on potential PFAS contaminated sites

PFAS are a group of manufactured chemicals that have been used for decades to make products non-stick, water repellent, and fire, weather and stain resistant (HEPA, 2020). PFAS have been used in a range of consumer products, such as carpets, clothes, and paper, and have also been used in firefighting foams, pesticides and stain repellents. There are thousands of individual PFAS; however, the three compounds most referred to are: perfluorooctane sulphonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS). PFAS are of concern around the world because they are not readily broken down, can persist for a long time in the environment and can bioaccumulate in humans and animals.

Airports, aviation infrastructure, firefighting and defence sites are identified by the PFAS National Environmental Management Plan 2.0 (HEPA, 2020) as primary sources of PFAS contamination, due to potential historical use of PFAS containing fire-fighting foams.

A search of public registers (listed in Table 5.4) for sites where PFAS contamination is known was undertaken, including those maintained by the EPA Victoria, Department of Defence and Airservices Australia.

No records of PFAS contaminated sites or Department of Defence sites subject to investigation or management for other contaminants were identified within the study area.

6.6 Historical aerial imagery review

Historical aerial imagery was not reviewed for the entire study area as the identified predominant current land uses are farming and agriculture, which are assumed to have little to no change in land use over time. Potentially contaminating activities associated with these land uses (e.g., farm dumps) are typically of a localised scale and unlikely to be detected through aerial imagery review.

Selected historical aerial imagery from 1945 to 1947 was reviewed where built-up areas outside primarily agricultural uses were identified. The findings of this review are presented in Table 6.6.

Table 6.6: Summary of historical aerial imagery review

LGA	No. of Records	Year	Photo Reference	Description
Hepburn and Moorabool	1	1946	Daylesford C3 or 827 C3 Zone 7, 1:15,840	Study area appears largely unchanged from current, with land use appearing as vacant land and / or agricultural and farming land.
Hepburn	1	1945	Creswick D2 or 826 D2 Zone 7, 1:15,840	Study area appears largely unchanged from current, with land use appearing as vacant land and / or agricultural and farming land. Areas of potential mining spoil stockpiles event around Creswick North and Allendale.
Hepburn Ballarat	1	1945	Creswick B3 or 826 B3 Zone 7, 1:15,840	Study area appears largely unchanged from current, with land use appearing as vacant land and / or agricultural and farming land.
Ballarat	1	1945	Creswick B1 or 826 B1 Zone 7, 1:15,840	
Hepburn Ballarat Pyrenees	1	1945	Creswick A4 or 826 A4 Zone 7, 1:15,840	
Pyrenees	1	1945	Creswick A3 or 826 A3 Zone 7, 1:15,840	Study area appears largely unchanged from current, with land use appearing as vacant land and / or agricultural and farming land.
Pyrenees	1	1945	Creswick A1 or 826 A1 Zone 7, 1:15,840	Study area appears largely unchanged from current, with land use appearing as vacant land and / or agricultural and farming land.
Pyrenees	1	1945	Beaufort B2 or 906 A1 Zone 6, 1:15,840	

LGA	No. of Records	Year	Photo Reference	Description
Pyrenees	1	1946	Avoca D4 or 898 D4 Zone 6, 1:15,840	
Pyrenees	1	1946	Avoca D3 or 898 D3 Zone 6, 1:15,840	
Pyrenees	1	1946	Avoca D1 or 898 D1 Zone 6, 1:15,840	
Pyrenees	1	1947	Avoca C2 or 898 C2 Zone 6, 1:15,840	
Pyrenees	1	1946	Avoca A4 or 898 A4 Zone 6, 1:15,840	
Pyrenees	1	1946	Avoca C1 or 898 C1 Zone 6, 1:15,840	
Pyrenees Northern Grampians	1	1946	Avoca A3 or 898 A3 Zone 6, 1:15,840	
Northern Grampians	1	1946	Avoca A1 or 898 A1 Zone 6, 1:15,840	
Northern Grampians	1	1946	Stawell B2 or 897 B2 Zone 6, 1:15,840	The area where the current Bulgana Terminal Station site is located and study area appears largely unchanged from current, with land use appearing as vacant land and / or agricultural and farming land prior to the construction of the terminal station in 2018.

No records were available to review for the Elaine Terminal Station (Unnamed Road off Murphys Road, Elaine) and large portions of Moorabool and Melton LGAs on the DEECA historic photo maps (DEECA, 2021b).

6.7 Environmental Audit Overlays

An Environmental Audit Overlay (EAO) is a planning tool used by planning authorities to identify sites that are known or reasonably suspected to be contaminated or potentially contaminated. An EAO requires that an environmental audit is undertaken in accordance with the Environment Protection Act when a sensitive use is proposed on land so that potentially contaminated land is suitable for a use which could be significantly adversely affected by any contamination.

A search of current EAOs applied to land within the study area was conducted using the VicPlan online spatial database (DEECA, 2024c) on 20 May 2024. No EAOs were identified within the study area.

6.8 Current and historical mining and extractive activities

Mine shaft locations were documented from as early as 1869 in some areas of Victoria, mainly around Creswick as a result of the rich gold deposits in these regions. According to spatial data maintained by the Earth Resources Regulations (DJSIR, 2021), the Ballarat and Creswick areas are known goldfields and accordingly have mine shaft locations surrounding these townships. Additionally, areas identified by La Trobe University (2020) between Bulgana and Waubra surrounding Glenlofty Creek, Glenpatrick Creek, Wimmera River and Avoca River have potential to be impacted by sludge deposition from historic gold mining activities.

The presence of historical gold mining activities within the study area is known, particularly surrounding Creswick and between Bulgana and Waubra. Concentrated areas of historical gold mining activities are evident surrounding Smeaton, Lawrence, Allendale and Creswick North. Historical mining activities may have resulted in the spread of mine tailings being at the surface, resembling clay or sand, which may contain elevated concentrations of arsenic (DoH, 2013). Rocks containing gold deposits were often roasted then crushed to extract the gold, resulting in the formation of calcined sands. Calcined sands, which are usually red or purple in colour, contain higher concentrations of arsenic than typical mine tailings (DoH, 2013). Mercury was widely used in historic mining activities in Victoria to amalgamate the gold and improve recoveries, resulting in loss of mercury to the environment through tailings, sludge and other wastes (Davies et. Al., 2015).

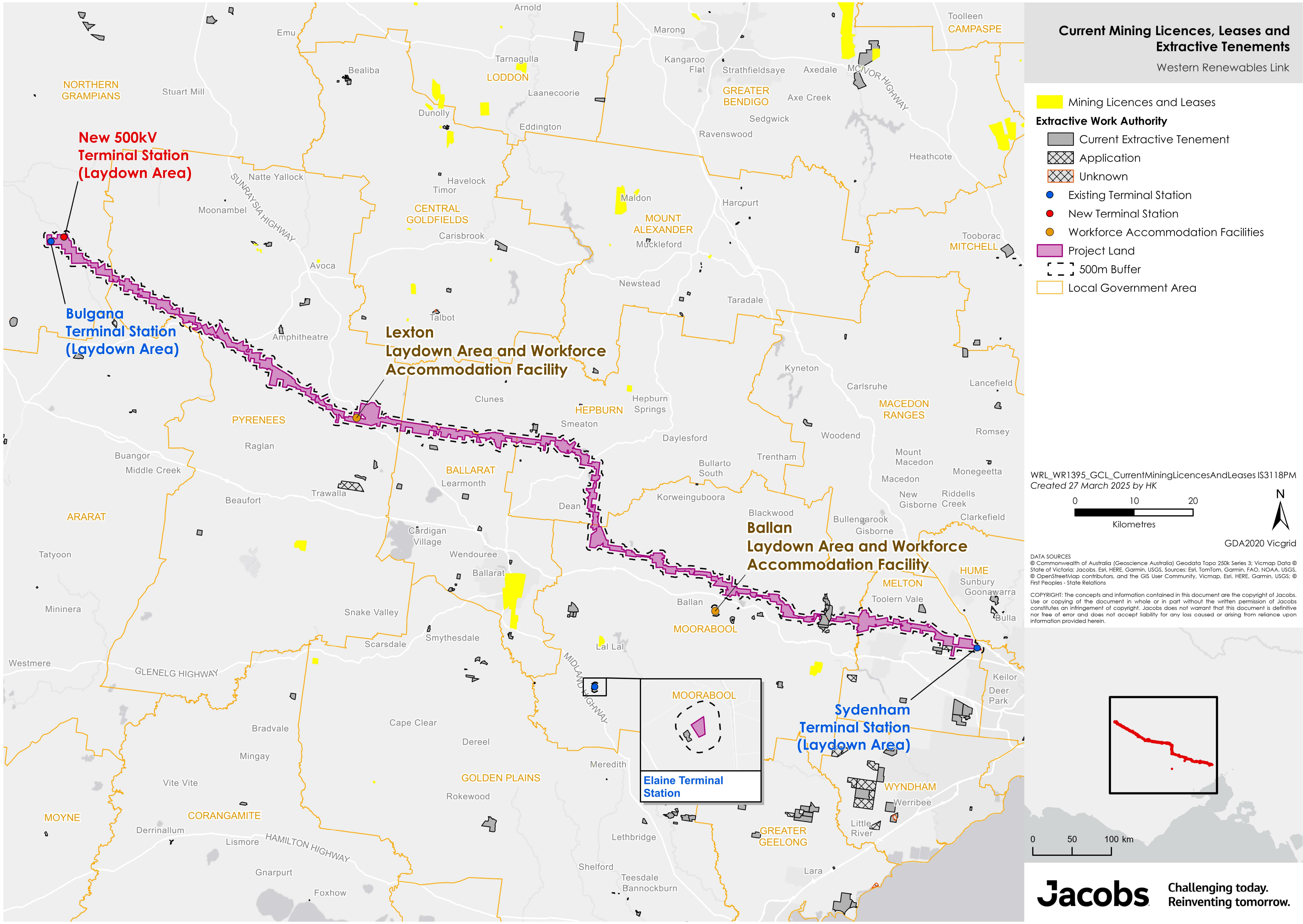
Information on currently operating mines is maintained by Earth Resources Regulations (DJSIR, 2024), while information on historic mining activity is maintained by DEECA (2024b). Information on current extractive industry tenements is maintained by DEECA (2024a). A search of the data maintained by Earth Resources Regulations (DJSIR, 2024) and DEECA (2024a; 2024b) identified the following within the study area:

- Multiple historic mining activities (3 locations) of unknown type located in Elmhurst in Pyrenees Shire Council
- A historic mining activity of unknown type located off Ballarat-Maryborough Road, in Tourello in Shire of Ballarat
- Multiple historic gold and quartzite mining activities (16 locations) near Creswick North and Allendale in Hepburn Shire Council
- A historic mining activity of unknown type off G Mays Road, Newlyn in Shire of Hepburn
- A historic miming activity of unknown type on Dean-Newlyn Road, Dean in Shire of Hepburn.

The following extractive industries (DEECA, 2024a) have been identified within the study area:

- Quartzite mineral extractive activities operating between Creswick North, Allendale and at Sawmill Road in Springmount in City of Ballarat and Shire of Hepburn
- Bonshaw Mine, a sand and gravel quarry in Myrniong
- Hanson Construction Materials Pty Ltd, Boral Resources (Vic) Pty Ltd and Barro Properties Pty Ltd sand and gravel quarries in Coimadai and Darley
- Extractive activity near Sydenham Station, in Shire of Melton
- Extractive activity on 354 Elaine Egerton Road, near Elaine Terminal Station, in Shire of Moorabool.

Current mining and extractive activities are illustrated in Figure 6.7 and historic mining activities are shown in Figure 6.8.



WRL_WR1395_GCL_CurrentMiningLicencesAndLeases IS3118PM
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Figure 6.7: Current mining licences, leases and extractive tenements within the study area (Source: DEECA, 2024a and DJSIR, 2024)

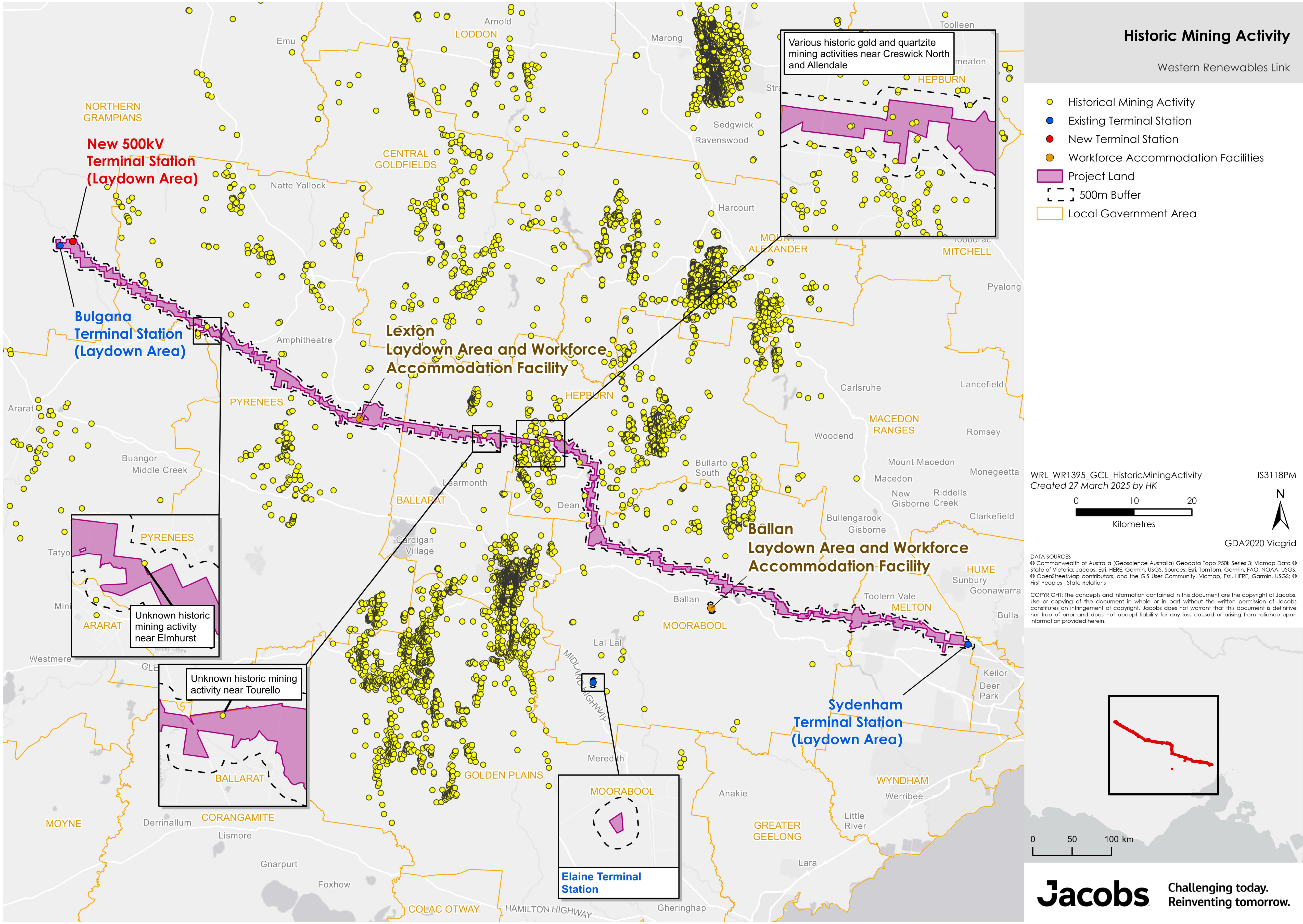

Figure 6.8: Historical mining activites within the study area (Source: DEECA, 2024b)

6.9 Contaminated land environmental values

The Environment Protection Act is supported by subordinate legislation including the ERS (Victoria Government, 2021b). The ERS sets out the environmental values, indicators and objectives of the ambient air, ambient sound, land and water (including surface water and groundwater) environments that are sought to be achieved or maintained in Victoria. The ERS comprise objectives for supporting different uses of the environment and indicators that can be measured to determine whether those objectives are being met and are described further below for land and water. The ERS are not compliance or regulatory thresholds or triggers but indicators and objectives to assess if a particular environmental value is being achieved, maintained or threatened.

Contaminated soil, ASS and ASR disturbed by the Project's activities may pose a risk to human health or the environment in several ways. Disturbing soil during earthworks may release contamination as dust which can then disperse within the study area. For instance, dust or volatile chemicals (vapours) could be released, and these could be harmful to human health or could create offensive odours. In addition, disturbing the ground could create pathways for migration of contaminants near the surface into the underlying groundwater or during rainfall events, which could cause contaminated run-off that might be washed into drains or waterways. The construction and operation activities of the Project also have the potential, through spills and leaks, to impact environmental values within the study area.

Existing contamination, ASS and ASR if intercepted by the Project's activities have the potential to impact land, groundwater and surface water environmental values in the study area. As the basis for the impact assessment, investigation results (where available) have been screened against the adopted criteria (refer Section A.6, Appendix A) for protection of human health, the environment and waste classification. Where screening has identified concentration of a substance or contaminant above an adopted screening criterion, and where a feasible exposure pathway to a human or ecological receptor is deemed complete during the Project's activities, it is considered that an impact to an environmental value may have occurred and further assessment and/or mitigation measure may be required to minimise or eliminate harm or detriment to these environmental values. As such, it is pertinent to establish the environmental values of land, surface water and groundwater that require protection.

To identify the protected environmental values within the study area, a review of the Land Use and Planning Impact Assessment, Groundwater Impact Assessment and Surface Water Impact Assessment was undertaken. The following sections summarise the findings of this review in the context of contaminated land.

6.9.1 Land

This section provides a summary of the land use conditions within the study area as described in the Land Use and Planning Impact Assessment. For detailed assessment of the land use conditions within the study area reference should be made to the Land Use and Planning Impact Assessment.

Based on the historical aerial imagery review in Section 6.6, the majority of the study area has been used for agricultural purposes use since at least the mid-1940s. A review of the Land Use and Planning Impact Assessment was undertaken to confirm current land uses within the study area, which confirms the majority of the study area remains as agricultural land uses. Other land uses in the study area include parks and reserves, sensitive use, industrial use and recreation and open space.

Under the ERS (Victoria Government, 2021b) land use categories that are located within the study area are as follows:

- Parks and reserves – including national and state parks, state forests, nature conservation and wildlife reserves
- Agricultural – including rural areas involved in agricultural or horticultural practices
- Sensitive use – including land used for residential, childcare centres, pre-school or primary school, subcategorised as follows:

  - Low density – where there is generally substantial access to soil on the property.
- Recreation / open space – including general open space and public recreational areas
- Commercial – including land used for commercial and business activities, other than land used for industrial activities
- Industrial – including land used for utilities and industrial activities.

Table 4.2 of the ERS (Victorian Government, 2021b) has been reproduced below in Table 6.7. This table provides context for those protected environmental values for land uses relevant to the study area. Land uses applicable to the study area have been shaded in grey and environmental values requiring protection have been indicated by a tick in Table 6.7.

Table 6.7: Environmental values of land (reproduced from Table 4.2 of the Environment Reference Standard)

Environmental values		Land use							Context / Relevance of land use to the study area						
		Parks and reserves	Agricultural	Sensitive use		Recreation / open space	Commercial	Industrial	LGA						
				High density	Other (lower density)				Shire of Northern Grampians	Shire of Pyrenees	City of Ballarat	Shire of Hepburn	Shire of Moorabool	City of Melton	Brimbank City Council
Land dependent ecosystems and species	Natural ecosystems	✓							Parks and reserves: Six Mile Creek (PCRZ)[1] Wimmera River (PCRZ)	Parks and reserves: Ben Major Flora Reserve (PCRZ) Ben Major State Forest Lexton Bushland Reserve (PCRZ)		Parks and reserves: Mount Beckworth Scenic Reserve (PCRZ) Bullarook Creek Streamside Reserve (PCRZ)			
	Modified ecosystems	✓	✓		✓	✓			Agriculture: Agriculture is a prominent land use across the study area. Activities include grazing and crop production. The prominent industry sectors include wool, broad acre grazing, cereal cropping, viticulture and olive growing. Prime agricultural land supports associated rural industries, such as food processing, abattoirs, shearing, irrigation supplies and stock feed producers. Sensitive Use (Low Density): Rural residences throughout the study area.						
										Recreation / open space: Lexton golf course	Recreation / open space: Glendaruel Public Hall Reserve			Recreation / open space: MacPherson Park (PPRZ) Sensitive Use (Low Density): Residential housing within the study area	
	Highly modified ecosystems		✓	✓	✓	✓	✓	✓	Industrial: Bulgana Terminal Station (off Vances Crossing Road, Joel Joel)	Industrial: Ararat Terminal Station (Easter Brooks Lane, Elmhurst) Crowlands Terminal Station (Unnamed Road, Crowlands)			Industrial: Hanson Construction Materials Pty Ltd, Boral Resources (Vic) Pty Ltd and Barro Properties Pty Ltd sand and gravel quarries in Coimadai and Darley	Industrial: Sydenham Terminal Station (off Victoria Road, Plumpton) Melton Aerodrome (airport) located (995 Coburns Road, Toolern Vale) Railway line and railyards (near Sydenham Terminal Station)	Industrial: A closed landfill located at 377 Calder Highway, Calder Park (now a motorsport complex)
Human health		✓	✓	✓	✓	✓	✓	✓	Relevant to all land uses in the study area.						
Buildings and structures		✓	✓	✓	✓	✓	✓	✓							
Aesthetics		✓		✓	✓	✓	✓		Relevant to all land uses in the study area except for agricultural and industrial.						
Production of food, flora and fibre			✓		✓				Relevant to agricultural and sensitive use (low density) (home garden produce) land use within the study area.						

Note:

1. Public Conservation and Resource Zone (PCRZ)

(Source: the ERS (Victoria Government, 2021b))

6.9.2 Surface water

The following provides a summary of the environmental values of surface water within the study area as described in the Surface Water Impact Assessment. For detailed assessment of the existing conditions relevant to surface water, reference should be made to the Surface Water Impact Assessment. Existing contamination, ASS and ASR if intercepted by the Project's activities have the potential to impact surface water environmental values in the study area. It is necessary to understand the existing conditions with regard to surface water within the study area and the level of protection required to maintain the environmental values of surface water under the ERS.

The environmental values that must be protected within surface waters vary according to the segment of the environment where the surface waters are located. These segments are set out in the ERS based upon the surface water type and geographic location or catchment attributes.

The applicable surface water segments in the study area include:

- Rivers and streams: Murray and Western Plains, Central Foothills and Coastal Plains and Urban
- Wetlands: Lakes and swamps (includes water bodies such as large open lakes, floodplains, billabongs and swamps).

The protected environmental values of inland water applicable to these surface water segments in the study area are summarised in Table 6.8. Surface water environmental values that may be applicable to the study area have been shaded in grey and environmental values requiring protection have been indicated by a tick in Table 6.8.

Table 6.8: Environmental values of inland waters relevant to the study area

Environmental values	Segment	Aquatic reserves	Rivers and streams						Wetlands
		Aquatic Reserves	Highlands	Uplands A	Uplands B	Central Foothills and Coastal Plains	Urban	Murray and Western Plains	Lakes and Swamps
Water dependent ecosystems and species that are:	Largely unmodified	✓	✓	✓	✓				
	Slightly to moderately modified					✓		✓	✓
	Highly modified						✓		
Human consumption after appropriate treatment		✓ if water is sourced for supply — in a special water supply catchment area listed in Schedule 5 of the Catchment and Land Protection Act 1994; or in accordance with the Safe Drinking Water Act 2003.							
Agriculture and irrigation			✓	✓	✓	✓	✓	✓	✓
Human consumption of aquatic foods		✓	✓	✓	✓	✓	✓	✓	✓
Aquaculture		✓ if the environmental quality is suitable and an aquaculture licence has been approved in accordance with the *Fisheries Act 1995*							
Industrial and commercial				✓	✓	✓	✓	✓	
Water based recreation (primary contact)		✓	✓	✓	✓	✓	✓	✓	✓

Environmental values	Segment	Aquatic reserves	Rivers and streams						Wetlands
		Aquatic Reserves	Highlands	Uplands A	Uplands B	Central Foothills and Coastal Plains	Urban	Murray and Western Plains	Lakes and Swamps
Water-based recreation (secondary contact)		✓	✓	✓	✓	✓	✓	✓	✓
Water-based recreation (aesthetic enjoyment)		✓	✓	✓	✓	✓	✓	✓	✓
Traditional Owner cultural values		✓	✓	✓	✓	✓	✓	✓	✓
Navigation and shipping									

(Source: the ERS (Victorian Government, 2021b)

6.9.3 Groundwater

The following section provides a summary of the environmental values and identified groundwater users within the study area as described in the Groundwater Impact Assessment. For detailed assessment of the existing conditions relevant to groundwater within the study area reference should be made to the Groundwater Impact Assessment. Existing contamination, ASS and ASR if intercepted by the Project's activities have the potential to impact groundwater environmental values in the study area.

The study area for the Groundwater Impact Assessment has been portioned into three geographical areas to align with areas of common groundwater conditions, as shown in Figure 6.9 and described below:

- Western portion of the study area – covers the new and existing Bulgana Terminal Station to the most easterly extent of the Pyrenees Formation, within the Project Area.
- Central portion of the study area – from the Pyrenees Formation to the eastern boundary of the Bungaree Groundwater Management Area.
- Eastern portion of the study area – from the eastern boundary of the Bungaree Groundwater Management Area to the end of the transmission line connecting to Sydenham Terminal Station. The area includes the existing Elaine Terminal Station.

Table 6.9 below provides a summary of the findings of the Groundwater Impact Assessment, including the potential groundwater salinity and corresponding segment, environmental values that require protection under the ERS and potential existing uses of groundwater. The study areas presented in Table 6.9 are as defined by the Groundwater Impact Assessment and as presented in Figure 6.9.

Table 6.9: Groundwater potential salinity, segment, environmental values and uses

Study area	Potential groundwater salinity range	Potential groundwater segment	Potential environmental values that may require protection	Potential existing uses of groundwater
Western portion of the study area	Less than 600 to 5,400mg/L total dissolved solids	A1 to C Majority of this study area could potentially be classified as segment B	▪ Water dependent ecosystems and species. ▪ Potable mineral water supply. ▪ Agriculture and irrigation – irrigation. ▪ Agriculture and irrigation – stock watering. ▪ Industrial and commercial. ▪ Water based recreation – primary contact. ▪ Traditional Owner cultural values. ▪ Buildings and structures. ▪ Geothermal properties.	▪ Nine registered licenced stock and domestic groundwater users were identified owing to the low yields available from the available aquifers and the availability of surface water supply. ▪ 29 State Observation Bore Network monitoring bores were identified. Five bores registered for monitoring purposes are within western portion of the study area. ▪ No groundwater users were identified through community feedback collected during consultation on the Project.
Central portion of the study area	Less than 600 to 5,400mg/L total dissolved solids	A1 to C Majority of this study area could potentially be classified as segment A1	▪ Water dependent ecosystems and species. ▪ Potable water supply – desirable. ▪ Potable water supply – acceptable. ▪ Potable mineral water supply.	▪ There is widespread extractive groundwater use within the central portion of the study area. Bores in the area primarily target the Newer Volcanics aquifer, owing to shallow depth and suitable groundwater salinity.

Study area	Potential groundwater salinity range	Potential groundwater segment	Potential environmental values that may require protection	Potential existing uses of groundwater
			▪ Agriculture and irrigation – irrigation. ▪ Agriculture and irrigation – stock watering. ▪ Industrial and commercial. ▪ Water based recreation – primary contact. ▪ Traditional Owner cultural values. ▪ Buildings and structures. ▪ Geothermal properties.	▪ Registered bore use in the central portion of the study area includes irrigation, stock and domestic, water supply, monitoring, commercial / industrial and state observation bores.
Eastern portion of the study area	Less than 600 to greater than 10,000mg/L total dissolved solids	A1 to F Majority of this study area could potentially be classified as segment C	▪ Water dependent ecosystems and species. ▪ Potable mineral water supply. ▪ Agriculture and irrigation – stock watering. ▪ Industrial and commercial. ▪ Water based recreation – primary contact. ▪ Traditional Owner cultural values. ▪ Buildings and structures. ▪ Geothermal.	▪ There are several bores registered for extractive use in the eastern portion of the study area. ▪ Registered bore use in the eastern portion of the study area includes commercial / industrial, dewatering, irrigation, monitoring, stock and domestic and water supply. ▪ There is one registered mineral spring (Mineral Spring No. 74) at Lake Merrimu. Records indicate that this spring is inundated by Lake Merrimu.

(Source: Groundwater Impact Assessment)

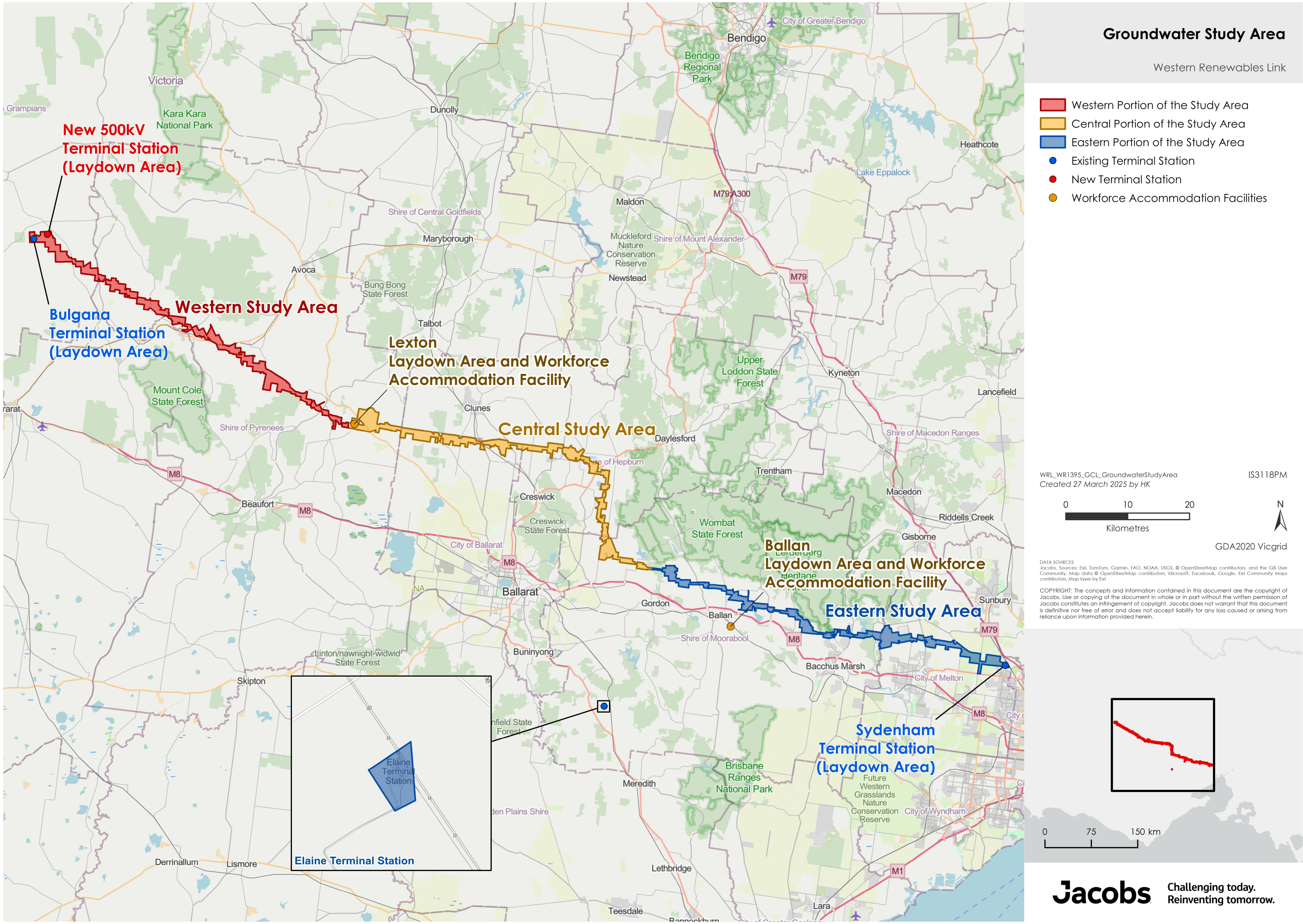

Figure 6.9: Groundwater study areas for groundwater existing conditions as defined in the Groundwater Impact Assessment (Source: Jacobs, 2024)

6.10 Preliminary Conceptual Site Model

A preliminary CSM describes possible linkages between contamination sources and receptors prior to screening for likely impacts, and prior to mitigation or management measures being implemented.

Where a complete link between a source, pathway and receptor is or may be present, further consideration, management and / or mitigation is required to maintain the risk of harm to humans or the environment at an acceptable level during the Project's construction, operation and decommissioning stages. The absence of a complete link (where no contamination or receptor is present, or where both are present, but no pathway exists between the two) generally indicates that an unacceptable risk is unlikely.

6.10.1 Potential sources of contamination

The desktop review identified the following within the study area:

- The most prevalent potentially contaminating activities identified were current and historic agricultural practices throughout the study area, generally associated with bulk fertiliser, herbicide, and/or pesticide use, and operation and maintenance of heavy machinery.
- Concentrated areas of historic gold mining activities were identified surrounding Smeaton, Lawrence, Allendale, and Creswick North.
- Industrial land uses were identified within the study area, including:
    - Terminal stations at Bulgana, Elaine, and Crowlands
    - Rail yards near Sydenham Terminal Station
    - Sand and gravel quarries between Coimadai and Darley
    - Melton Aerodrome
    - A closed landfill (now motorsport complex) at Calder Park.

The Project Land at Sydenham Terminal Station is also located within the recommended 200m buffer distance of an inert waste landfill.

6.10.2 Potential contaminants of concern

Potential contaminants of concern associated with the potential sources of contamination identified in Section 6.10.1 are summarised in Table 6.10.

Table 6.10: Potentially contaminating activities associated with current and historic land uses

Current or Historical Land Use	Potential Contaminating Activity and Common Contaminants
Importation of fill (e.g., existing terminal stations)	Various contaminants depending on source of materials. Potential contaminants include metals, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, volatile organic compounds, asbestos, phenols, organophosphate pesticides, polychlorinated biphenyls (PCBs)(1), cyanide and sulfate.
Agricultural and farming	Carbamates, organochlorine pesticides, organophosphate pesticides, herbicides (e.g., triazine, atrazine), nitrates, salinity, metals (aluminium, arsenic, cadmium, copper, iron, lead, magnesium, potassium), nutrients (e.g., nitrogen, phosphorus), PFAS (potentially used as an adjuvant or active ingredient in fertilisers and pesticides and firefighting foam). Sheep and cattle dips – potential contaminants may include metals (e.g., arsenic), carbamates, organochlorine pesticides, organophosphate pesticides, herbicides, synthetic pyrethroids.
Quarries and historic gold mining	Metals (aluminium, arsenic, copper, chromium, cobalt, lead, nickel, silver, selenium, zinc, iron and mercury), acids, alkalis, total dissolved solids, organic flocculants (e.g., sulfate, cyanide), total petroleum hydrocarbons, monocyclic aromatic hydrocarbons, explosives, caustic, asbestos, and pesticides.

Current or Historical Land Use	Potential Contaminating Activity and Common Contaminants
Industrial waste dumping	Contaminants depend on the industry or activity of the source site of the material but may include metals, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, monocyclic aromatic hydrocarbons, and asbestos.
Landfill	Potential contaminants are dependent on the type of landfill and wastes disposed, but may include polychlorinated biphenyls, ASS, alkanes, sulfides, metals, asbestos organic acids, nutrients (e.g., nitrogen, phosphorus), total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, monocyclic aromatic hydrocarbons, ammonia, landfill gases (e.g., methane), and total dissolved solids.
Rail yards	Total petroleum hydrocarbons, monocyclic aromatic hydrocarbons (e.g., benzene, toluene, ethylbenzene and xylene), phenols, metals (e.g., arsenic, lead, zinc, cadmium, chromium, iron), asbestos, creosote, nutrients (e.g., nitrates, ammonia), carbonates, organochlorine pesticides, organophosphate pesticides, and herbicides.
Airports (aerodrome)	Total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, monocyclic aromatic hydrocarbons, metals (including aluminium, magnesium and chromium), solvents, and PFAS.

Note:

1. PCBs have been banned in Australia and are not proposed to be introduced during the course of this Project. Existing substation sites will have a PCB management plan in place, where applicable. PCBs are a contaminant of concern at legacy substation sites and will be considered during soil sampling for waste classification.

6.10.3 Pathways

Some construction activities may disturb ASS and groundwater. Potential pathways between contamination sources and receptors include:

- Direct contact (dermal, inhalation, ingestion) with contaminated soil – including via dust and surface water runoff.
- Uptake by flora and fauna present in the area of soil and / or groundwater contamination (e.g., via sediment run-off, dust generated during works or through future reuse).
- Groundwater – through the mobilisation of contaminants into groundwater (e.g., excavation, piling), or through the mobilisation or dewatering of contaminated groundwater. Contaminants tend to migrate with the direction of groundwater flow; however, groundwater flow direction may be altered by construction activities, and contaminants may be subject to retardation, dilution and dispersion.
- Vapour – construction workers in trenches and excavations or working with contaminated soil stockpiles. The vapour pathway may also include vapour intrusion into existing and newly constructed slab-on-grade buildings and structures, including maintenance pits.

6.10.4 Receptors

Identified receptors and corresponding environmental values for the Project are summarised in Table 6.11.

Table 6.11: Environmental values and receptors

Environmental Value	Location	Receptor Description	Status
Land dependent ecosystems and species	Study area	Parks and reserves	Current / future
	Study area	Agricultural	Current / future
	Study area	Rural residential and public open space	Current / future
	Study area	Commercial and industrial	Current
Human health	Study area	Agricultural workers	Current / future
	Study area	Rural residents	Current / future

Environmental Value	Location	Receptor Description	Status
	Study area	Users of parks and reserves and public open space	Current / future
	Project Area	Workers of terminal stations (existing and proposed)	Current / future
	Project Area	Construction and maintenance workers	Future
Buildings and structures	Project Area	Cements and concrete	Future
	Project Area	Steel	Future
Aesthetics	Project Area	General	Current / future
Production of food, flora and fibre	Study area	Parks and reserves	Current / future
	Study area	Agricultural	Current / future
	Study area	Rural residential	Current / future

Note :

1. Water dependent ecosystems, including surface water bodies and groundwater dependent ecosystems, are considered in the Groundwater Impact Assessment and Surface Water Impact Assessment.

6.10.5 Potentially complete source-pathway-receptor linkages

Potentially complete linkages between contaminants in soils and / or groundwater, pathways and transport mechanisms, and receptors during the construction, operation and decommissioning stages are summarised in Table 6.12.

Table 6.12: Potentially complete source-pathway-receptor linkages

Sources and pathways for exposure	Relevant receptors	Construction	Operation	Decommissioning
Direct contact with contaminated soils including any spoil with low level of contamination reused by the Project	Construction workers within the Project Area	✓		✓
	Site workers and maintenance workers at terminal stations and permanent unsealed access tracks		✓	
Direct contact with contaminated mobilised sediment or dissolved contaminants in surface water	Construction workers within the Project Area Flora or fauna within or downstream of Project Area	✓		
Direct contact with contaminated groundwater	Construction workers within the Project Area	✓		✓
Inhalation of dust from mobilisation of contaminated soils (e.g., earthworks, shallow ground disturbance, vehicle movement) including any spoil with low level of contamination reused by the Project	Construction workers within the Project Area	✓		✓
	Site workers and maintenance workers at terminal stations and permanent unsealed access tracks		✓	
	Nearby rural residents, agricultural workers and users of parks, reserves and public open space	✓	✓	✓

Sources and pathways for exposure	Relevant receptors	Construction	Operation	Decommissioning
Mobilisation of groundwater contamination (if dewatering is required)	Construction workers within the Project Area Nearby rural residents, agricultural workers and users of parks, reserves and public open space	✓		✓
Direct contact with contaminated soils due to chemical spills	Environmental receptors within the study area Construction workers within the Project Area	✓		✓
Direct contact (underground structures) with aggressive ground conditions	Buildings and structures		✓	

6.11 Excavation spoil classification

Geotechnical investigations are currently under way by AusNet to inform detailed design of the Proposed Route. For the purpose of spoil management, soil sampling is proposed to be undertaken concurrently with the geotechnical investigations to target areas of potential contamination identified by the existing conditions assessment.

The geotechnical investigations will include a Geotechnical Intrusive Investigation, which will target the tower locations to inform detailed design. There is opportunity to include scope for contaminated land sampling as part of the investigation.

The soil sampling objectives and scope should be informed by the preliminary CSM presented in Section 6.10.

6.12 Current Site Observations

During the course of Cultural Heritage IA field work and surveys supporting the EES, potentially contaminated ground conditions were encountered on at least three occasions. Contaminants of potential concern observed included asbestos, heavy metals and polycyclic aromatic hydrocarbons (PAHs). Contaminated soils were identified and managed consistent with the requirements of the EPRs presented in Section 11.

7. Construction impact assessment

7.1 Key issues

The potential for contaminated soil, groundwater or ASS to impact the Project is largely related to the disturbance of soil and groundwater resulting from pre-construction activities described in Section 3.3.4.

The key issues pertaining to contamination conditions that may arise during construction ground disturbance activities (including pre-construction activities) are summarised below:

- Potential to encounter unexpected contamination during construction, leading to increased spoil management costs
- Potential risk to human health and the environment from spoil excavation and stockpiling
- Mobilisation of contaminants leading to degradation of local environment
- Potential spill of oils, chemicals, and solid and liquid waste during construction.

An assessment of the above impacts and relevant mitigation strategies is described in the following sections.

7.2 Impact assessment

The following impacts are considered relevant to all stages of construction works, including pre-construction establishment of laydown areas and workforce accommodation facilities and installation of distribution line crossovers described in Section 3.3.

7.2.1 Potential to encounter contamination during construction

As indicated in Section 6.10.1, the following potentially contaminating land uses have been identified within the Project Land: agricultural land use, historic gold mining, sand and gravel quarries, existing terminal stations and illegal dumping. The Sydenham end of the Proposed Route is also located within the recommended 200 m buffer distance of an inert waste landfill as per Table 5.2 of the EPA publication 788.3 (EPA Victoria, 2015) for placement of buildings and structures.

The majority of the Project Land Is indicated as having low to extremely low potential for ASS. There is a high probability of ASS occurrence in isolated locations within the Project Land surrounding Glendaruel (within City of Ballarat), Dean Reservoir, Moorabool Reservoir, Hepburn Lagoon, Bolwarrah Weir, Pykes Creek Reservoir and Merrimu Reservoir (within Shire of Hepburn and Shire of Moorabool) (Section 6.2.4).

The potential to encounter contaminated soil, groundwater or ASS within the Project Land is therefore considered likely.

Unmitigated exposure to contaminated material or ASS during the construction stage of the Project would be likely to have a minor, localised impact to human health, the environment or land use due to the relatively short duration of potential exposure.

Consideration of contamination mobilisation and migration during construction is considered in Section 7.2.3.

7.2.2 Spoil excavation and stockpiling

Uncontrolled excavation and stockpiling of contaminated spoil have the potential to impact human health, the environment and existing land use through the generation of contaminated surface water run-off, leaching of contaminants to the underlying soil and potentially surface water and groundwater resources, dust generation, and the movement of plant and equipment and direct placement on sensitive environments.

Based on EPA Publication 1968.1 *Guide to Classifying Industrial Waste*, all excavated soil should be considered solid waste and managed accordingly to adhere to waste management requirements.

Unmitigated, impacts to human health, the environment or existing land-use arising from the generation of excavation spoil have been assessed as moderate to major. The severity of impact would be positively correlated to the volume of disturbed contaminated material, the severity of contamination and the sensitivity of the land-use.

The key objective for the Project's spoil management strategy should be to maximise re-use of construction spoil. The proposed approach to achieve this objective is in-situ characterisation of soils within the proposed excavation areas as much as practicable before it is excavated and to identify practical re-use or management outcomes. This approach will reduce project costs and delays during the construction stage of the Project.

Should the spoil be proposed to be reused outside the Project Land, the spoil would require classification and transport to a lawful place in accordance with EPA Victoria waste management regulations. Additional permits or permissions from local jurisdictions may also be required, depending on the contaminants identified. This constraint can be appropriately managed through application of the EPRs presented in Section 11.

7.2.3 Mobilisation of contaminants

Contaminants can be mobilised through excavation, piling, and dewatering works, which can create pathways for contaminant migration that currently do not exist. The resultant contamination may degrade the protected environmental values of land, surface water and groundwater and be difficult to mitigate or remediate. It is noted that excavation dewatering is not currently proposed as part of the project design.

Impact to human health, the environment or existing land-use could be major, if contamination or ASS is disturbed and mobilised to a broader area or enters waterways or groundwater. In particular, the disturbance and mobilisation of mining waste in waterways, which has been identified within the Project Land, has the potential to cause moderate to major impacts to the surrounding environment and land use if inappropriately managed.

7.2.4 Potential spill of oils, chemicals, and solid and liquid waste during construction

Oils, chemicals, and solid and liquid waste may be stored and used within the Project Area during construction. Inappropriate storage and handling of oils, chemicals and solid and liquid waste could result in spills and leaks, potentially contaminating the land and groundwater and pose a risk to human health and the environment. A list of hazardous substances planned for use and storage during the construction stage are presented in Appendix E.

Unmitigated, typical oil, chemical, and soil and liquid waste spills are likely to have a minor, localised impact on human health and the environment.

7.2.5 Laydown areas and workforce accommodation facilities

The following sections explain in detail the impacts of activities associated with laydown area and workforce accommodation facilities, for both establishment and use, and how the impacts will be mitigated in the context of the EPRs and/or the draft Incorporated Document. The impact pathway and associated mitigation measures are summarised in Table 7.1.

Table 7.1: Laydown areas and workforce accommodation facilities impact assessment pathways

Impact Assessment Pathway	Mitigation Pathway	Applicable location & facility
Establishment of laydown areas. As per the draft Incorporated Document, the establishment of laydown areas can be carried out as preparatory works, and as such EPRs do not apply.	With the adoption of mitigation measures identified in Section 7.3, the establishment of the laydown areas would meet the requirements of the GED and additional duties in relation to identifying, managing and notifying contamination risks.	▪ Bulgana (existing) Terminal Station laydown area – establishment ▪ Bulgana (new) Terminal Station laydown area – establishment ▪ Lexton laydown area – establishment ▪ Ballan laydown area – establishment ▪ Sydenham Terminal Station laydown area – establishment
The construction of the workforce accommodation facilities.	Application of the relevant workforce accommodation facilities conditions	▪ Lexton workforce accommodation facility – construction

Impact Assessment Pathway	Mitigation Pathway	Applicable location & facility
Establishment of laydown areas. As per the draft Incorporated Document, the establishment of laydown areas can be carried out as preparatory works, and as such EPRs do not apply.	With the adoption of mitigation measures identified in Section 7.3, the establishment of the laydown areas would meet the requirements of the GED and additional duties in relation to identifying, managing and notifying contamination risks.	▪ Bulgana (existing) Terminal Station laydown area – establishment ▪ Bulgana (new) Terminal Station laydown area – establishment ▪ Lexton laydown area – establishment ▪ Ballan laydown area – establishment ▪ Sydenham Terminal Station laydown area – establishment
	within the draft Incorporated Document including conditions to avoid, minimise and manage contaminated land impacts associated with the workforce accommodation facilities, which includes a Construction Environmental Management Plan.	▪ Ballan workforce accommodation facility – construction
The use of laydown areas and workforce accommodation facilities during the construction stage.	Components of the Project's construction works that will be subject to EPRs as detailed in Table 11.1.	▪ Bulgana (existing) Terminal Station laydown area – use ▪ Bulgana (new) Terminal Station laydown area – use ▪ Lexton laydown area and workforce accommodation facility – use ▪ Ballan laydown area and workforce accommodation facility – use ▪ Sydenham Terminal Station laydown area – use

7.2.5.1 Bulgana Terminal Station laydown area

Previous soil investigations conducted at the existing Bulgana Terminal Station did not identify significant contamination. The soils at the existing Bulgana Terminal Station have a low probability of occurrence of ASS (6-70% chance of occurrence).

The establishment of the laydown area at the site has the potential to cause land and groundwater contamination as a result of ground disturbance activities identified in Section 7.1.

With the adoption of mitigation measures identified in Section 7.3, establishment of the laydown area is not expected to cause any significant land and groundwater contamination. The significance of impacts would be considered negligible. The construction of the laydown area would meet the requirements of the GED and additional duties in relation to identifying, managing and notifying contamination risks.

7.2.5.2 New terminal station near Bulgana laydown area

The soils at the laydown area at the new terminal station site have a low probability of occurrence of ASS (6-70% chance of occurrence).

The establishment of the laydown area at the site has the potential to cause land and groundwater contamination as a result of ground disturbance activities. identified in Section 7.1.

With the adoption of mitigation measures identified in Section 7.3, establishment of the laydown area is not expected to cause any significant land and groundwater contamination. The significance of impacts would be considered negligible. The construction of the laydown area would meet the requirements of the GED and additional duties in relation to identifying, managing and notifying contamination risks.

7.2.5.3 Lexton laydown area and workforce accommodation facility

A desktop review of publicly available databases, GQRUZs, as declared by EPA Victoria, previous contaminated land investigations conducted within the study area by AusNet and other publicly available information did not identify any specific contamination risks at the proposed Lexton laydown area and workforce accommodation facility. However, it is noted that no soil or groundwater testing was completed.

The soils at the proposed site have a low probability of occurrence of ASS (6-70% chance of occurrence).

The establishment of the laydown area near Lexton has the potential to cause land and groundwater contamination as a result of ground disturbance activities. As per the draft Incorporated Document, the establishment of laydown areas can be carried out as preparatory works, and as such EPRs do not apply. The establishment of the laydown area would meet the requirements of the GED and additional duties in relation to identifying, managing and notifying contamination risks. The establishment of the laydown area at Lexton is not expected to cause any significant land and groundwater contamination. The significance of impacts would be considered negligible.

Similarly, the construction of the workforce accommodation facility has the potential to cause land and groundwater contamination as a result of ground disturbance activities. Mitigation measures for the establishment of the facility are identified in the draft Incorporated Document, which includes the preparation of a Construction Environmental Management Plan with procedures to identify, manage and monitor environmental risks associated with contaminated land. With the adoption of these mitigation measures, the construction of the workforce accommodation facility is not expected to cause any significant land and groundwater contamination. The significance of impacts would be considered negligible.

The use of the laydown area and workforce accommodation facility throughout the construction stage is not expected to cause any significant land and groundwater contamination, with the adoption of mitigation measures identified in Section 7.3. The significance of impacts would be considered negligible.

7.2.5.4 Ballan laydown area and workforce accommodation facility

A desktop review of publicly available databases, GQRUZs, as declared by EPA Victoria, previous contaminated land investigations conducted within the study area by AusNet and other publicly available information did not identify any specific contamination risks at the Ballan laydown area and workforce accommodation facility. However, it is noted that no soil or groundwater testing was completed.

The soils at the laydown area and workforce accommodation facility at Ballan have a low probability of occurrence of ASS (6-70% chance of occurrence).

The establishment of the laydown area near Ballan has the potential to cause land and groundwater contamination as a result of ground disturbance activities. As per the draft Incorporated Document, the establishment of laydown areas can be carried out as preparatory works, and as such EPRs do not apply. The establishment of the laydown area would meet the requirements of the GED and additional duties in relation to identifying, managing and notifying contamination risks. The establishment of the laydown area at Lexton is not expected to cause any significant land and groundwater contamination. The significance of impacts would be considered negligible.

Similarly, the construction of the workforce accommodation facility has the potential to cause land and groundwater contamination as a result of ground disturbance activities. Mitigation measures for the establishment of the facility are identified in the draft Incorporated Document, which includes the preparation of a Construction Environmental Management Plan with procedures to identify, manage and monitor environmental risks associated with contaminated land. With the adoption of these mitigation measures, the construction of the workforce accommodation facility is not expected to cause any significant land and groundwater contamination. The significance of impacts would be considered negligible.

The use of the laydown area and workforce accommodation facility throughout the construction stage is not expected to cause any significant land and groundwater contamination, with the adoption of mitigation measures identified in Section 7.3. The significance of impacts would be considered negligible.

7.2.5.5 Sydenham Terminal Station laydown area

Previous soil investigations conducted at the Sydenham Terminal Station did not identify significant contamination.

One site on EPA Victoria's Priority Sites Register was identified about 4km to the northwest of the existing Sydenham Terminal Station, which is an illegal solid inert waste dump located in Plumpton in the City of Melton. There is also a closed solid inert waste landfill in the City of Brimbank, approximately 40m to the east of the Sydenham Terminal Station.

The soils at the site have an extremely low probability of occurrence of ASS (1-5% chance of occurrence).

The establishment of the laydown area has the potential to cause land and groundwater contamination as a result of ground disturbance activities as determined for the other sites.

With the adoption of mitigation measures identified in Section 7.3, establishment of the laydown area is not expected to cause any significant land and groundwater contamination. The significance of impacts would be considered negligible. The establishment of the laydown area would meet the requirements of the GED and additional duties in relation to identifying, managing and notifying contamination risks.

7.3 Mitigation of impacts

Mitigation strategies for contaminated land impacts during the construction stage of the Project have been outlined below. The mitigation strategies include planning and due diligence prior to undertaking ground disturbance activities, as well as development and implementation of a Spoil Management Plan (SMP) for inclusion in the CEMP for the Project.

The following mitigation strategies provide a feasible way that the EPRs presented in Section 11 could be achieved:

- Design project elements, including access tracks and laydown areas, to avoid areas with high potential for contamination in the Project Land such as historic gold mines, quarries and landfills, where possible (EPR CL1).
- Plan and undertake contaminated land investigations prior to any excavation of potentially contaminated areas, particularly those with high contamination potential such as historic gold mines, quarries and landfills. These investigations should include but not be limited to consideration of the following:
    - Potential contamination risks associated with historical and current land uses within and in vicinity of the Proposed Route, in the context of human health, environment and odour.
    - Potential mobilisation of groundwater contamination towards the Proposed Route should dewatering be required as part of the construction.
    - Potential implications of chemically aggressive ground conditions and ASS on the selection and durability of construction materials.
    - Potential contamination risks associated with any alternative Project designs.

  All intrusive contaminated land investigations should be planned, executed, and reported in accordance with a NEPM 2013 compliant Sampling, Analysis and Quality Plan (EPR CL1).
- Develop and implement a CEMP in accordance with the Environment Protection Act and subordinate legislation, as set out in EPA Victoria guidance documents on assessing and managing contaminated land including (but is not limited to) EPA Publication 1977: Assessing and controlling contaminated land risks, EPA Publication 1834.1: Civil Construction, Building and Demolition Guide) and best practice guidance found in the NEPM 2013 (EPR CL2).
- Develop and implement a Dewatering Plan as part of the CEMP to manage potential dewatering impact during construction. The Dewatering Plan should include identification of disposal options for groundwater extracted during construction (EPR CL2).

- Prepare a Contingency and Unexpected Finds Plan in relation to contaminated land including the identification of responsibilities, training, staff induction, typical unexpected finds and responses, notification(s), and reporting requirements (EPR CL2).
- Develop and implement a SMP, as part of the CEMP, prior to commencement of construction in accordance with the Environment Protection Act and subordinate legislations. (EPR CL3)
- As part of the SMP, prepare an ASS and ASR Management Sub-Plan in general accordance with EPA Publication 655.1: Acid Sulfate Soil and Rock (EPA Victoria, 2009), *National Acid Sulfate Soils Guidance: A Synthesis: Department of Agriculture and Water Resources* (Sullivan et. al., 2018) and in consultation with the EPA. The plan should include identification of locations and extent of any potential ASS/ASR. (EPR CL3)

7.4 Residual impacts

The Project's impact on the environmental values described in Section 6.9 generally relates to the disturbance of ground where existing contamination, ASS and ASR are present. Identification, management and communication of potential contamination constitute the underlying GED for the Project, including implementation of effective control measures.

The existing conditions assessment presented in Section 6.1 identified varying site contamination conditions within the Project Land. Identified areas of potential contamination risk can be mitigated across all Project locations within the Project Land.

Therefore, the EPRs presented in Section 11 that describe specific measures to be undertaken to be consistent with the GED will require application across all locations within the Project Area. Table 7.2 presents a summary of pre-mitigated impacts; reference to relevant EPRs; a discussion on how impacts would be mitigated; and the resultant residual impacts.

Table 7.2: Summary of residual impacts

Impact	Significance of pre-mitigated impact	Relevant EPR	Mitigation strategy	Significance of residual impact
Potential to encounter unexpected contamination during construction, leading to increased spoil management costs	Minor	**CL1**	Investigations and requisite soil testing for waste management purposes will significantly reduce the potential to encounter unexpected contamination during construction.	Negligible
Potential risk to human health and the environment from spoil excavation and stockpiling	Moderate to Major	**CL2, CL3**	Development and implementation of a CEMP and SMP to manage spoil management will align earthworks with requirements of the EPA, WorkSafe Victoria and other relevant stakeholders.	Negligible
Mobilisation of contaminants leading to degradation of local environment	Major	**CL2, CL3**	A critical aspect of the requisite CEMP and SMP detailed above pertains to immobilisation of ground contamination where it has been identified, and site hygiene best practice, regardless the contaminant status of the material being managed.	Negligible
Potential spill of oils, chemicals, and solid and liquid waste during construction	Minor	**CL2**	Communication of and adherence to the CEMP will significantly reduce the likelihood of new ground contamination during the construction stage of the Project.	Negligible

Following application of the relevant workforce accommodation facilities conditions within the draft Incorporated Document including conditions to avoid, minimise and manage impacts associated with the workforce accommodation facilities, the residual impact is considered to be negligible. For contaminated land, this includes a Construction Environmental Management Plan. It is considered that these conditions are sufficient to meet the requirements of any relevant EPR applying to contamination impacts at the workforce accommodation facilities.

With the implementation of the management and mitigation measures described in Section 7.3 and commitment by the Principal Contractor to the EPRs in Section 11, residual impacts resulting from Project construction activities that have potential to cause land or groundwater contamination are considered to be negligible.

8. Operations impact assessment

It is expected that the activities during operation of the Project are largely related to above ground operations and infrastructure; and there are no operations works that are expected to involve significant earthworks. However, there is potential for the operational works to include some shallow ground disturbance activities such as ongoing maintenance of underground services (located at terminal stations), access tracks, landscaped areas, and hard stand areas.

In general, and subject to the physical and chemical quality of spoil, reuse is encouraged by EPA Victoria as the preferred management option for excess spoil. It may be possible for spoil material with low level of contamination generated from Project's construction activities to be reused/retained within the Project Area. Those contaminated materials may be reused/retained in areas where future workers (terminal stations and transmission towers) and maintenance workers may come into contact when undertaking operational activity that may involve ground disturbance works. Exposure to the contaminated material could have an adverse impact on human health or the environment, if not managed appropriately.

The key issues pertaining to contamination conditions that may arise during operations are summarised below:

- Potential to encounter reused contaminated spoil
- Potential spill of oil / chemicals during operation.

An assessment of the above impacts and relevant mitigation strategies is described in the following sections.

8.1 Assessment of impacts

8.1.1 Potential to encounter reused contaminated spoil

The potential exists for spoil with low levels of contamination to be reused within the Project Area, where future workers (terminal stations and transmission towers) and maintenance workers may come into contact with the reused material when undertaking ground disturbance works.

Due to the expectation that any reused spoil would be assessed as having acceptably low levels of contamination, unmitigated direct or indirect exposure has been assessed as likely to have a minor impact on human health, the environment, land-use or assets.

8.1.2 Potential spill of oils, chemicals, and solid and liquid waste during operation

Oils, chemicals, and solid and liquid waste may be stored and used within the Project Area during operation. Inappropriate storage and handling of oils, chemicals and solid and liquid waste could result in spills and leaks, potentially contaminating the land and groundwater and pose a risk to human health and the environment.

Unmitigated, typical oil, chemical, and solid and liquid waste spills are likely to have a minor, localised impact on human health or the environment. Ongoing or major spills or leaks could have a moderate impact depending on the volume and chemical composition of the spill or leak.

8.2 Mitigation of impacts

AusNet have existing procedures in place that, related to contaminated soils management and environmental management, that when implemented, have the capacity to mitigate impacts associated with contaminated land during the operations stage.

These procedures are applicable across AusNet's transmission network in Victoria and contain:

- Processes for soil contamination management through three overarching principles: investigation, assessment and control of contaminated soil. It provides the key steps, activities and responsibilities for managing contaminated soil, including the circumstances under which a contaminated land specialist is to be consulted. This procedure was updated in 2021 to include updates to contaminated land regulation in Victoria.

- Processes to establish objectives and measures to minimise to the extent practicable the following risks:
    - Asbestos containing buildings/structures
    - Battery rooms
    - Chemical storage areas
    - Fuel storage and/or generators
    - Oil containing equipment, including PCBs and mineral/hydraulic oil
    - On-site septic systems
    - Sulphur hexafluoride and/or LPG cylinder
    - Spoil and/or waste materials.

This procedure was updated in 2023 to include updates to contaminated land regulation in Victoria.

8.3 Residual impacts

The impact assessment identified that the key issues from operations activities relate to potential exposure to contaminated soil and the potential of spills to cause soil or groundwater contamination. In contrast with construction stage impacts, operational stage impacts have control measures already in place, in the form of the AusNet procedures that are applicable across AusNet's transmission network in Victoria.

Potential operational stage impacts are referenced in Table 8.1, with pre-mitigated impacts and residual impacts with the mitigation strategy (i.e. existing AusNet procedure(s)) applied.

Table 8.1: Summary of residual impacts

Impact	Significance of pre-mitigated impact	Mitigation strategy	Significance of residual impact
Potential risk to human health and the environment from exposure to reused contaminated spoil	Minor	Implementation of AusNet's contaminated soils and environmental management procedures (refer to Section 8.2), which describe the processes for management and re-use of contaminated soil, and processes for management of spill of oils, chemicals, and soil and liquid waste	Negligible
Potential spill of oils, chemicals, and soil and liquid waste during operation	Moderate		Negligible

With the implementation of the management and mitigation measures described in Section 8.2, residual impacts resulting from Project operation activities that have potential to cause land and groundwater contamination were considered to be negligible.

9. Decommissioning impact assessment

The Project's transmission line is designed for a service life of 80 years, while the terminal stations have been designed to have a minimum life of 45 years. Terminal stations will be maintained and upgraded to remain operational for the service life of the transmission line. The activities described for decommissioning in Section 3.3.3 are broadly similar to activities which would occur during construction (Section 3.3.1). The potential decommissioning activities that have potential to cause land, surface water and groundwater contamination issues are largely related to the disturbance of soil and rock resulting from:

- Decommissioning (including transformers and shunt reactors), demolition of foundations for transmission towers and terminal stations
- Decommissioning of temporary and permanent access tracks
- Construction of temporary hardstands to facilitate transmission tower decommissioning
- Reinstatement of the transmission tower and terminal station locations, potentially using imported materials.

The impact assessment identified that the key issues from decommissioning activities that have potential to cause land and groundwater contamination are largely similar to construction and operation. As such, if relevant construction and operational stage control measures are implemented, residual impacts resulting from Project decommissioning activities that have potential to cause land and groundwater contamination are considered to be negligible. Therefore, a Contaminated Land Management Plan should be included in the Decommissioning Management Plan for the decommissioning stage. The Decommissioning Management Plan would outline the specific controls to avoid or minimise risks to human health and the environment from leaks and spills, stormwater runoff, contaminated surface water runoff, disturbance of potentially contaminated soils and waste soil management.

Given the expected lifespan of the Project, it is likely that the current standards and guidelines will have been superseded and the Decommissioning Management Plan will need to be prepared based on good industry practice at that time, and approved prior to decommissioning.

10. Cumulative impacts

A cumulative impact assessment considers the impacts of a project together with the impacts of other relevant projects that may interact spatially and temporally to change the level of impact on environmental, social or cultural values. **EES Chapter 4: EES assessment framework and approach** identifies relevant future projects that are proportionate to the scale and potential significance of the impacts of Western Renewables Link Project (WRL); that have sufficient information publicly available in an EES or an environmental approvals application; and that have a spatial and temporal relationship to Western Renewables Link. Cumulative impacts may occur when incremental, successive and combined effects of actions or projects are added to other proposed actions or projects.

Cumulative contaminated land impacts may arise from the interaction of construction, operational and decommissioning activities of WRL, and other developments, activities, land uses and projects in the area, both current and future. When considered in isolation, WRL impacts may be considered manageable. These manageable impacts may, however, be more substantial, when the impact of multiple projects on the same receptors are considered.

Of the 23 shortlisted credible projects identified in **EES Chapter 4: EES assessment framework and approach**, the following have been considered as potentially relevant to contaminated land:

- Sand quarry, located at Lot 8 Seereys Road, Coimadai, Vic. Re-establishment of a quarry and associated infrastructure for the purpose of extracting mineral resources (sand and gravel).
- Victoria to New South Wales Interconnector West (VNI). A proposed future transmission line connecting clean, low-cost renewable power from renewable energy zones (REZs) in New South Wales and Victoria to WRL.
- Nyaninyuk Wind Farm. A proposed windfarm consisting of up to 58 wind turbine generators with a total combined capacity of up to 330 megawatts. This project is located between Ecansford, Clunes and Waubra.
- Akaysha (Elaine) Battery Energy Storage System (BESS). A proposed BESS with a capacity of 311 megawatts. This project is located immediately west of the Elaine terminal station site.

Relative to the extent of the Project Land, potential impacts in relation to contaminated land are typically localised, and therefore can be considered and managed incrementally on a case-by-case basis. Due to the localised nature of these potential impacts and assuming application of the EPRs presented in Section 11, spatial overlap of contaminated land impacts from the Project and other proposed credible projects is not expected to occur.

Based on the limited spatial relationship, the predicted negligible residual impacts are not expected to result in cumulative impacts with other proposed projects or proposed future project expansions.

11. Environmental Performance Requirements

Environmental Performance Requirements (EPRs) set out the environmental outcomes to be achieved through the implementation of mitigation measures during construction, operation and decommissioning. While some EPRs are performance based to allow flexibility in how they will be achieved, others include more prescriptive measures that must be implemented. Compliance with EPRs will be required as a condition of the Project's approval.

To meet the EES evaluation objective of avoiding and/or minimising contaminated land risks to social, economic and cultural values, the EPRs outlined in Table 11.1 are recommended.

Table 11.1: Contaminated Land Environmental Performance Requirements

EPR code	Environmental Performance Requirements	Project component	Stage
CL1	**Minimise contaminated land impacts through investigation and design** 1. Prior to the commencement of construction, undertake assessments consistent with Schedule A – Recommended general process for assessment of site contamination of the NEPM 2013 in areas of planned ground disturbance prior to any earthworks to inform detailed design and preparation of the Construction Environmental Management Plan (CEMP) (EPR EM2). As part of the General Environmental Duty, these assessments must include but not be limited to consideration of the following: a. Potential mobilisation of groundwater contamination towards the Proposed Route should dewatering be required as part of the construction. b. Potential implications of chemically aggressive ground conditions, Acid Sulfate Soil (ASS) and Acid Sulfate Rock (ASR) on the selection of construction materials and durability. c. Characterisation of all excavated soil in accordance with waste management requirements in EPA Publication 702.2 *Soil sampling for waste soils*.	▪ Access tracks ▪ Transmission towers ▪ Terminal stations ▪ Laydown and hardstand areas ▪ Distribution line crossovers	Design
CL2	**Develop and implement contaminated land management and mitigation measures for construction** 1. Prior to the commencement of construction and as part of the Construction Environmental Management Plan (CEMP) (EPR EM2), develop and implement management and mitigation measures for contaminated land consistent with the EPA, WorkSafe Victoria, and any other relevant regulatory requirements. The contaminated land section of the CEMP must include (but is not limited to) the following: a. Summary of applicable regulatory requirements. b. Description of roles and responsibilities. c. Management measures to address potential risks associated with excavation of impacted soils, extraction of impacted groundwater, open excavations and stockpiles. d. Odour management measures (in accordance with EPA Victoria requirements) during the excavation, stockpiling and transportation of contaminated material. e. Management measures for storage and use of chemicals, fuels and hazardous materials during construction. f. A process for the assessment of suitability of any imported material. g. Procedures for the identification of issues and appropriate management measures for residual risks of construction spoil that will become a waste and require management through construction (EPA Publication 1834.1: Civil Construction, Building and Demolition Guide). h. Processes for preparation of a Remedial Options Assessment (if unacceptable residual risks are identified or as required for re-use of Project spoil (EPR CL3)) and further, if required, prepare a Remedial Action Plan and remedial designs.	▪ Access tracks ▪ Transmission towers ▪ Terminal stations ▪ Laydown and hardstand areas ▪ Distribution line crossovers	Construction

EPR code	Environmental Performance Requirements	Project component	Stage
	i. Measures to prevent contamination of areas used for temporary construction works and to remediate any contamination caused by temporary construction activities in consultation with the relevant land manager. j. Contingency and Unexpected Finds Plan should unexpected, contaminated soil or groundwater be identified during earthworks.		
CL3	**Develop and implement a Spoil Management Plan** 1. Prior to commencement of construction and as part of the Construction Environmental Management Plan (CEMP) (EPR EM2), develop and implement a Spoil Management Plan (SMP) in consultation with EPA to manage the environmental impacts associated with construction spoil. The SMP must include (but not limited to) the following: a. Summary of applicable regulatory requirements. b. Description of roles and responsibilities. c. Characterisation approach for the spoil for off-site disposal or re-use, if required. d. Consideration of major projects in the region to minimise cumulative impacts associated with spoil management e. Identification of suitable sites for disposal of any waste in consultation with local councils. f. Identification of reuse options for all categories of spoil expected to be generated through construction. g. Management of hazardous substances. h. Monitoring and reporting requirements i. Sub-plans as appropriate, including but not limited to an Acid Sulfate Soil (ASS) and Acid Sulfate Rock (ASR) Management Sub-Plan. The ASS and ASR Management Sub-Plan will include but not be limited to: i. Undertaking ASS and ASR investigations prior to commencement of construction. ii. Identification of locations and extent of any potential ASS/ASR. iii. Stockpile management including lining, covering and runoff collection to prevent oxidation and release of acid to the environment, and impact to human health. iv. Identification of suitable sites for re-use management or disposal of ASS and ASR. j. The ASS and ASR Management Sub-Plan will be prepared in accordance with General Environmental Duty, Environment Protection Act 2017 and subordinate legislation, EPA Publication 655.1: Acid Sulfate Soil and Rock, and the Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils k. Management measures for sustainable handling and transport of spoil for the protection of human health and the environment. l. Environmental management plans for temporary stockpile areas and stockpile activities. m. Details of appropriate lawful places for the receipt of waste and permit requirements.	▪ Access tracks ▪ Transmission towers ▪ Terminal stations ▪ Laydown and hardstand areas ▪ Distribution line crossovers	Construction

In addition to the EPRs recommended specific to contaminated land, the other related EPR is listed in the table below for reference.

Table 11.2: Additional EPRs related to contaminated land

EPR code	Environmental Performance Requirements	Project component	Stage
EM2	**Develop and implement a Construction Environmental Management Plan** 1. Prior to the commencement of construction, develop and implement a Construction Environmental Management Plan (CEMP) with associated subplans as required by relevant EPRs in accordance with the Environmental Management Framework to manage the environmental impacts associated with construction in accordance with the mitigation hierarchy. 2. The CEMP must be developed in consultation with relevant stakeholders as required by relevant EPRs, reviewed by AusNet, and reviewed and verified by the Independent Environmental Auditor (IEA) for compliance with the EPRs prior to the commencement of construction. 3. The CEMP subplans must address applicable EPRs including those relevant to surface water, groundwater, geology and soils, contaminated land, biodiversity, air, noise, historical heritage, bushfire protocols, weed and pest management. 4. The CEMP and its subplans must comply with the EPRs and relevant environmental legislation, and performance must be reported to AusNet and relevant government agencies as appropriate.	All	Construction
EM11	**Develop and implement a Decommissioning Management Plan** 1. Prior to commencement of decommissioning, develop and implement a Decommissioning Management Plan detailing mitigation measures required to manage the environmental impacts associated with decommissioning and seek to minimise the risk of harm to human health or the environment of all activities associated with decommissioning 2. Management and mitigation measures shall be consistent with environmental management strategies, practices, and technologies current at the time and shall include, but not be limited to measures for communications and stakeholder engagement, environmental protection measures, waste management and recycling, emergency response and measures to minimise disturbance to agriculture, recreation and other enterprises.	All	Decommissioning

The draft Incorporated Document has been informed by the above EPRs and includes conditions to avoid, minimise and manage impacts associated with the workforce accommodation facilities. For contaminated land, this includes a Construction Environmental Management Plan. It is considered that these conditions are sufficient to meet the requirements of any relevant EPR applying to contaminated land impacts at the workforce accommodation facilities.

12. Conclusion

The Project has the potential to interact with contamination in soil and groundwater and ASS if construction and earthworks are not planned and managed with respect to contamination levels and relevant legislation and guidelines. This report assesses and provides mitigation measures related to the potential impacts on the Project construction and operation of existing contamination within the study area. The report also assesses the potential for Project activities to cause contamination of the receiving environment. Further details on impacts identified for contaminated land are presented separately in the following sections.

This assessment has concluded that the environmental objective to "maintain the functions and values of aquatic environments, surface water and groundwater quality and stream flows and prevent adverse effects on protected beneficial uses." will be met assuming the implementation of the mitigation measures to achieve the EPRs.

12.1 Existing conditions

Potential sources of contamination identified within the Project Land included agricultural land use, historic gold mining, sand and gravel quarries, rail yards, the Melton Aerodrome, a closed private landfill and illegally dumped solid inert waste. These contaminating activities have the potential to cause soil and groundwater contamination. The Sydenham end of the Project Area is also located within the recommended 200m buffer distance of an inert waste landfill as per Table 5.2 of the Environment Protection Authority (EPA) publication 788.3 (EPA Victoria, 2015) for placement of buildings and structures.

Potential ASS and ASR are found across the study area, with high probability of occurrence in isolated locations surrounding Glendaruel (within City of Ballarat), Dean Reservoir, Moorabool Reservoir, Hepburn Lagoon, Bolwarrah Weir, Pykes Creek Reservoir and Merrimu Reservoir (within Shire of Hepburn and Shire of Moorabool).

Soil investigations were previously conducted at the Bulgana and Sydenham Terminal Stations, the Crowlands Substation, and several opportunistic sites located within the study area. These soil investigations did not identify significant contamination in the study area.

12.2 Construction impact assessment

The Project has the potential to cause land and groundwater contamination during construction as a result of disturbance of soil and rock during construction due to site preparation, earthworks activities, foundation construction, construction of temporary and permanent access tracks, construction of laydown areas and hardstands as well as below ground works (including distribution line crossovers) that may intercept groundwater.

The key issues pertaining to contamination conditions that may arise during construction are:

- Potential to encounter unexpected contamination during construction, leading to increased spoil management costs
- Potential risk to human health and the environment from spoil excavation and stockpiling
- Mobilisation of contaminants leading to degradation of local environment
- Potential spill of oils, chemicals, and solid and liquid waste during construction.

The construction impact assessment found that after mitigation measures are applied, residual impacts resulting from Project construction activities that have potential to cause land or groundwater contamination were considered to be negligible.

12.3 Operational impact assessment

The key issues pertaining to contamination conditions that may arise during operations are:

- Potential risk to human health and the environment from exposure to contaminated spoil
- Potential spill of oils, chemicals, and solid and liquid waste during operation.

The operational impact assessment found that after appropriate mitigation measures are applied, residual impacts resulting from Project operation activities that have potential to cause land and groundwater contamination were considered to be negligible.

12.4 Decommissioning impact assessment

The decommissioning activities are broadly similar to the activities which would occur during construction. Based on the current decommissioning impact assessment, land and groundwater contamination issues have been considered similar to those described in the construction stage impact assessment (i.e., negligible).

The decommissioning impact assessment identified the key issues from decommissioning activities that have potential to cause land and groundwater contamination are largely similar to construction and operation. As such, the control measures that will be employed for construction and operational stages that will limit the significance of impacts will be the same for decommissioning.

12.5 Cumulative impact assessment

Four credible projects were identified with potential for impacts (based on their spatial or temporal proximity) that could change the cumulative level of impact on environmental, social or cultural values. However, post-mitigation contaminated land impacts due to these projects are expected to be both localised and negligible, and therefore cumulative impacts can be managed incrementally on a case-by-case basis.

Based on the limited spatial relationship, the predicted negligible residual impacts are not expected to result in cumulative impacts with other proposed projects or proposed credible project expansions.

12.6 Environmental Performance Requirements

Three EPRs relating to contaminated land have been recommended in order to meet the EES evaluation objective which include:

- **CL1: Minimise contaminated land impacts through investigation and design**. Prior to the commencement of construction, undertake assessments consistent with *Schedule A – Recommended general process for assessment of site contamination* of the NEPM 2013 in areas of planned ground disturbance prior to any earthworks to inform detailed design and preparation of the CEMP
- **CL2: Develop and implement contaminated land management and mitigation measures for construction**. Prior to the commencement of construction and as part of the CEMP, develop and implement management and mitigation measures for contaminated land consistent with the EPA, WorkSafe Victoria, and any other relevant regulatory requirements
- **CL3: Develop and implement a Spoil Management Plan**. Prior to commencement of construction, and as part of the CEMP, develop and implement a Spoil Management Plan (SMP) in consultation with EPA, including preparation of a sub-plan to manage ASS and ASR.

An additional EPR that applies to the Project decommissioning more broadly, but is also relevant to contaminated land, is also included in Section 11.

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Appendix A. Legislative Framework and Approval Requirements

A.1 Introduction

This section summarises the legislative framework relevant to contaminated land assessment of the Project.

The *National Environment Protection Act 1994* (Commonwealth of Australia 1994) provides overarching national framework documents setting out national environmental protection objectives. Specific to contaminated land is the National Environment Protection (Assessment of Site Contamination) Measure, 1999 (as amended 2013) (NEPM 2013). The NEPM 2013 provides a technical framework for the consistent approach to the assessment and management of contaminated land nationally. A brief description of the NEPM 2013 and the implication for the Project is provided in Section A4.6.

The procedures for preparing and amending planning provisions and planning schemes are set out in the *Planning and Environment Act 1987* together with associated regulations and Ministerial Directions. Further description and discussion of planning and contaminated land is provided in Section A.2.

The *Environment Protection Act 2017* is the principal environmental legislation in Victoria. Key aspects of the Act in relation to contaminated land and the Project Area are the General Environmental Duty and legal and regulatory obligations, policies and guidance relating to contaminated land and waste. The *Environment Protection Act 2017* is supported by *Environment Protection Regulations 2021* and the Environment Reference Standard. Further description and discussion on environmental protection and contaminated land is included in Section A.3. The regulation of safety in the workplace is legislated by the *Occupational Health and Safety Act 2004* (Victoria Government, 2004).

In addition to the legislative instruments noted above is subordinate legislation and other regulatory guidelines prepared by the EPA Victoria and other Victorian Government authorities. General technical guidance documents and standards are attached to legislation and regulatory guidelines that combined form the technical basis for the planning and completion of contaminated land-related projects.

Table A.1 and Figure A.1 summarises the relevant legislation that applies to the Project as well as the approvals required.

Table A.1: Legislation and approvals

Legislation or policy	Key policies and strategies	Implications for this Project	Approvals required
Commonwealth			
National Environment Protection (Assessment of Site Contamination) Measure, 1999 (as amended 2013) (NEPM 2013)	Consistent framework for completing the assessment and management of contaminated land.	Overarching technical approach	No specific approvals are provided in the NEPM 2013.
State			
Planning and Environment Act 1987	Planning scheme amendments and Ministerial Directions No. 1 and 19	Contaminated land issues will inform the Ministers decision and the gazetted planning scheme amendment.	Minister's decision and Planning Scheme Amendment.
Environment Protection Act 2017	General Environmental Duty and specific contaminated land and waste duties and obligations. Risk-based approach for contaminated land management.	General environmental duty in relation to pollution and waste to manage risks as far as reasonably practicable. Policy and procedures for planning and completing the assessment of impacts from contaminated land and waste.	Approvals / permits / declarations may be required by the Principal Contractor depending on detailed design and methods. Potential engagement of an Environmental Auditor appointed under the *Environment Protection Act 2017* to complete a preliminary risk

Legislation or policy	Key policies and strategies	Implications for this Project	Approvals required
	Hazard-based criteria for waste classification	Duty to inform the EPA Victoria should contaminated land be identified. Obligation to investigate. Compilation of data relevant to inform the further detailed design, the planning and construction of the Project. Duty to make sure that the waste ends up at a lawful place (e.g., landfills). A lawful place will typically need a permission to accept the waste either as a licence, permit, registration, or declaration of use. Duties in relation to identifying alternatives (e.g., reuse) to waste disposal.	screen assessment or environmental audit, if deemed required.
Environment Protection Regulations 2021 (the 'Regulations') (Victoria Government, 2021a)	As above	As above	As above
Environment Reference Standard (ERS) (Victoria Government, 2021b)	Environmental values and standards for land and water	Refers largely to the NEPM 2013, Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018).	No specific approvals
Occupational Health and Safety Act 2004 (Victoria Government, 2004)	Specific duties in relation to the health and safety of workers.	Policy and procedures for considering contaminated land-related issues in safe working procedures. Compilation of data relevant to inform the further detailed design, the planning and construction of the Project.	No specific approvals.
State Regulatory Guidance			
EPA Victoria technical documents (refer Table 4.3).	Not Applicable	Inform and support the assessment of contaminated land	No specific approvals.

Note: Obligations and duties relate predominantly to the 'person in management and control' of the land.

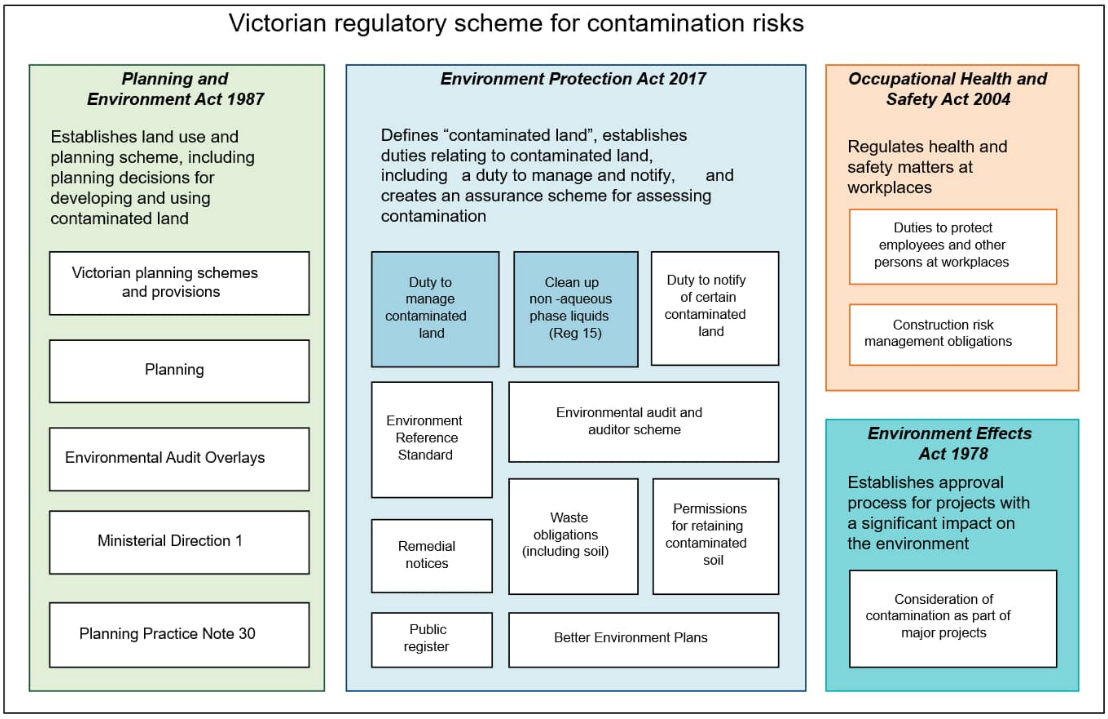

Figure A.1: Regulatory Hierarchy (Source: EPA Publication 1977.1, dated October 2022)

A.2 Planning and approvals

In the preparation of a planning scheme or planning scheme amendment, the planning authorities are required to 'take into account any significant effects which it considers the scheme or amendment might have on the environment or which it considers the environment might have on any use or development envisaged in the scheme or amendment' in accordance with s12(2)(b) of the *Planning and Environment Act 1987*. For some projects (including this Project), an EES is also required to assist decision-makers in making informed decisions during the approvals process. Planning approval will be required for any use and / or development that triggers a planning permit under the relevant planning scheme.

Development of contaminated land provides the opportunity to address the contamination and mitigate risks of harm to human health and the environment. Advice to Planning Authorities in Victoria is provided by the DEECA in Planning Practice Note 30: Potentially Contaminated Land (DEECA, 2021). This advice is supplemental to duties under *the Environment Protection Act 2017* and provides advice about the role of the planning system and applies to situations where a planning approval or control applies.

Planning authorities generally need to refer to Ministerial Directions when considering a planning scheme amendment. Where it has determined land is potentially contaminated the planning authority must satisfy itself that the environmental conditions of that land are or will be suitable for that use (DEECA, 2021b).

Planning Practice Note 30 – Potentially Contaminated Land (DEECA, 2021a) provides guidance on how to identify potentially contaminated land and the appropriate level of assessment of contamination in different circumstances. Table 2 and Table 3 of Planning Practice Note 30 – Potentially Contaminated Land (DEECA, 2021a) provide a list of land uses / activities with high and medium potential to cause land contamination and recommended approach to assessing potentially contaminated land, respectively.

Ministerial Direction No. 19 has a broader remit relating to the preparation and content of amendments that may significantly impact the environment, amenity and human health. Ministerial Direction No.19 requires the planning authority to seek the advice of the EPA Victoria when preparing planning scheme reviews and planning scheme amendments that could significantly impact the environment, amenity and human health. This consultation requirement is triggered when a planning scheme amendment is being prepared that may allow the use or development of land that could result in water, noise, air or land pollution impacts on the environment, amenity or human health, including as defined by State Environment Protection Policies (noting the State Environment Protection Policies have been superseded by the Environment Reference Standard).

Planning Practice Note 30 – Potentially Contaminated Land sets out an approach for the planning or responsible authority to assessing potentially contaminated land as part of a planning scheme amendment or permit application. This is based on the combination of potential for contamination and sensitivity of land use, going from Category A requiring the applicant to go straight to an audit, through to Category D where the potential for contamination is documented. The assessment approach is outlined in Table 3 of the Planning Practice Note 30 and reproduced as Figure A.2 below.

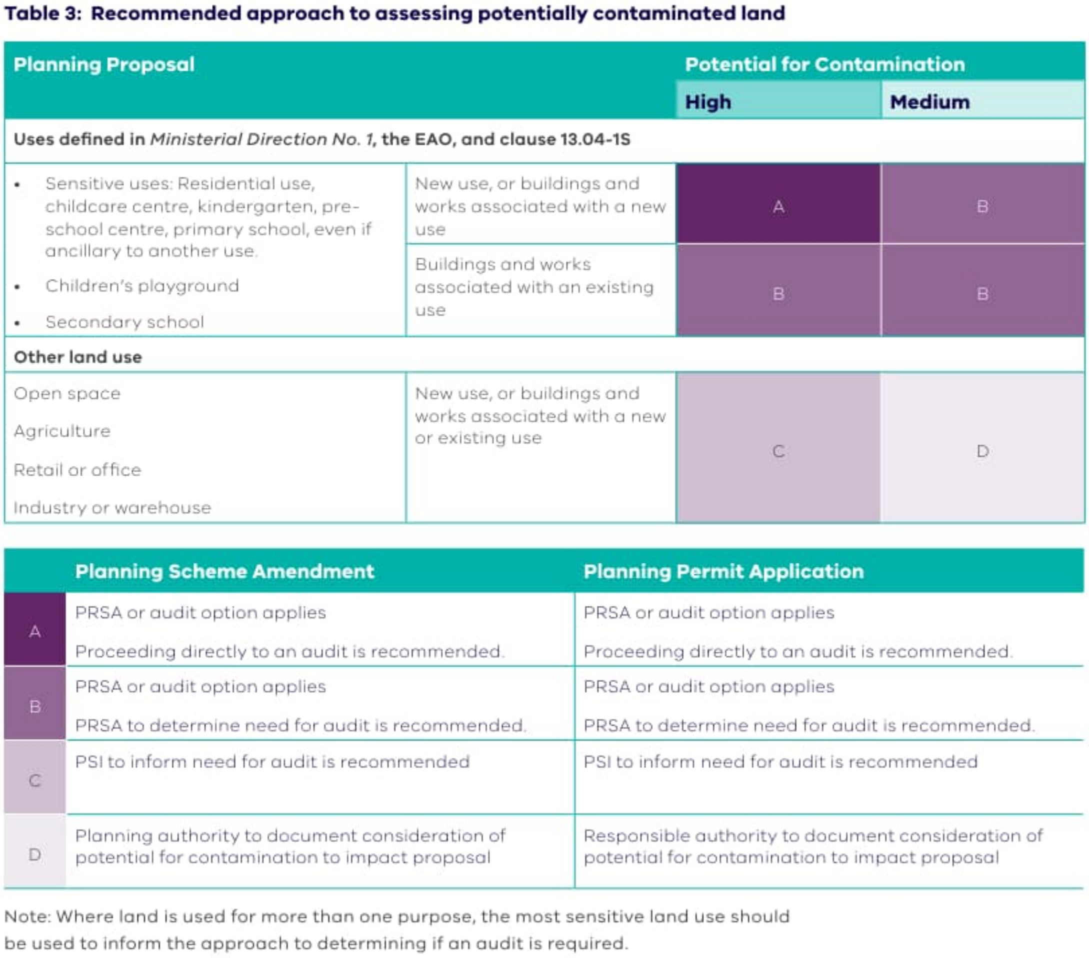

Table 3: Recommended approach to assessing potentially contaminated land

Planning Proposal		**Potential for Contamination**	
		High	**Medium**
Uses defined in *Ministerial Direction No. 1*, the EAO, and clause 13.04-1S			
• Sensitive uses: Residential use, childcare centre, kindergarten, pre-school centre, primary school, even if ancillary to another use. • Children's playground • Secondary school	New use, or buildings and works associated with a new use	A	B
	Buildings and works associated with an existing use	B	B
Other land use			
Open space Agriculture Retail or office Industry or warehouse	New use, or buildings and works associated with a new or existing use	C	D

	Planning Scheme Amendment	**Planning Permit Application**
A	PRSA or audit option applies Proceeding directly to an audit is recommended.	PRSA or audit option applies Proceeding directly to an audit is recommended.
B	PRSA or audit option applies PRSA to determine need for audit is recommended.	PRSA or audit option applies PRSA to determine need for audit is recommended.
C	PSI to inform need for audit is recommended	PSI to inform need for audit is recommended
D	Planning authority to document consideration of potential for contamination to impact proposal	Responsible authority to document consideration of potential for contamination to impact proposal

Note: Where land is used for more than one purpose, the most sensitive land use should be used to inform the approach to determining if an audit is required.

Figure A.2: Assessment approach outlined in Table 3 of the Planning Practice Note 30 (Source: DEECA, 2021a)

Whilst the Project Area includes land uses with a high potential for contamination (such as quarry and historical gold mines), given development is not for sensitive land use, this would place the Project Area either as Category C or Category D. To inform decisions on the planning scheme amendment or permit application for the Project, Council would likely require a Preliminary Site Investigation to inform decision making on what (if any) requirements may be applied to a planning approval to address contamination.

A.3 Protection of the environment

Protection of the environment, the definition of environmental values and the management of pollution and waste are regulated by the *Environment Protection Act 2017* and the Environment Regulations 2021. The basis and nature of the duties are covered in an overarching GED as defined in Section 25 of the *Environment Protection Act 2017*. The GED also acts as the framework for the regulation of particular risks (such as contaminated land). This section describes aspects of the GED in relation to contaminated land issues that may arise during the Project.

A.3.1 General environmental duty

Construction activities such as excavating contaminated soil may trigger the GED. The GED requires that 'a person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as 'reasonably practicable'. Reasonably practicable means that proportionate controls to mitigate or minimise risk of harm need to be put in place (EPA Victoria 2020a). The GED requires practicable measures to be taken to restore the environment if a pollution incident occurs and under certain conditions including if material harm to human health or the environment is caused, requires notification to EPA Victoria. The GED applies to design, manufacture, installation or supply of structures, with the duty potentially breached even if an adverse effect has not taken place.

EPA Victoria Publication 1834.1 (EPA Victoria, 2020b) summarises the duties as they relate to civil construction, building and demolitions. The duties relevant to contaminated land and this Project are summarised in Table A.2.

Table A.2: Duties relevant contaminated land and civil construction, building and demolition (Adapted from EPA Publication 1834)

Aspect	Description	Refer to
General Environmental Duty (Section 25 of Environment Protection Act 2017)	A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable	N/A
Duty to take action to respond to harm caused by pollution incident (Section 31 of Environment Protection Act 2017)	Restore an affected area if pollution or land contamination happens as a result of an activity (whether by act or omission). The person who engaged in the activity that resulted in the pollution incident must clean it up. It must be restored to the state it was in prior to the pollution incident occurred, as far as reasonably practicable.	Section A.3.2
Duty to notify of incidents (Sections 32–33 of Environment Protection Act 2017)	EPA Victoria should be notified as soon as practicable after a pollution incident that causes or threatens material environmental harm occurs.	
Duty to manage contaminated land (Section 39 of Environment Protection Act 2017)	Minimise risks of harm to human health and the environment from contamination as far as reasonably practicable if you manage or control contaminated land (including vacant land and groundwater). This duty applies regardless of who caused the contamination or when it happened.	Section A.3.3
Duty to notify of contaminated land (Section 40 of Environment Protection Act 2017)	The person engaging the activity must notify EPA Victoria as soon as possible if the land the person is managing, or controlling is contaminated above the thresholds set out in the regulations. This includes contamination to groundwater. This duty applies regardless of who caused the contamination or when it happened. It applies as soon as you become aware, or ought to have been aware, of the contamination.	
Duties relating to waste (Sections 133– 135, 139, 140, 142 and 143 of Environment Protection Act 2017)	There are seven specific duties that apply when managing or controlling waste. These apply when you are depositing, transporting and receiving waste. Any waste produced must be taken to a place that is lawfully able to receive it.	Section A.5

A.3.2 Construction Environmental Management

As noted in Table A.2, two of the key duties relate to response to harm and notification of incidents. EPA Victoria Publication 1834.1 (EPA Victoria 2023) identifies ways for duty holders to manage this risk. Development of a Project-specific environmental plan is a useful tool in describing how on-site activities will be managed to minimise harm to human health and the environment. Preparation of an effective CEMP will be a key requirement of the Principal Contractor as an outcome of this EES.

A.3.3 Contaminated land

A.3.3.1 The Contaminated Land Duties

Section 39 of the Act establishes a 'duty to management contaminated land', which creates an obligation on persons in management or control of land to minimise risks of harm to human health and the environment from the contamination so far as reasonably practicable. This includes obligations to:

a) *identification of any contamination that the person knows or ought reasonably to know of;*

b) *investigation and assessment of the contamination;*

c) *provision and maintenance of reasonably practicable measures to minimise risks of harm to human health and the environment from the contamination, including undertaking clean up activities where reasonably practicable;*

d) *provision of adequate information to any person that the person in management or control of the contaminated land reasonably believes may be affected by the contamination, including*

   i. *sufficient information to identify the contamination; and*

   ii. *the results of investigation and assessment referred to in paragraph (b); and*

   iii. *the risks of harm to human health and the environment from the contamination;*

e) *provision of adequate information to enable any person who is reasonably expected to become a person in management or control of the contaminated land to comply with the duty to manage contaminated land.*

If certain conditions are met, there is a duty to notify EPA Victoria about contamination (Section 40 of the Act) as soon as practicable after the person in management or control of the land becomes aware of, or reasonably should have become aware of the notifiable contamination. Further guidance on this can be found in EPA Publication 2008 – Notifiable Contamination Guideline – Duty to Notify of Contaminated Land (EPA Victoria 2021a).

A.3.3.2 The duty holder

A duty to manage contaminated land rests with the person in management or control of land. This duty can also require notification to EPA Victoria (Section 40 of the Act). EPA Victoria Publication 1915 (EPA Victoria 2021b) clarifies that 'the person in management or control of land is responsible for minimising contaminated land risks of harm. The duty applies where a person who exercises power over the land, can make choices about the land or is formally recognised as holding such powers'.

EPA Publication 1915 confirms (in detail) what the duties are for the 'five states' of land being:

- No known or suspected potential contamination (most land in Victoria);
- Potential contamination (where the duty holder must consider and proportionately investigate risks);
- Known contamination (where the duty holder must manage the risks);
- Notifiable contamination (where the duty holder must notify EPA Victoria); and
- Contamination that presents an unacceptable risk of harm (where compliance and enforcement action can be expected).

A.4 Contaminated land regulations and guidance

The *Environment Protection Act 2017* is supported by subordinate legislation including the Environment Reference Standard (ERS) (Victoria Government 2021b)[2]. The ERS sets out the environmental values, indicators and objectives of the land and water environments that are sought to be achieved or maintained in Victoria. ERS comprise objectives for supporting different uses of the environment and indicators that can be measured to determine whether those objectives are being met and are described further in Sections A.4.1 and A.4.2 for land

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[2] Environment Reference Standard (ERS), as available at the time of publication

and water respectively. The ERS are not compliance or regulatory thresholds or triggers but indicators and objectives to assess if a particular environmental value is being achieved, maintained or threatened. The relevant technical guidance documents and standards that should be considered for the planning and completion of contaminated land investigations for the Project are provided in Sections A4.3 – A4.7.

A.4.1 Environment reference standards for land

ERS are defined for five land-based environmental values with each environmental value having defined indicators and objectives. The environmental values are themselves mapped to six land use categories as defined in the Victoria Planning Provisions and so a land use can be associated with a particular set of indicators and objectives, as set out in Table A.3.

Table A.3: Application of land use categories (land) to environmental values (reproduced from Table 4.2 of ERS)

Environmental Values		**Land Use**						
		Parks & reserves	**Agricultural**	**Sensitive use**		**Recreation / open space**	**Commercial**	**Industrial**
				High density	**Other (lower density)**			
Land dependent ecosystems and species	Natural Ecosystems	✓						
	Modified Ecosystems	✓	✓		✓	✓		
	Highly Modified Ecosystems		✓	✓	✓	✓	✓	✓
Human health		✓	✓	✓	✓	✓	✓	✓
Buildings & structures		✓	✓	✓	✓	✓	✓	✓
Aesthetics		✓		✓	✓	✓	✓	
Production of food flora and fibre		✓	✓		✓			

Table 4.3 of the ERS identifies relevant indicators and objectives for the environmental values. The ERS notes that the environmental value may not apply if the background level of an indicator is greater than the relevant objective or the achievement or maintenance of an environmental value is impracticable.

Indicators are set out in Table 4.3 of the ERS which identify a list of contaminants predominantly from Schedule B2 of the NEPM (2013). Some indicators are described in qualitative terms (for example, with respect to aesthetics). The associated objectives are drawn predominantly from the NEPM 2013 or from the Food Standards Code (Australian Government 2016).

A.4.2 Environment reference standards for water

While mainly considered within the Technical Report S: Groundwater Impact Assessment and Technical Report T: Surface Water Impact Assessment, the quality of surface water and groundwater are also relevant in the contaminated land assessment.

The surface water and groundwater environments are divided into Segments. ERS are defined for 13 water based environmental values, 11 of which apply to surface water and 11 of which apply to groundwater. The ERS designates the environmental values that are protected for each segment of the surface water and groundwater environments; and each environmental value has defined indicators and objectives.

The ERS defines segments of surface waters within Aquatic Reserves (being reserves as defined under various Acts[3]), and the four surface water types include: rivers and streams, wetlands (both being inland waters); estuarine and marine.

Environmental values that apply to inland waters are shown in Table A.4. There are also similar environmental values for estuarine and marine waters, but these are not included in this report as they are not relevant.

Table A.4: Environmental values of inland waters

Environment al values	**Segment**	**Aquatic reserves**	**Rivers and streams**						**Wetlands**
		Aquatic Reserves	**Highlands**	**Uplands A**	**Uplands B**	**Central Foothills and Coastal Plains**	**Urban**	**Murray and Western Plains**	**Lakes and Swamps**
Water dependent ecosystems and species that are:	Largely unmodified	✓	✓	✓	✓				
	Slightly to moderately modified					✓		✓	✓
	Highly modified						✓		
Human consumption after appropriate treatment		✓ if water is sourced for supply — in a special water supply catchment area listed in Schedule 5 of the Catchment and Land Protection Act 1994; or in accordance with the Safe Drinking Water Act 2003.							
Agriculture and irrigation			✓	✓	✓	✓	✓	✓	✓
Human consumption of aquatic foods		✓	✓	✓	✓	✓	✓	✓	✓
Aquaculture		✓ if the environmental quality is suitable and an aquaculture licence has been approved in accordance with the *Fisheries Act 1995*							
Industrial and commercial				✓	✓	✓	✓	✓	
Water based recreation (primary contact)		✓	✓	✓	✓	✓	✓	✓	✓
Water-based recreation (secondary contact)		✓	✓	✓	✓	✓	✓	✓	✓
Water-based recreation (aesthetic enjoyment)		✓	✓	✓	✓	✓	✓	✓	✓
Traditional Owner cultural values		✓	✓	✓	✓	✓	✓	✓	✓
Navigation and shipping									

Indicators and objectives for protection of surface water environmental values are designated by the ERS. For the environmental value ‘Water dependent ecosystems and species’, objectives for toxicants are designated according to the level of environmental modification attributed to that Segment: unmodified, slightly to moderately modified, and highly modified aquatic ecosystems are allocated objectives corresponding to 99%-,

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[3] (a) nature conservation reserves reserved for public purposes or the conservation of their natural values under the *Crown Land (Reserves) Act 1978*
(b) State Wildlife Reserves under the *Wildlife Act 1975*
(c) reference areas proclaimed under the *Reference Areas Act 1978*
(d) areas listed in Schedules 2,4,7 and 8 to the *National Parks Act 1975*
(e) fisheries reserves declared under section 88 of the *Fisheries Act 1995*.

95%- and 90%- ‘species protection’ values respectively, primarily as set out in the ANZG (ANZG, 2018). Objectives for protection of other environmental values are either as specified in the ERS, or likewise adopted primarily from the ANZG; the Australian Drinking Water Guidelines (NHMRC and NRMMC, 2011) are adopted for human consumption after appropriate treatment. Objectives for Traditional Owner cultural values must be developed in consultation with Traditional Owners and may be informed by the process identified in the ANZG Guidelines for determining cultural and spiritual values.

In order to determine groundwater impacts, the ERS defines seven segments of groundwater defined by the background water quality level based on groundwater salinity (as concentration of total dissolved solids), as shown in Table A.5.

Table A.5: Environmental values that apply to the groundwater segments

Environmental values	**Segment (Total Dissolved Solids mg/l)**						
	A1 (0-600)	**A2 (601-1,200)**	**B (1,201-3,100)**	**C (3,101-5,400)**	**D (5,401-7,100)**	**E (7,101-10,000)**	**F (>10,000)**
Water dependent ecosystems and species	✓	✓	✓	✓	✓	✓	✓
Potable water supply (desirable)	✓						
Potable water supply (acceptable)		✓					
Potable mineral water supply	✓	✓	✓	✓			
Agriculture and irrigation (irrigation)	✓	✓	✓				
Agriculture and irrigation (stock watering)	✓	✓	✓	✓	✓	✓	
Industrial and commercial use	✓	✓	✓	✓	✓		
Water-based recreation	✓	✓	✓	✓	✓	✓	✓
Traditional Owner cultural values	✓	✓	✓	✓	✓	✓	✓
Buildings and structures	✓	✓	✓	✓	✓	✓	✓
Geothermal properties	✓	✓	✓	✓	✓	✓	✓

Indicators are set out in the ERS which identify a list of contaminants predominantly from the ANZG (ANZG, 2018), the drinking water guidelines (NHMRC and NRMMC 2011) and the recreational water guidelines (NHMRC 2008; NHMRC 2019).

Background water quality level is the objective for an indicator when the objective is not able to be attained due to natural levels of the indicator; or the background water quality level better protects the environmental values than the objective specified the ERS.

A.4.3 Per- and polyfluoroalkyl substances and other emerging contaminants

Current best practice guidance for Australia is provided in the PFAS National Environmental Management Plan 2.0 (HEPA 2020) which has been broadly adopted by EPA Victoria[4] with interim reuse criteria set out in EPA Victoria Publication 1669.4 (EPA Victoria, 2020c).

A.4.4 Asbestos

The following guidelines are applicable when considering asbestos in soil:

- Part 4 of the ERS refers to the NEPM 2013. Section 4 of NEPM 2013, Schedule B1, provides Health Screening Levels (HSLs) for asbestos in soil, including bonded asbestos containing material, friable asbestos and 'all forms of asbestos'. The criteria provided covers exposure scenarios which are comparable to the health investigation levels and are both quantitative (i.e., % w/w) and qualitative (i.e., no visible asbestos);
- WA DoH (2021) Guidelines of the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia, 2021;
- AS 4964-2004 Method for the qualitative identification of asbestos in bulk samples;
- Victorian Occupational Health and Safety Regulations, 2017 S.R.No.22/2017 (Victorian OHS Regulations); and
- WorkSafe Victoria Compliance Code – Managing Asbestos in Workplaces, 2019; and WorkSafe Victoria Compliance Code – Removing Asbestos in Workplaces, 2019.

A.4.5 Acid sulfate soils and rock

Criteria for the potential ASS and actual ASS are defined in EPA Victoria Publication 655: Acid Sulfate Soil and Rock (EPA Victoria 2009) and the Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils (Department of Sustainability and Environment, 2010). Further guidance on the assessment and management of actual ASS is available in a series of publications available from Water Quality Australia (Sullivan et. al. 2018).

A.4.6 National Environment Protection (Assessment of Site Contamination) Measurement 2013

A national risk-based framework for the assessment of contamination is provided in the NEPM 2013. This sets out current best practice with respect to the planning and implementation of contaminated land investigations and in completing risk assessments.

A.4.7 Standards

Standards Australia have published a number of standards relevant to the assessment and management of contaminated land. Sampling and investigation of contaminated sites are included in AS 4482.1 (Standards Australia 2005) and AS 4482.2 (Standards Australia 1999).

A.5 Construction and excavation spoil

Surplus spoil generated from construction activities would become waste. This potentially comprise anthropogenic fill, soil and rock from general excavations, from construction of concrete pile footings (transmission towers and termination stations) and other subsurface structures and access tracks. The assessment and management of wastes requires the identification of waste types so the correct aspect of the GED can be applied, and appropriate waste management options can be put in place. The main duties on waste generators with specific obligations relating to the management of wastes are summarised in EPA Victoria Publication 1756.2 (EPA Victoria 2021c). The GED also applies with respect to temporary management of spoil prior to a final solution.

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[4] At the time of writing this EES, EPA Victoria has not officially endorsed the NEMP v 2, but has adopted NEMP v1.

A.5.1 Waste classification of construction spoil

Wastes classification involves the (a) determination of the relevant waste code; (b) the determination of the waste type and relevant duties; and (c) for priority waste, determining which priority waste category or disposal category applies. There is a duty to determine the waste categories in accordance with EPA Victoria Publication 1828.3 (EPA Victoria, 2024). Table 2 of that publication provides a list of substances and waste disposal categories based on total concentrations and leachable concentrations[5] for priority wastes. The waste can then be categorised based on upper limiting concentrations as either Category D, Category C or Category B. Further categories are defined as Category A wastes which are prohibited from disposal to landfill and soil containing asbestos only.

Fill Material[6] is an industrial waste (a non-priority waste) and this waste is defined as having contaminant concentrations not exceeding the upper limits for fill material waste contaminant specified in Table 3 of Publication 1828.3 (EPA Victoria 2024). Fill Material cannot contain asbestos (see below). In accordance with EPA Determination – Specifications acceptable to the Authority for Receiving Fill Material – published in the Victorian Government Gazette No. S 301 (Victorian Government 2021a), fill material should not contain any wastes or physical contaminants that are not soil, including:

- *"Concrete, brick, ceramics, asphalt, plastics, glass, metal or wood; and*
- *Putrescible or organic wastes; and*
- *The fill material is not malodourous (including from petroleum hydrocarbons, hydrogen sulfide or organosulfur compounds); and*
- *The fill material does not contain discoloured chemical deposits or staining from chemical waste."*

Often wastes do not fit into the normal classification or categorisation process. In this case there is recourse to application to EPA Victoria for a designation as a means to classify the waste. EPA Victoria would be expected to issue designations unless risks of harm to human health or the environment are demonstrated to be low. The designation would be likely to contain conditions. For this Project, a designation would be likely for spoil consisting of natural soil that contain enriched metals and inorganics, with in this case, designation as Fill Material would be anticipated.

A.5.2 Waste acid sulfate soil

Waste acid sulfate soil (WASS) is a priority waste that has its own waste code (assuming it does not have any other contaminants). This needs to be managed at premises either with an L08 registration permit or if the WASS is being buried the receiving site needs an A18 permit. EPA Victoria has indicated that it will develop a determination for WASS, which means that if it is WASS, assuming the duty holder is taking it to a lawful place, then no additional paperwork will be needed. Current EPA Victoria guidance has reinforced that the technical approach as set out in the Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils and EPA Victoria Publication 655.1 (EPA Victoria 2009a) should be followed. However, EPA Victoria has also flagged that it will be updating the technical guidance with respect to ASS.

A.5.3 Asbestos

If friable asbestos is found, there is a duty to notify EPA Victoria under certain circumstances and as part of Contaminated Land duties and Occupational Health and Safety Regulations as discussed in Section A.3.3.

If soil containing asbestos only and does not have contaminant concentrations greater than the upper limit for fill material in Table 3 of EPA publication 1828.3 (EPA Victoria 2024) is found, then a reasonable first step would be to remove the asbestos ideally rendering the waste as Fill Material. The asbestos can then be separately managed with the material removed by a licenced asbestos removalist with the asbestos taken to a landfill authorised to accept soil with asbestos.

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[5] Leachability determined by the Australian Standard Leaching Protocol (ASLP)

[6] Fill material relates here to the waste category definition as opposed to the commonly used reference to the lithological material 'fill' which represents a wide range of soils that have been modified by manmade activities.

Soil containing asbestos only can be contained in the Project Area (if the volume is under 1,000 m^3) or sent to a landfill authorised to accept soil with asbestos. If the volumes are over 1,000 m^3 then the soil can be stored on site with a L02 licence (or EPA Victoria may place a Site Management Order on the land title requiring ongoing management of the asbestos).

If asbestos is to be contained in the Project Area, then this should be below a cap that will restrict access and exposure and will be associated with a management plan for the material.

A.5.4 Per- and polyfluoroalkyl substances and other emerging contaminants

Current best practice guidance for Australia is provided in the PFAS National Environmental Management Plan 2.0 (HEPA 2020) which has been broadly adopted by EPA Victoria[7].

Threshold values for the classification of waste soils with PFAS are not currently included in EPA Publication 1828.3. Thus, where PFAS is detected in waste soils above laboratory limits of reporting, EPA should be contacted for a designation. If however the detected concentrations are less than the reuse criteria as set out in the Interim position statement on PFAS (Publication 1669.4) (EPA Victoria 2020c), a streamlined designation application can be used (at the time of writing this streamlined process is a work in progress and is yet to be finalised).

A.5.5 Polychlorinated biphenyls

Polychlorinated biphenyls were widely used in electrical equipment due to their good insulating, fire resistant and dielectric properties. Polychlorinated biphenyls containing material may still be found in some electrical supply and telecommunications equipment, such as transformers, generators and capacitors. Polychlorinated biphenyls are managed under the Environment Protection Act 2017 via a Notifiable Chemicals Order, which implements the Polychlorinated Biphenyls Management Plan. The guidance for storage, handling, use and transport of materials containing polychlorinated biphenyls is detailed in EPA Publication *IWRG643.2 Polychlorinated Biphenyls (PCB) Management* (EPA Victoria 2017).

A.6 Adopted assessment criteria

A.6.1 Screening criteria for soil

Based on the nature of the Project (e.g., transmission towers and terminal stations), the land use within the Project Area would generally be considered to be commercial / industrial land use. Consistent with the ERS (Victoria Government 2021b), the following environmental values are considered to require protection on-site:

- Land dependent ecosystems and species;
- Human health;
- Buildings and structures; and
- Aesthetics.

Given the surrounding land use of the Project Area is a mixture of agricultural, sensitive land use (such as rural residential), parks and reserves, public open space (recreation) and commercial or industrial land uses (such as quarry, gold mining and commercial and industrial development near Melton), the following environmental values are considered to require protection off-site, in addition to those listed above:

- Production of food, flora and fibre (at parks and reserves, agricultural and rural residential areas).

Where the NEPM 2013 does not specify soil quality objectives for specific analytes, additional national, interstate and international guidelines have been referenced to supplement the NEPM 2013 values. The specific objectives adopted for each protected environmental value are discussed below.

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[7] At the time of writing this EES, EPA Victoria has not officially endorsed the NEMP v 2, but has adopted NEMP v1.

A.6.1.1 Land dependent ecosystems and species

The environmental value 'land dependent ecosystems and species' is defined in the Environmental Reference Standards (Victoria Government, 2021b) as 'Land quality that is suitable to protect soil health and the integrity and biodiversity of natural ecosystems, modified ecosystems and highly modified ecosystems'. The indicators and objectives are the ecological investigation or ecological screening levels in the NEPM 2013.

In accordance with Section 2.5 of the NEPM 2013 Schedule B1 Guideline on Investigation Levels for Soil and Groundwater, ecological investigation levels (EILs) have been derived for eight common contaminants in soil: arsenic, trivalent chromium, copper, nickel, lead, zinc, naphthalene and dichlorodiphenyltrichloroethane (DDT) for the protection of terrestrial ecosystems in the following three generic land use settings at the specified protection levels:

- 'Areas of ecological significance EIL' (99% protection level) – Including planning provisions or designated land uses for conserving and protecting the natural environment. This includes national parks, state parks, wilderness areas and designated conservation areas;
- 'Urban residential areas and public open space EIL' (80% protection level) – Broadly equivalent to the land use settings considered in the development of health investigation level 'Residential HIL A', 'Residential HIL B' and 'Recreational HIL C'; and
- 'Commercial and industrial EIL' (60% protection level) – Broadly equivalent to the land use setting considered in the development of 'Commercial / Industrial HIL D'.

As the Project Area is predominantly used for commercial and industrial land use, primary reference has been made to the 'Commercial and industrial' EILs for the above eight common contaminants as specified in the NEPM (2013). However, in consideration of the surrounding land use also includes more sensitive use such as rural residence and public open space areas reference has been made to the 'Urban residential areas and public open space' EILs for off-site soil investigation.

The site-specific EIL derivation methodology outlined in the NEPM Schedule B1 and Schedule B5 was used to derive site-specific EILs for nickel, chromium (III), copper and zinc across the Project Area. An EIL calculation spreadsheet is provided in the 'ASC NEPM Toolbox' which can be used for the derivation of EILs.

The PFAS NEMP (HEPA, 2020) also presents criteria protective of ecological receptors for PFAS-impacted soils. The PFAS NEMP no longer discriminates based on land use for ecological assessments and now only presents criteria for direct and indirect exposure:

- The ecological direct exposure soil guideline applied to organisms that live within, or in close contact with soil, such as earthworms of plants. Currently no ecological direct exposure criteria exist so the human health soil criteria for public open space are adopted as an interim position. The PFAS NEMP ecological direct exposure guideline is considered a suitable Tier 1 screening criteria for ecological protection for the Project Area.
- The ecological indirect exposure soil guideline accounts for various pathways through which organisms can be exposed without direct contact with soil (that is, via the food chain). The PFAS NEMP ecological indirect exposure guideline is considered a suitable Tier 1 screening criteria for ecological protection.

Where Australian Tier 1 guidelines were not available soil quality guidelines from Canada were referred to (CCME, 2018) or others as appropriate. Whilst there is uncertainty applying these criteria to the Australian context, they are considered suitably conservative for the purposes of this assessment.

A.6.1.2 Human health

The Health Investigation Levels (HILs) provided in the NEPM 2013 Schedule B1 have been referenced in the first instance to assess the potential health risk presented by potential soil contamination. The HILs have been derived for a broad range of metals and organic substances.

The HILs are applicable for assessing human health risks from chronic exposure to contaminants via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use. However, site-specific conditions should determine the depth to which HILs apply for other land uses such as commercial and industrial. Investigation level values are provided for four generic land use settings as follows:

- HIL A: Residential with garden / accessible soil (home-grown produce less than 10% fruit and vegetable intake (no poultry), also includes childcare day care centres, pre-schools and primary schools
- HIL B: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments
- HIL C: Public open space such as parks, playgrounds, playing fields (such as ovals), secondary schools and footpaths. This does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate
- HIL D: Commercial / industrial includes premises such as shops, offices, factories and industrial sites.

In consideration that the majority of the future land use is commercial and industrial at the Project Area, primary reference has been made to the HIL D as specified in the NEPM 2013 for the proposed future use. However, the NEPM does not designate health investigation levels specifically applicable for short-duration exposures to contaminants in soils (by direct contact and ingestion) for construction workers involved in intrusive and excavation works. HIL C has therefore been adopted for the purpose of screening for potential health risk to construction workers, on the basis that of the HIL scenarios provided in the NEPM. The HIL C, which assumes a higher exposure duration than HIL D, may be reasonably and conservatively applied as tier 1 screening levels for assessing potential health risk to construction workers.

Given the surrounding land use of the Project Area includes more sensitive land use (such as rural residential), parks and reserves and public open space, primary reference has been made to HIL A and HIL C respectively for these land uses.

Health screening levels (HSLs) have been specified in the NEPM 2013 for select petroleum hydrocarbon compounds, benzene, toluene, ethylbenzene, xylene and naphthalene and are applicable to assessing human health risk via the inhalation of vapours and direct contact with affected soils. The HSLs depend on specific soil physicochemical properties, land use scenarios, and the characteristics of building structures and apply to different soil types (sand, clay or silt) and depth of contamination (that is, 0 to 1m, 1 to 2m, 2 to 4m and greater than 4m. Jacobs has adopted the HSL D for commercial and industrial land use setting, HSL C for public open space for open spaces and landscaped areas and HSL A for residential areas for screening purposes.

To supplement the guidelines outlined above, HSLs for various petroleum hydrocarbon compounds developed by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment, specifically *Technical Report No. 10, Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater, September 2011* (CRC CARE 2011) have also been adopted for the assessment of direct contact pathway. Based on the proposed development of the site (that is, commercial / industrial) and in consideration of the protection of construction / maintenance workers performing intrusive works at the site, the application of HSL D criteria have been adopted for consideration of direct contact with soil.

The following guidelines were adopted to assess the impact upon the environmental value Human Health:

- NEPM 2013 HIL A & HSL A (vapour intrusion) – for the protection of health for nearby off-site residents and other sensitive land uses
- NEPM 2013 HIL C & HSL C (vapour intrusion) – for the protection of health for nearby off-site recreational users of public open spaces and landscaped areas
- NEPM 2013 HIL C – for the protection of health for personnel performing construction works for the Project works
- NEPM 2013 HIL D & HSL D (vapour intrusion) – for the protection of health for future Project workers / visitors
- CRC CARE (2011) HSL for intrusive maintenance workers (direct contact and vapour intrusion) – for the protection of health of construction / maintenance workers via multiple pathways (oral ingestion, dermal contact and dust inhalation and vapour intrusion).

The PFAS NEMP (HEPA 2020) derived HILs using a methodology consistent with the assumptions outlined in the NEPM 2013. Consequently, the following guidelines were adopted alongside the NEPM 2013 HILs and HSLs to assess the impact upon the environmental value Human Health:

- HEPA (2020) HIL A (PFAS impacted soils) – for the protection of health for nearby off-site residents
- HEPA (2020) HIL D (PFAS impacted soils) – for the protection of the future Project workers / visitors; and
- HEPA (2020) HIL C (PFAS impacted soils) – for the protection of health for recreational use of public open spaces and landscaped areas and for the protection of personnel performing construction and maintenance works during Project works.

In addition to appropriate consideration and application of the HSLs and ESLs, the NEPM 2013 provides 'Management Limits' for petroleum hydrocarbons, which reflect the nature and properties of petroleum hydrocarbons:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosive hazards; and
- Effects on buried infrastructure such as penetration of, or damage to in-ground services by hydrocarbons.

Total recoverable hydrocarbon results will be screened against the NEPM Management Limits for each of the total recoverable hydrocarbon fractions (F1 – C_{10}-C_9; F2 - >C_{10}-C_{16}; F3 - >C_{16}-C_{34}; F4 - >C_{34}-C_{40}). Where Management Limits are exceeded, further site-specific assessment and management may enable risks to be addressed.

For the assessment of asbestos, the NEPM has made reference to the HSLs for asbestos containing material and free asbestos / asbestos fibres provided in the Western Australia Department of Health for the protection of the human health against exposure to asbestos (WA DoH 2021).

A.6.1.3 Buildings and structures

The environmental value 'Buildings and Structures' is defined in the ERS (Victoria Government 2021b) as "*Land quality that is not corrosive to buildings, structures, property and materials*". The indicators are pH, sulfate, chloride, redox potential, salinity or any chemical substance or waste that may have a detrimental impact on the structural integrity of buildings or other structures.

A.6.1.4 Aesthetics

The environmental value 'aesthetics' is defined in the ERS (Victoria Government 2021b) as 'Aesthetic issues do not adversely impact the use of land. Aesthetic issues include the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity'. The indicators and objectives are 'any chemical substance or waste that may be offensive to the sense' and 'Land that is not offensive to the senses of human beings'. As such, consideration has been given to the following aesthetic condition of the soil environment:

- Discolouration and staining;
- Discernible offensive odours; and
- Presence of waste products (that is, rubble, metals, plastics, ceramics and other anthropogenic materials).

A.6.2 Statistical analysis

Under circumstances where chemical concentrations exceed the Tier 1 screening criteria adopted to assess the potential for health risks to be present, this does not necessarily indicate that a risk exists. In many instances the criteria adopted may be very conservative and a more realistic site-specific criteria may be available or calculated for adoption (usually conducted in Tier 2 or Tier 3 assessments). Alternatively, statistical analysis can be employed in the Tier 1 screening description and assessment of soil data and risk to health. The NEPM 2013 Schedule B7 outlines the process for statistical analysis of soil data reporting above the adopted HILs.

A.6.3 Screening criteria for groundwater

The ERS requires certain Environmental Values of groundwater are protected, based on the natural salinity of the groundwater. For the purposes of groundwater risk assessment, consideration of the potential impacts of groundwater on construction workers and maintenance workers health and safety, vapour impacts on current and future site users and surrounding land uses, and the potential for groundwater contamination to migrate towards the Project Area and impact the soil contamination status are of primary concern.

A.6.3.1 Criteria for groundwater environmental values

In accordance with the ERS, reference should be made to the Water Quality Guidelines (ANZG 2018) for the assessment of environmental value of water dependent ecosystems and species, irrigation and stock Watering and Australian Drinking Water Guidelines (NHMRC and NRMMC 2021) for potable water supply and potable mineral water supply. In the absence of groundwater quality objectives in the Water Quality Guidelines (ANZG 2018), alternative screening criteria have been sourced from national and international documents. The adopted groundwater criteria for this Project are presented in Table A.6 below.

Table A.6: Adopted groundwater quality objectives

Protected Environmental Values	Adopted Guideline Source/s
Water dependent ecosystems and species	For water dependent ecosystems and species, primary reference has been made to the objectives provided in the Water Quality Objectives (ANZG 2018) for protection of aquatic ecosystems. The environmental value of water dependent ecosystems and species applies to surface water at one of the following three levels of protection – largely unmodified; slightly to moderately modified; or highly modified. The level of protection depends on the types of surface waters (i.e., ‘segment’ as designated in the ERS) and current or desired ecosystem conditions. Where high or medium reliability trigger levels are not specified for certain analytes, then the low reliability trigger values (where available) published in the Water Quality Objectives (ANZG 2018) have been adopted.
Potable water supply	For potable water use, primary reference has been made to the NHMRC/ NRMMC (2011) National Water Quality Management Strategy – Australian Drinking Water Guidelines (human health and aesthetics), version 3.6, updated March 2021.
Potable mineral water supply	For potable mineral water use, primary reference has been made to the NHMRC / NRMMC (2011) National Water Quality Management Strategy – Australian Drinking Water Guidelines (human health and aesthetics), version 3.6, updated March 2021.
Agriculture and irrigation (Irrigation)	For irrigation water use, primary reference has been made to the irrigation water trigger values provided in the Water Quality Objectives (ANZG 2018).
Agriculture and irrigation (Stock watering)	For stock watering, primary reference has been made to the livestock drinking water trigger values provided in the Water Quality Objectives (ANZG 2018).
Industrial and commercial	The ERS states that the objective for the environmental value of industrial and commercial is “*water quality suitable for its industrial or commercial use.*” No generic investigation levels or thresholds for industrial and commercial water quality are provided in ANZG. As the water quality requirements change substantially across various commercial and industrial activities and on the basis the quality of water needs to be assessed on a case-by-case basis, no specific criteria have been adopted for assessing this environmental value. On this basis, the objectives for industrial and commercial have been adopted as default objectives on the assumption that if the objectives for other extractive environmental values requiring protection are achieved, then the environmental value of industrial and commercial will also be protected.
Water-based recreation (Primary contact recreation)	For Water-based Recreation (Primary Contact Recreation), primary reference has been made to the guideline values provided in the NHMRC (2008) Guidelines for Managing Risks in Recreational Water.
Traditional Owner cultural values	The ERS provides no specific environmental quality indicators or objectives for groundwater used for this environmental value. However, the ERS states that “*Objectives must be developed in consultation with Traditional Owners and may be informed by the process identified in the ANZG for determining cultural and spiritual values*”

Protected Environmental Values	Adopted Guideline Source/s
Buildings and Structures	Australian Standard AS2159 (2009) *Piling - Design and Installation* has been referenced for assessing the impact of groundwater on building structures, in particular, corrosive or aggressive effects of groundwater as indicated by pH, sulfate and chloride.
Geothermal properties	In accordance with the ERS, for the purposes of geothermal, Specific indicators include "temperature between 30 and 70 degrees Celsius."; and The objective is "Geothermal properties of groundwater to be maintained for current and future users of the resource."

A.6.3.2 Criteria for ingestion / absorption

In consideration of the risk to construction workers and maintenance workers during construction, reference has been made to the Water Quality Guidelines (ANZG 2018) for water-based recreation which considers that recreational water makes only a relatively minor contribution to intake. This is applicable to construction workers and maintenance workers since any groundwater ingestion is likely to be incidental and minor.

A.6.3.3 Criteria for vapour inhalation

Groundwater Health Screening Levels (Groundwater HSLs) have been specified in the NEPM 2013 for selected petroleum compounds (including benzene, toluene, ethylbenzene, xylene and naphthalene and volatile total recoverable hydrocarbon fractions) and are applicable to assessing potential human health risk via the vapour inhalation exposure pathway. The Groundwater HSLs are dependent on the specific land use setting of a site and the characteristics of building structures. The Groundwater HSLs apply to different soil types (sand, clay or silt) and depth to source below surface from 2 to 8+ mbgl. The Groundwater HSLs (sand) have been conservatively adopted as preliminary screening levels for the assessment of potential vapour intrusion risks at the Project Area.

A.6.4 Waste classification

The waste classification process in accordance with EPA Victoria Publication 1828.3 (EPA Victoria 2024) and IWRG702.2 (EPA Victoria 2024). In combination with the classification as determined by that process, the results of the Tier 1 screening assessment would also be considered to determine whether the spoil is suitable for reuse or whether disposal off-site is necessary. PFAS is not listed in the EPA Victoria 1828.3 Waste Disposal Categories guideline, but where PFAS is suspected as a contaminant of potential concern, or where PFAS is already identified in soils, options for waste disposal may be impacted.

Appendix B. La Trobe University (2020 and 2022)

LA TROBE UNIVERSITY

La Trobe Archaeology Research Partnerships

Desktop review of mining-related impacts: Western Victoria Transmission Network Project (WVTNP) (Bulgana to Waubra)

Draft Report

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Date: October 2020

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1. PROJECT INTRODUCTION

This report presents the results of a desktop review of gold mining impacts within Areas of Cultural Heritage Sensitivity (ACHS) (as specified in Division 3, Part 2 of the *Aboriginal Heritage Regulations* 2018) across the WVTNP CHMP Activity Areas.

The review had two objectives: 1) to establish the likelihood that mobilised mining waste sediment (sludge) had been deposited within ACHS across four of the WVTNP Cultural Heritage Management Plan (CHMP) Activity Areas; and 2) to identify any other evidence of impacts resulting from gold mining within and in the vicinity of those ACHS. For the purposes of this report, a 'Focus Area' is any location classed as an ACHS that is intersected by a WVTNP CHMP Activity Area.

This report provides information for 22 Focus Areas, which are situated across three Registered Aboriginal Party (RAP) areas and an area administrated by Aboriginal Victoria (four CHMP Activity Areas):

- **Barengi Gadjin Land Council Aboriginal Corporation**
    - Focus Areas: ID-1 to ID-4
- **Eastern Maar Aboriginal Corporation**
    - Focus Areas: ID-5 to ID-8
- **Area administrated by Aboriginal Victoria**
    - Focus Areas: ID-9 to ID-14
- **Dja Dja Wurrung Clans Aboriginal Corporation**
    - Focus Areas: ID-15 to ID-22

Accompanying this report is a GIS shapefile that depicts the spatial extent of each Focus Area and provides a ranking associated with the potential for sludge to have been deposited within that locality. A separate ranking is also given that reflects the likelihood that gold mining activities has resulted in ground disturbance within each Focus Area.

This report includes:

- Guidance on how to identify sludge in the field, including photographic examples.
- Information pertaining to the implications of sludge for Aboriginal cultural heritage and its management.
- An explanation of the methodologies employed for ranking sludge and mining impact potential.
- The results of the desktop review.

As this assessment was limited to a desktop review, it is possible that additional, undocumented mining took place within and upstream of the Focus Areas. The findings of this review should not preclude the need for ground-truthing.

2. BACKGROUND – HISTORICAL GOLD MINING IMPACTS IN VICTORIA

In 1851, the discovery of easily worked Victorian gold sparked a gold rush that would continue-on largely uninterrupted till the start of the First World War. Thousands of gold seekers from all parts of the globe descended upon the colony's goldfields, trying their luck as each area boomed and busted. To extract gold from paydirt, miners employed a variety of tools and techniques, which differed depending upon local conditions and the maturity of the rush (Ritchie & Hooker 1999). Each method of mining impacted the environment in a different manner, both in the vicinity of works, but also in downstream areas (Garden 2001; McGowan 2001; Davies et al. 2020). At the very beginning of the rush, miners relied on rudimentary methods such as panning, fossicking, and through arbitrarily placed mineshafts. However, by the mid-1850s Victorian mining had progressed to more systematic techniques such as ground sluicing, puddling, and paddocking, which enabled far greater quantities of dirt to be processed at once. The introduction of hydraulic sluicing by 1860, which used high-pressure water hoses to rapidly disintegrate metres of earth, had a particularly transformative effect on ground surfaces and the local environment (Davies et al. 2018).

A near-universal use of water to extract gold from paydirt greatly impacted Victoria's waterways, as waterborne mining waste significantly increased the sediment budgets of creeks and river systems (Grove et al. 2019). Waterways choked by sediment burst their banks during heavy rains, causing large floodplain areas downstream of mining to be inundated under thick deposits of mud (Lawrence et al. 2016). Referred to at the time as 'sludge', this was a widespread problem in Victoria and was the focus of numerous governmental inquiries and newspaper editorials (**Figure 1**) (Lawrence & Davies 2014; 2019).

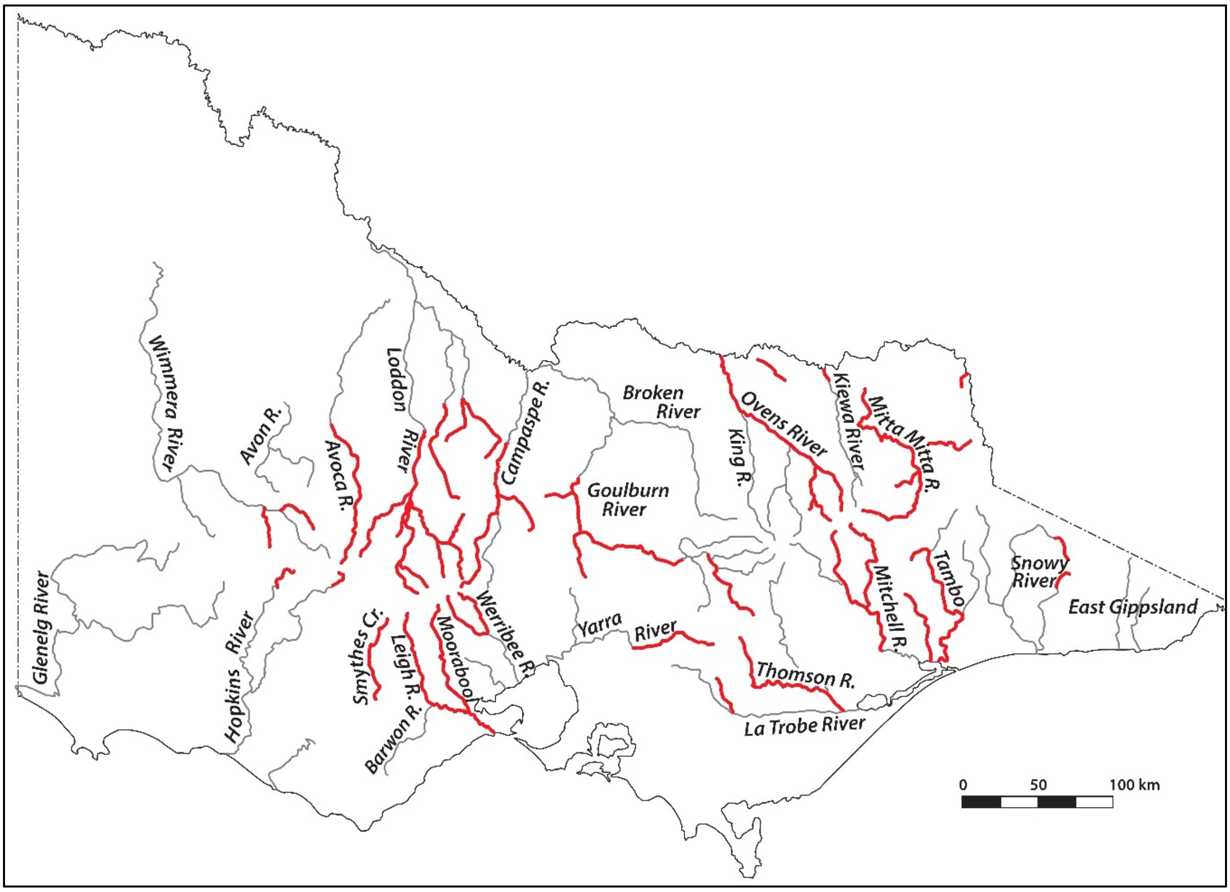

Figure 1. A map produced by the Rivers of Gold project (Lawrence et al. 2018; Grove et al. 2019) of all major rivers in Victoria purportedly affected by sludge in 1886 (based on testimonies in an 1887 governmental inquiry) (from Davies et al. 2018:9).

Victoria's historical mining activity and the sludge it produced has resulted in contrasting examples of altered ground surfaces, in which some areas have been dug into and greatly disturbed, while other areas have been capped by sediment and thus protected from subsequent impactful activities (Hil et al. 2020). Understanding local mining history and delineating between these two scenarios can help archaeologists to anticipate scenarios where cultural heritage has been buried (protected) and where it may have been impacted (Lawrence et al. 2018).

3. SLUDGE IDENTIFICATION

Sludge is easiest to identify in exposed stratigraphic sections. Examples of good exposures include the banks of creeks and rivers, gullies, and drainage ditches (**Figure 2**), but sediments can also be investigated through the use of an auger (**Figure 3**).

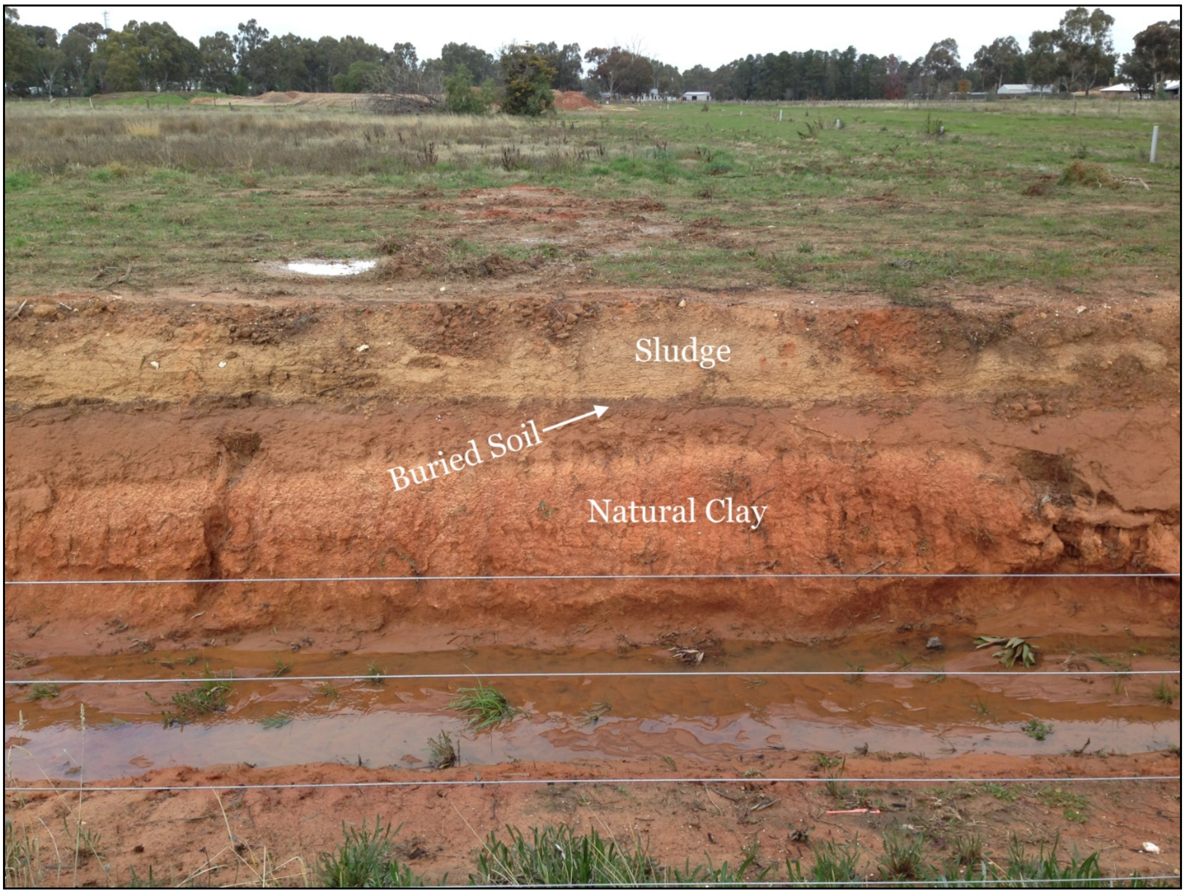

Figure 2. An example of a sludge exposure along a drainage ditch near Bendigo Creek. A CHMP was prepared at this location (CHMP 14621) and Aboriginal cultural heritage was located beneath sludge deposits during subsurface testing. The original ground surface is visible as the dark band situated beneath the buff-coloured material (sludge).

The colour and composition of sludge differs depending upon the material it originated from and the mining technique used to produce it. However, sludge tends to be 'buff-coloured' (a product of its waterborne genesis) and is lighter in appearance than floodplain alluvium and most topsoils. Grainsize alone is not a diagnostic feature as sludge can be anywhere from as fine as talcum powder to as coarse as quartz pebbles (**Figure 6**). Instead of colour or texture look for its tell-tale laminations (horizontal banding). Like rings of a tree, each band represents a single episode of sludge deposition. These are more easily viewed within an auger or a freshly scraped section/baulk (**Figure 3**).

Figure 3. An example of sludge showing within the core of an auger. Note the horizontal laminations and the range of colours and texture.

As sludge is a product of fluvial processes it sometimes contains pebbles, charcoal, European or Aboriginal cultural heritage material carried with it from upstream. In exposed sections this material can appear in long truncated lenses (**Figure 6**). The laminations present within sludge distinguish it from floodplain material, which tends to crack vertically as a result of wetting and drying expansion/contraction cycles **(Figure 4**). It should also be noted that a clear point of contact can typically be observed between sludge and pre-existing ground surfaces (**Figure 5**).

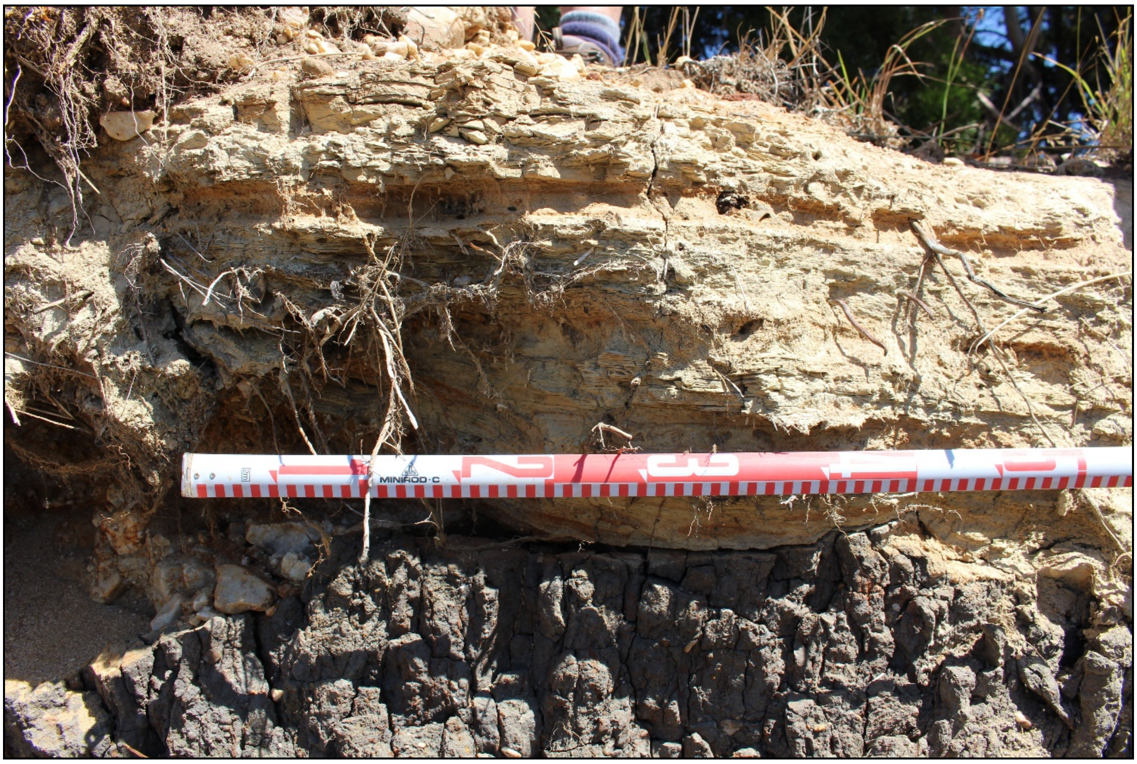

Figure 4. A close-up of sludge produced from quartz crushing overlying floodplain material. Note the contrast between the floodplain's vertical cracking and the horizontal laminations evident in the sludge.

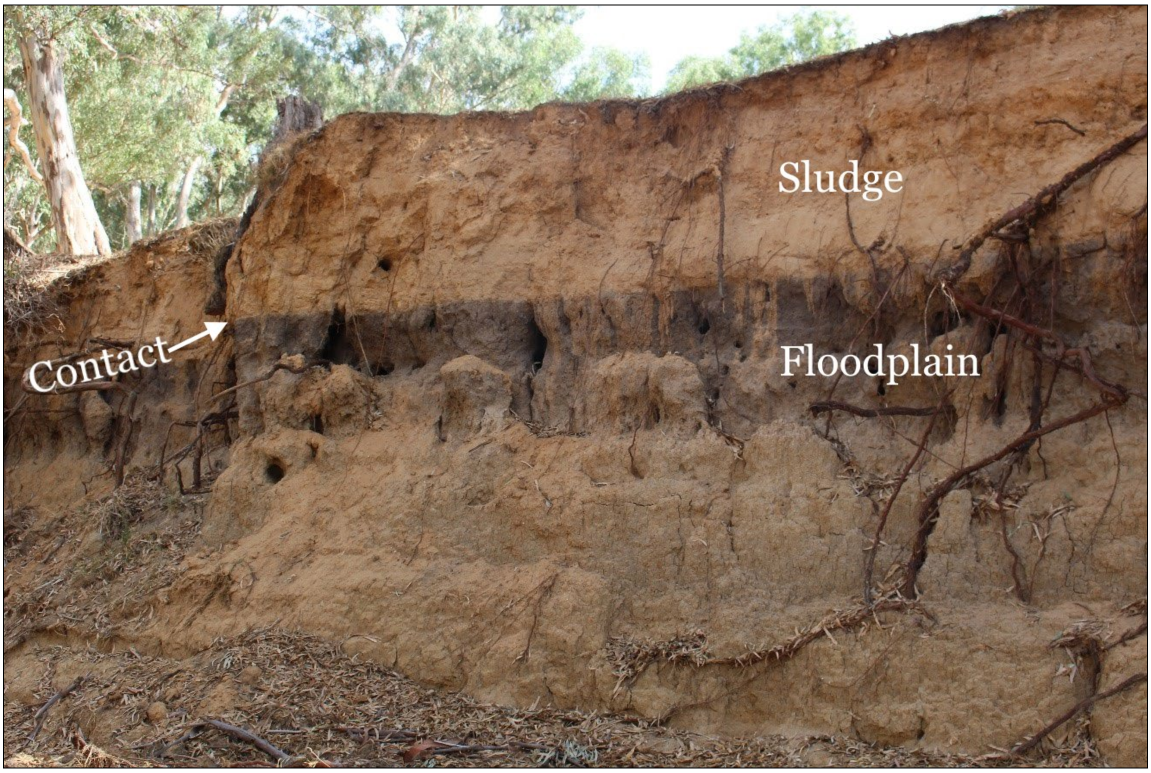

Figure 5. Another exposure of sludge overlying floodplain deposits. Note the clearly defined point of contact.

Figure 6. Another section of exposed sludge along the same drainage ditch as **Figure 3**. Note the variability of colour and grainsize and widely dispersed pebble lenses.

4. IMPLICATIONS OF SLUDGE FOR ABORIGINAL CULTURAL HERITAGE

If an undisturbed ground surface containing Aboriginal cultural heritage is buried by sludge deposits this has implications from an Aboriginal cultural heritage management standpoint (Lawrence et al. 2018; Hil et al. 2020). In 2010, VCAT ruled that Significant Ground Disturbance (SGD) must have affected the 'original' ground surface (Colquhoun & Ors v Yarra CC [2010] VCAT 1710). The same applies to any 'high impact activities' that may have previously affected (or will affect) a given area. This means the depth of any impacts must be greater than the depth of any overlying anthropogenic deposits (not just sludge) to be classed as SGD.

If sludge is anticipated to be present within a particular area, the methodology of a cultural heritage assessment (e.g. conducted as part of a CHMP) should reflect that potential. For example, an archaeological survey taking place as part of a CHMP Standard Assessment may not identify examples of cultural heritage on the surface in sludge-affected areas. In such cases, an absence of cultural heritage material on the ground surface may not be indicative of subsurface absence or the potential for intact cultural deposits to be present, because these will be underneath the sludge, sometimes well below the current ground surface. Moreover, if an area is buried by sludge and later subject to relatively shallow ground disturbance, the surface of that area may appear disturbed even though underlying natural topsoil deposits remain intact. For example, if broken bricks or other examples of modern detritus were identified during an archaeological survey of the localities depicted in **Figures 2** and **6**, the presence of that material would not demonstrate that all (or any) of the original ground surface had been previously disturbed.

Sludge has sometimes been referred to historically as 'swamp cement' (Peterson 1996; Kotsonis & Joyce 2003). When freshly deposited clayey (i.e. fine grained) sludge is exposed to high temperatures it can bake into a hard surface. An archaeologist uncovering sun-baked sludge beneath topsoil during excavation could potentially misidentify it as a culturally sterile basal layer. It is therefore important to have a contextual understanding of a given location prior to subsurface testing to ensure that sludge capping a prior ground surface is not misinterpreted as 'natural clay'.

5. METHODS

The likelihood that mobilised mining waste sediment (sludge) was deposited in each Focus Area was investigated through a combination of historical research and GIS-based spatial analysis.

Datasets relating to Victorian mining were retrieved from online databases and imported into GIS. These data sources include, but were not limited to, shapefiles relating to known areas of shallow gold working, historical mine shafts, publicly accessible borehole data, and the Victorian Heritage Database. A 10-metre-resolution and a 20-metre-resolution Digital Terrain Model (DTM) were paired with a watercourse polyline to establish relationships between prior mining activities and the sub-catchments of investigated creek and river systems.

Historical maps and gold mining plans were retrieved from online databases and georeferenced within GIS. These maps provided an additional source of information about mining impacts, such as the probable paths of shallow gold leads or areas of previously observed mining activities or impacts. The maps were also checked to investigate whether there was evidence suggesting the course of each waterway had shifted over time. Further sources of historical mining information came from historical newspapers (via Trove), expired and current mining exploration licences, gold mining literature, and governmental reports and inquiries into mining impacts.

5.1 Sludge assessment

Each Focus Area was assessed for the likelihood that sludge had been deposited based on a combination of the following natural and cultural factors:

1. The presence, type, and intensity of upstream mining activity

   Some techniques employed by miners produced greater volumes of sludge than others. Sludge is a waste product of gold extraction that is created when mine tailings are mobilised by water. Methods of mining that relied heavily on the use of water to extract gold from alluvium (such as ground sluicing, puddling, and hydraulic sluicing) produced greater quantities of sludge than shallow gold workings (e.g. mine shafts and prospect pits).

2. The position of a Focus Area within a river catchment or sub-catchment

   Areas situated higher up in a catchment have fewer potential upstream sources of mobilised mining sediment, whereas a river that is fed by a significant number of smaller creek and river systems has a greater likelihood of being impacted by sludge.

3. The Focus Area's local topography

   Water flows faster through a steep, narrow river valley than a wide, open floodplain. Higher energy (faster flowing) sections of a river system provide less opportunity for sludge deposition than areas of lower energy/waterflow.

These three factors were dovetailed with the outlined historical research and GIS analysis to rank each study area as having: Negligible potential; Some potential; Moderate potential; or Evidenced potential. 'Evidenced potential' is the assessment result allocated to Focus Areas where specific evidence for sludge impacts was identified (e.g. a newspaper article reports that sludge has impacted a property within or adjacent to that Focus Area).

5.2 Mining assessment

A four-tier ranking system was also used for assessing the potential for mining impacts within each Focus Area: No evidence identified; Some potential; Moderate potential; or Evidenced potential.

'No evidence identified' was used in situations where no evidence of mining within or in the vicinity of a Focus Area was identified in mining datasets, the VHD, or through historical research. 'Some potential' was used in situations where a particular waterway or general location was known to have been worked by miners, but there is no evidence to suggest it took place within the Focus Area. Moderate potential was used for examples where mining took place within the vicinity and the historical record does not rule out that it may have occurred within the Focus Area. 'Evidenced potential' was reserved for examples where evidence was identified that strongly suggested mining took place specifically within a Focus Area.

6. RESULTS

Figure 7 shows the path of the combined WVTNP CHMP Activity Areas from Bulgana to Waubra in relation to major river catchments and the shallow workings dataset. Each of the 22 Focus Areas are labelled and colour-coded according to their associated sludge potential ranking. The flow direction of relevant named waterways is indicated through dashed arrows. A full list of Focus Area rankings can be found in **Table 1**.

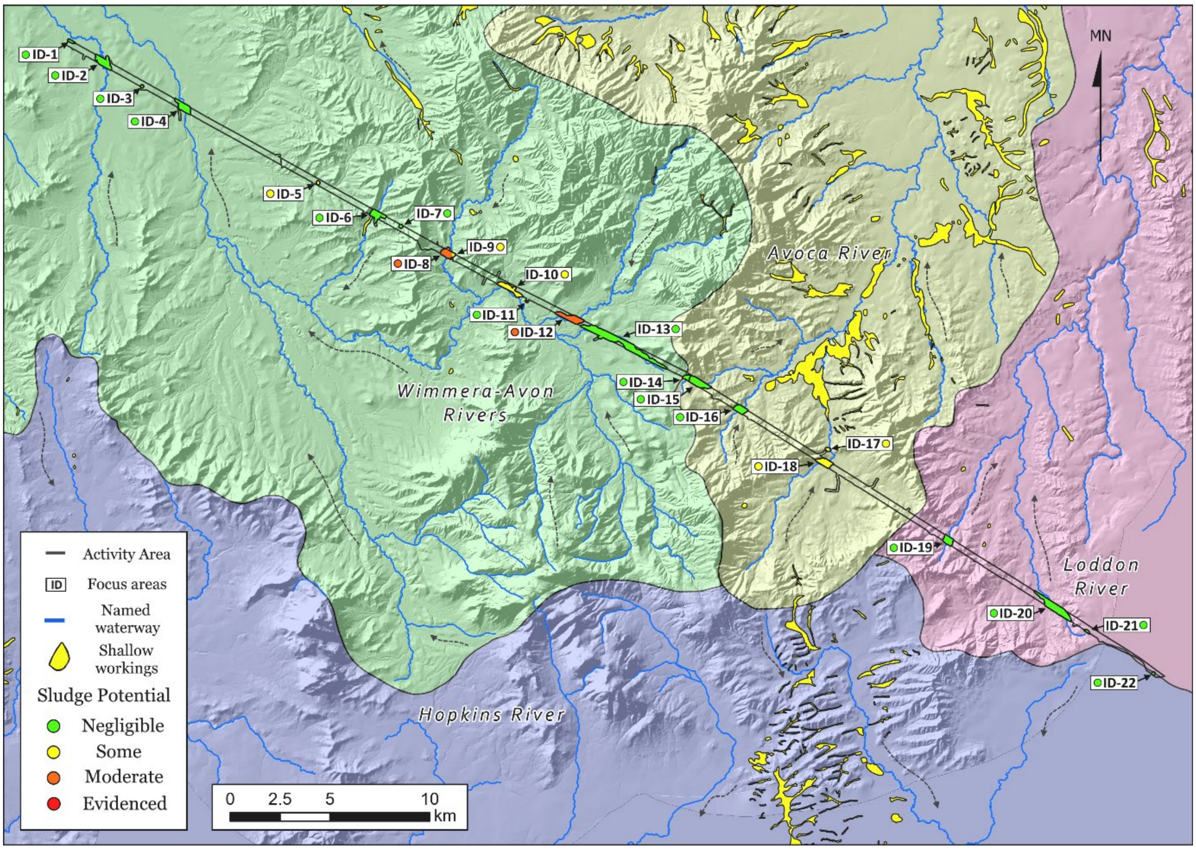

Figure 7. The WVTNP CHMP Activity Areas from Bulgana to Waubra overlying a 10-metre DTM, major river catchments, named waterways, the shallow workings dataset, and Focus Areas ID-1 through ID-22.

As shown in **Figure 7**, the Activity Area intersects four major catchments (the Wimmera-Avon, Avoca, Loddon, and Hopkins Rivers), but typically does so upstream of the larger clusters of shallow workings. Although the shallow workings dataset is just one of numerous data sources used for ranking sludge or mining impacts, it provides a good general indication of historical mining intensity across the region.

Only two areas were assessed as having moderate potential for sludge deposition (ID-8 and ID-12). ID-8 is located along Glenlofty Creek, which was purportedly rushed by 1,000 gold miners in 1855, and has numerous examples of shallow workings situated a short distance upstream from the Focus Area (ID-8). ID-12 is located downstream of the Glenpatrick Creek Diggings, which is the only locality upstream of the Activity Areas that is known to have been worked through high intensity hydraulic sluicing. The close vicinity of that mining activity to the Focus Area (ID-12) increased the likelihood that sludge deposition occurred historically. However, no historical evidence was identified of complaints from downstream landowners or any reference to sludge affecting Glenpatrick Creek or the Wimmera River further downstream.

In terms of Focus Areas that may have been impacted by localised mining activities, ID-6 along Spring Creek is the only locality where an Activity Area intersected the shallow workings dataset. However, a map from 1897 suggests that those workings may have been further downstream. As the full extent of the Spring Creek shallow workings remains historically uncertain, the Focus Area was given a 'moderate' ranking for mining impact potential. The historical record indicates that shallow mining could have also taken place within Focus Areas along the Avoca River (within ID-17 and ID-18) and Burnbank Creek (ID-21 and ID-20). However, the historical sources uncovered for those Focus Areas were not specific enough to definitively conclude that historical mining impacts occurred within those areas. As such, those Focus Areas were ranked as having 'some potential' for impacts resulting from localised mining activities.

No evidence for significant historical waterway movement was identified within any of the Focus Areas during this review. However, that determination is based on a non-exhaustive review of a limited number of historical maps, which are provided as references alongside the results given for each Focus Area.

Table 1. A summary of the rankings given for each Focus Area.

RAP/Admin Area	Location	Focus Area	Sludge Potential	Mining Potential
Barengi Gadjin	Six Mile Creek	ID-1	Negligible	No evidence identified
Barengi Gadjin	Six Mile Creek	ID-2	Negligible	No evidence identified
Barengi Gadjin	Wimmera River	ID-3	Negligible	No evidence identified
Barengi Gadjin	Wimmera River	ID-4	Negligible	No evidence identified
Eastern Maar	Glendhu Rd	ID-5	Some potential	No evidence identified
Eastern Maar	Spring Creek	ID-6	Negligible	Moderate potential
Eastern Maar	Spring Creek	ID-7	Negligible	No evidence identified
Eastern Maar	Glenlofty Creek	ID-8	Moderate potential	Some potential
Aboriginal Victoria	Glenlofty Creek	ID-9	Some potential	Some potential
Aboriginal Victoria	Wimmera River	ID-10	Some potential	No evidence identified
Aboriginal Victoria	Wimmera River	ID-11	Negligible	No evidence identified
Aboriginal Victoria	Glenpatrick Creek	ID-12	Moderate potential	Some potential
Aboriginal Victoria	Sandy Creek	ID-13	Negligible	No evidence identified
Aboriginal Victoria	Amphitheatre Creek	ID-14	Negligible	No evidence identified
Dja Dja Wurrung	Amphitheatre Creek	ID-15	Negligible	No evidence identified
Dja Dja Wurrung	Glenlogie Creek	ID-16	Negligible	No evidence identified
Dja Dja Wurrung	Avoca River	ID-17	Some potential	Some potential
Dja Dja Wurrung	Avoca River	ID-18	Some potential	Some potential
Dja Dja Wurrung	Bet Bet Creek	ID-19	Negligible	No evidence identified
Dja Dja Wurrung	Burnbank Creek	ID-20	Negligible	Some potential
Dja Dja Wurrung	Burnbank Creek	ID-21	Negligible	Some potential
Dja Dja Wurrung	Near Waubra	ID-22	Negligible	No evidence identified

6.1 - ID-1 and ID-2 - Areas of Cultural Heritage Sensitivity (Six Mile Creek)

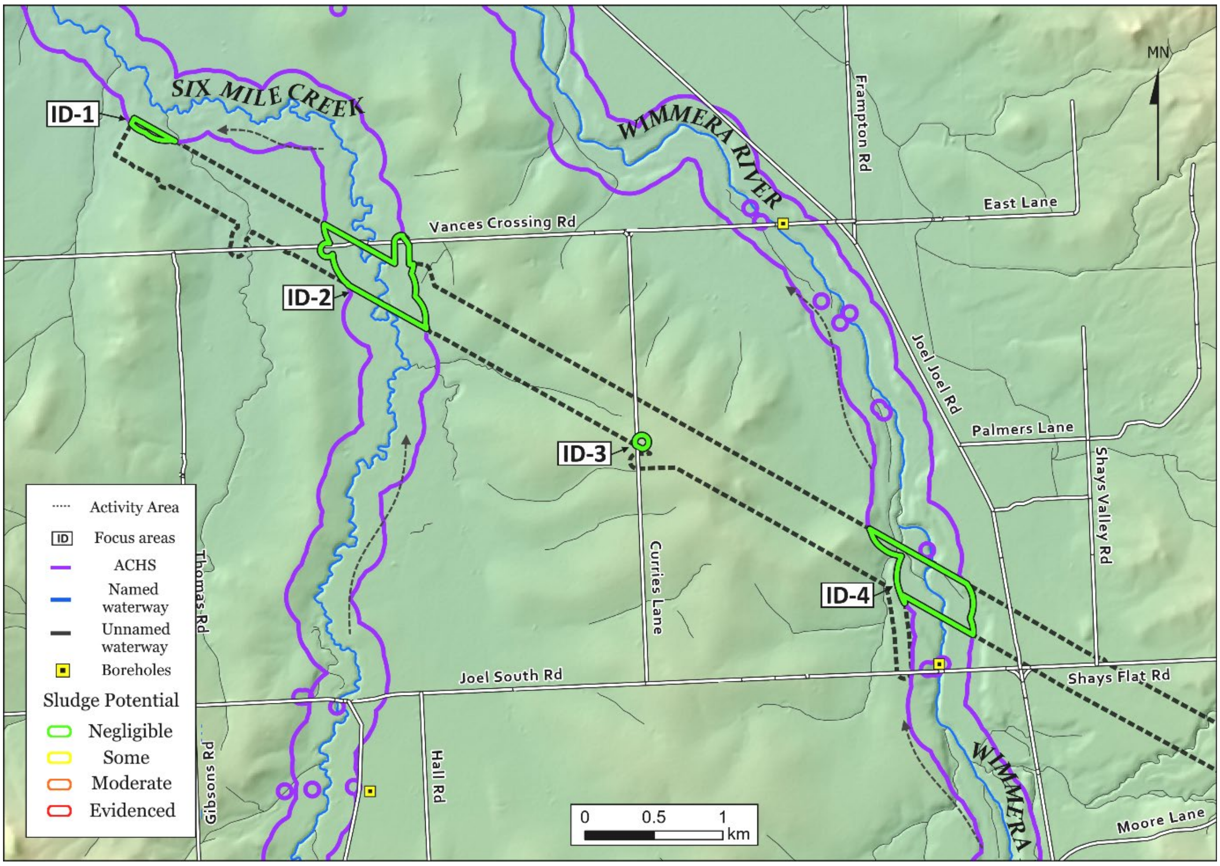

Figure 8. 10-metre Digital Terrain Model (DTM) showing Focus Areas (ID-1 and ID-2) along Six Mile Creek. There is no indication of any mining activity within or in the vicinity of these Focus Areas and there is negligible potential for sludge.

Potential for Sludge: Negligible

- Focus Areas ID-1 and ID-2 (**Figure 8**) are situated along Six Mile Creek and no evidence for historical upstream mining was identified.

Potential for Mining: No evidence identified

- No evidence for mining activity for ID-1 and ID-2 in mining datasets or the VHD was identified.

Historical research

- No literature relating to mining or sludge were identified for ID-1 and ID-2.

Waterway movement

- No evidence identified.

6.2 - ID-3 - Area of Cultural Heritage Sensitivity (between Six Mile Creek and Wimmera River)

Potential for Sludge: Negligible

- Focus Area ID-3 (**Figures 8 and 9**) is situated between Six Mile Creek and the Wimmera River and is likely to be beyond the reach of potential sludge impacts.

Potential for Mining: No evidence identified

- No evidence for mining activity for ID-3 in mining datasets or the VHD was identified.

Historical research

- No literature relating to mining or sludge for ID-3 was identified.

Waterway movement

- No evidence identified.

6.3 - ID-4 - Area of Cultural Heritage Sensitivity (Wimmera River)

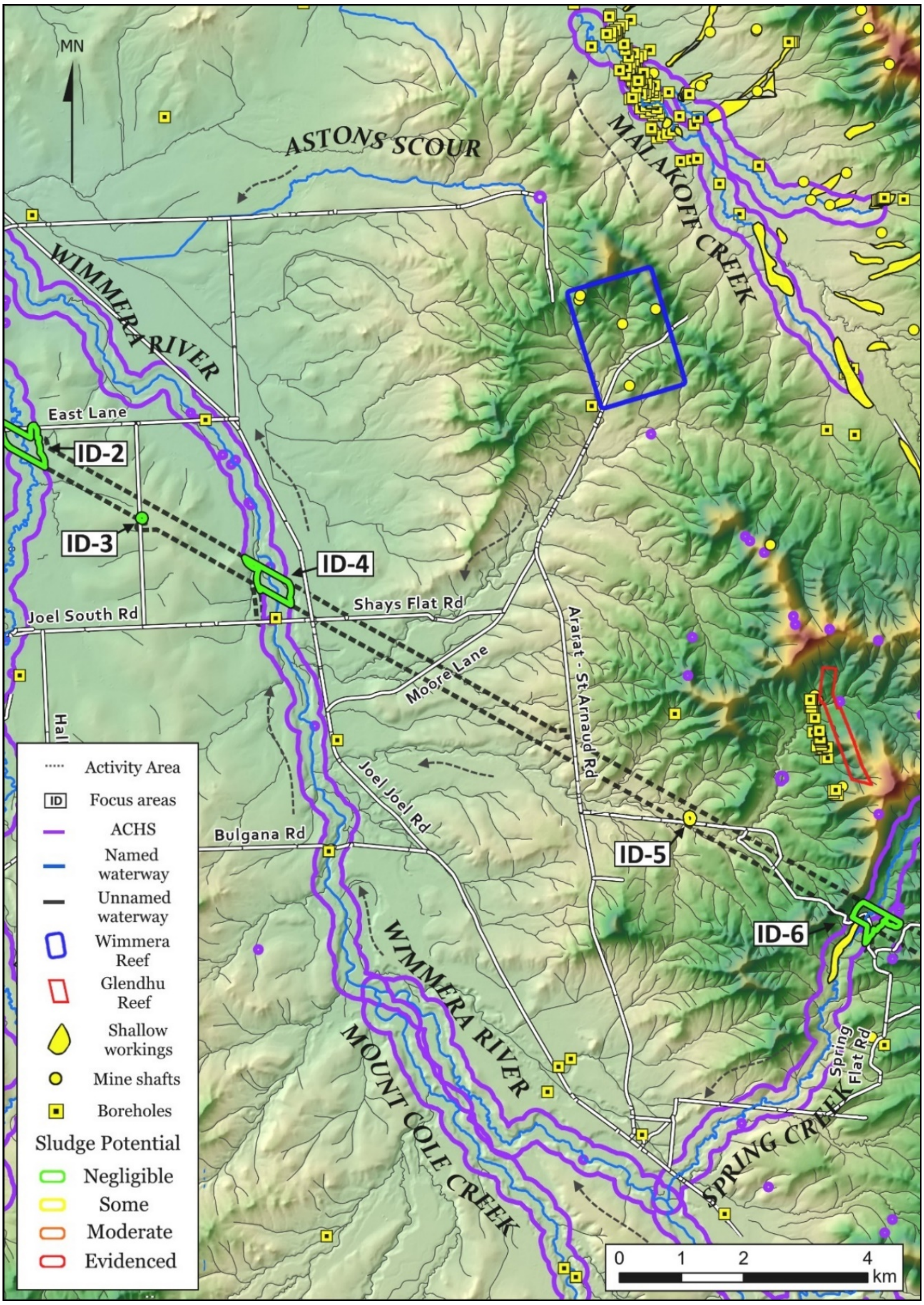

Figure 9. 10-metre Digital Terrain Model (DTM) showing Focus Area (ID-4) along the Wimmera River. Beyond a single borehole 350 metres upstream of the Focus Area, the closest gold workings upstream were low intensity quartz works at Wimmera Reef. The potential for sludge or mining impacts to be encountered within the study area is negligible.

Potential for Sludge: Negligible

- Focus Area ID-4 (**Figures 8 and 9**) is situated along the Wimmera River. The Wimmera is not a waterway that is generally considered to have been affected by sludge (Davies et al. 2018). The river's catchment did not contain many high intensity mining activities during the nineteenth century. The few instances of mining that did take place upstream include works at Glendhu Reef (ID-5), Spring Creek (ID-6), Glenlofty Creek (ID-8), and Glenpatrick Creek (ID-12). Each of those areas of mining are more than 10 kilometres upstream of this Focus Area (ID-4), making it unlikely that significant volumes of mining sediments would have reached the Focus Area. Within ten kilometres there were works at Wimmera Reef, but these were low intensity quartz reef workings and the small amount of material produced was crushed offsite in Stawell or Melbourne (see historical research section).

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-4 in mining datasets or the VHD was identified.
- A single borehole was sunk 350 metres upstream of ID-4 in 1981. No other evidence for mining activity was identified within a kilometre of the Focus Area.

Historical Research

- *The Argus* (1894)
    - 'NAVARRE – In Landsborough and Barkly little is doing in mining matters. At the former place two small rushes have taken place, but very little is expected from either. The Nil Desperandum mine is not working, nor does their seem any prospect of its doing so unless in the hands of a new company. From the **Wimmera Reef** a trial crushing of 10 tons of stone has been sent to Stawell.'
- *Historic gold mining sites in the south west region of Victoria* (Bannear 1999:22)
    - **'**Mining in the division during the late 1880s, given its depressed state during the preceding 15 or so years, was pursued with some vigour. Aided by funds from the government widespread prospecting took place which resulted in some interest being shown in several areas, including the Glenpatrick alluvial workings, the Glendhu Reef, and in the Perrys and **Wimmera reefs** near Landsborough. By the end of 1889, pumping machinery being erected at Glenpatrick by the New Victoria Company; and a shaft had been sunk on the **Wimmera Reef**. The **Wimmera Reef shaft** was only sunk 25 feet, with parcels of quartz being crushed at Melbourne, and at the Moonlight Company's battery (Stawell) which gave an average yield of 1½ ounces to the ton. The reef, however was not mined and the prospecting funds were withdrawn.'
        - This reference (and the preceding) indicate that works at the Wimmera were low intensity and quartz crushing took place offsite.
- *Reconstruction of historical riverine sediment production on the goldfields of Victoria, Australia* (Davies et al. 2018:8)
    - 'Sludge affected around three-quarters of river catchments in Victoria, and the only major river catchments not affected by sludge were the Glenelg and the Wimmera in the west, the Broken River in the north, and most streams east of the Tambo in Gippsland in the east of the state.'

Waterway movement

- No evidence identified

Historical Maps

Caldwell, J.J., 1928. Parish of Landsborough 1:31,680 (40 chains:1 inch) geological map. Plan No 94p. Geological Survey of Victoria.

References

Bannear, D. 1999, *Victorian goldfields project; historic gold mining sites in the south west region of Victoria.*, Department of Natural Resources and Environment, Victoria.

Davies, P., Lawrence, S., Turnbull, J., Rutherfurd, I., Grove, J., Silvester, E., Baldwin, D. & Macklin, M. 2018. Reconstruction of historical riverine sediment production on the goldfields of Victoria Australia, *Anthropocene*, vol. 21, pp. 1-15.

NAVARRE (1894, February 1). *The Argus* (Melbourne, Vic.: 1848 - 1957), p. 7. Retrieved October 21, 2020, from http://nla.gov.au/nla.news-article8727145

6.4 - ID-5 - Area of Cultural Heritage Sensitivity (downstream of Glendhu Reef)

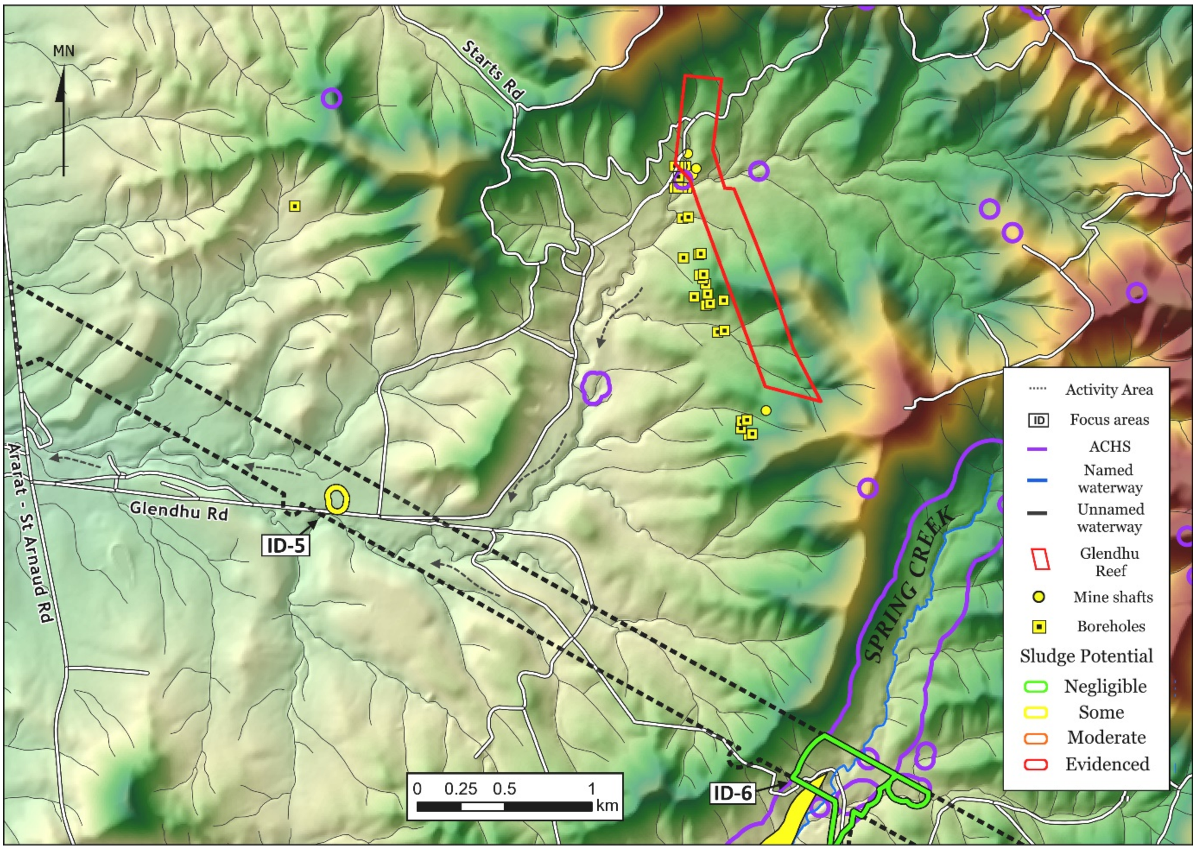

Figure 10. 10-metre Digital Terrain Model (DTM) showing Focus Area (ID-5) downstream of the Glendhu Reef. Glendhu was a quartz reef goldfield that was worked off and on from 1859 to 1888 (with some intermittent interest continuing into the 20th and 21st centuries). There were two quartz crushing batteries onsite that are estimated to have processed 6,000 tons of ore. There is some potential for sludge from quartz crushing. However, this was a relatively low intensity area of mining and greater than one kilometre from the Focus Area. No evidence for mining was identified within the Focus Area.

Potential for Sludge: Some potential

- Focus Area ID-5 (**Figure 10**) is approximately one kilometre downstream of Glendhu Reef, a quartz reef goldfield that was worked off and on from 1859 to 1888. The historical research listed below suggests quartz crushing took place on site and 6,000 tons of ore was processed. A map of the gold workings (Medwell 1957) indicates works associated with the reef extend approximately 1.5 kilometres, all of which is within the catchment of the Focus Area.
- The reef did not prove to be profitable, and does not appear to have produced enough volumes of mining waste to significantly affect ID-5 nearly a kilometre downstream. However, there remains some potential that sands from quartz crushing may be found within the Focus Area.
- The topography of the Focus Area (ID-5) is suitable for the accumulation of sludge deposits.

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-5 in mining datasets or the VHD was identified.
- All identified mining activities within the vicinity are associated with the Glendhu Reef and are located upstream.

Historical Research

- *Mining Surveyor's Report 1859* (Smythe 1859:17)
  - 'Crowlands— Glen Dhu Reef is about 26 miles N.N.E of Ararat. The population is as follows: —Quartz miners: 550 Alluvial miners: 100. There are two steam quartz-crushing machines, of the aggregate of 21-horsepower, with stampers, ripples, and shaking-tables. There is also one-horse whim. The value of the mining plant is about £16,000. The quality of the gold on this reef has so far proved very inferior, but it is expected that it will improve as the reef is more worked. The alloy seems to be silver and lead. Connected with the Glen Dhu Reef there are the Malakhoff and Johnson's alluvial diggings. On the Malakhoff there were about 700 Europeans, and from 50 to 60 Chinese.'

- *Geelong Advertiser* (1859)
    - 'GLENDHU REEF – Some very good prospects have been obtained during the last week, and everyone seems to have great faith in the ultimate results of this reef. As high as 5ozs 18dwts was crushed from 27cwt of unburned quartz from Blunden's claim; had the quartz been burned it would not have weighed more than 22cwt, so we may call the yield 5 oz. per ton. All this stone was raised within four days prior to the crushing, and if they continue to raise as good as this has turned out the claim will pay splendidly. From claim 26 south a first-rate prospect was also got, from three tons crushed on Friday 5ozs 16dwts was obtained. This stone was raised from within twenty feet of the surface. I went down the shaft and could plainly see gold (with the assistance of a lighted match) right through the solid reef; certainly the reef is very narrow-only about eighteen inches, but getting thicker as they go deeper, especially towards the south of the claim. Altogether, Glen Dhu is decidedly looking up, and though many are disappointed at not being able to strike payable gold immediately, and find that reefing takes a great deal of time and money before any return is got, yet the majority are satisfied to take their chance of a pile when the reef shall be proved at a proper depth. Both the machines seem to give satisfaction, they have come down in prices for crushing from 40s to 30s per ton. Gordon had some 5 tons crushed on Saturday, but I cannot learn the result as they have not yet cleaned out the stampers of the machine, but from what I can learn the yield will not equal their expectations.'
- *The Ballarat Courier* (1872)
    - 'MINING – We are informed that two mining leases have recently been taken up at Glendhu, near to Crowlands, by parties of Pleasant Creek miners, In connection with influential men in Melbourne. The reef, it will be remembered, was worked many years ago, and although very good prospects were then obtained, the place was abandoned, after great outlay had been incurred by several of the claimholders. The gold then obtained was of inferior quality, and the stone contained sliver and other metals that prevented the proper combination of the quicksilver with the gold. From trials that have been made since, it seems there is some probability of a fresh start being made, with better changes of success, as it found the gold and silver can be separated from the baser metals with a profitable result'
- *Historic gold mining sites in the south west region of Victoria* (Bannear 1999:22)
    - **'**The diggers working the alluvial gold also discovered several quartz reefs, but all proved to be poor gold producers. One of the earliest worked was the Glen Dhu Reef, at Crowlands. This reef, situated about 25 miles north-north-east of Ararat had some 70 to 80 claims taken out on it, but only a handful were worked. Within a couple of months most of the miners had left the reef to attend the Lamplough and Inglewood gold rushes.'
- *Extracts from reports on Glendhu Reef, Crowlands* (Baragwanath 1915).
    - It has been estimated that 6,000 tons of ore have been extracted from Glendhu down to depths of 70 ft to 100 ft.

Waterway movement

- No evidence identified

Historical Maps

MEDWELL, G.J., 1957. Map of the surface workings at Glendhu Reef, Crowlands, including topography, geology and locations of shafts, reefs and sample points. Parish of Glendhu. Plan No 712/G/1 [W size]. Geological Survey of Victoria.

References

Bannear, D. 1999, *Victorian goldfields project; historic gold mining sites in the south west region of Victoria.*, Department of Natural Resources and Environment, Victoria.

Baragwanath W.D. 1915. *Extracts from reports on Glendhu Reef, Crowlands*. Mining Development Reports Department of Mines Victoria, pp 88-89.

GLEN DHU REEF MINING INTELLIGENCE. (1859, December 30). Geelong Advertiser (Vic.: 1859 - 1929), p. 3. Retrieved October 19, 2020, from http://nla.gov.au/nla.news-article146567203

MINING. (1872, November 1). *The Ballarat Courier (Vic.: 1869 - 1883; 1914 - 1918)*, p. 3. Retrieved October 19, 2020, from http://nla.gov.au/nla.news-article191573728

Smythe, R.B. 1859. *Extracts from the reports furnished by the Mining Surveyors of Victoria to the Board of Science, from May to December (inclusive), 1859*, Melbourne: Board of Science.

6.5 - ID-6 - Area of Cultural Heritage Sensitivity (Spring Creek)

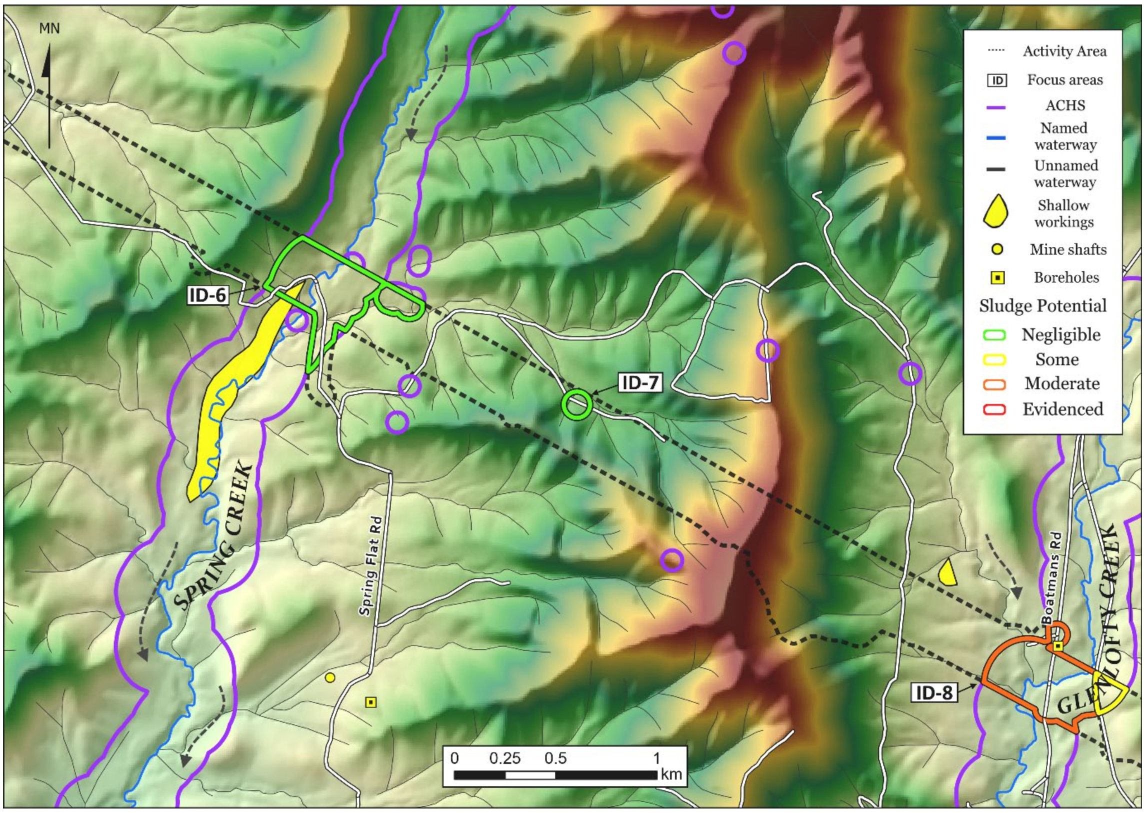

Figure 11. 10-metre Digital Terrain Model (DTM) showing Focus Area along Spring Creek. There is evidence of shallow working within and immediately downstream of the Focus Area (ID-6). As no evidence of upstream mining activity was identified for this locality, the potential for sludge is negligible.

<u>Potential for Sludge:</u> Negligible

- Focus Area ID-6 (**Figures 11 and 12**) is not situated downstream of any identified evidence for mining activity.

<u>Potential for Mining Impacts:</u> Moderate potential

- The shallow gold working dataset indicates shallow workings may have taken place within the southwestern corner of ID-6 (**Figure 11**).
- A geological map produced in 1897 identifies numerous gold workings along Spring Creek immediately downstream of ID-6 (Lidgey 1897) (**Figure 12**). As such, there is some potential for evidence of gold working to be encountered within this Focus Area.
- Historical research into this location uncovered two mentions of gold working along 'Spring Flat'
  - See 'Leader 1891', where prospecting at 'Spring Flat' is mentioned in association with Glen Dhu Reef.
  - In 1898 there is mention of gold works at Spring Flat in the Barkly mining division (see Avoca Mail 1898).
  - Note that there is also a 'Spring Flat Road' in this location.

<u>Historical research</u>

- *Leader* (1891)
  - 'PROSPECTING BOARDS – Edward Shalders and others, Spring Flat, near Glen Dhu Reef, £200; Thos. Torney and others, from Jubilee to State forest, Frenchman's, £200; Edward Walter and others, between Shea's Flat and Crowlands, £200'
    - This newspaper article on mining mentions a 'Spring Flat' near Glen Dhu reef in 1891.
- *Avoca Mail* (1898)
  - 'BARKLY – 'Mining, which used to give employment to thousands on the gold leads of Barkly, Frenchman's, Spring Flat, and several others…'

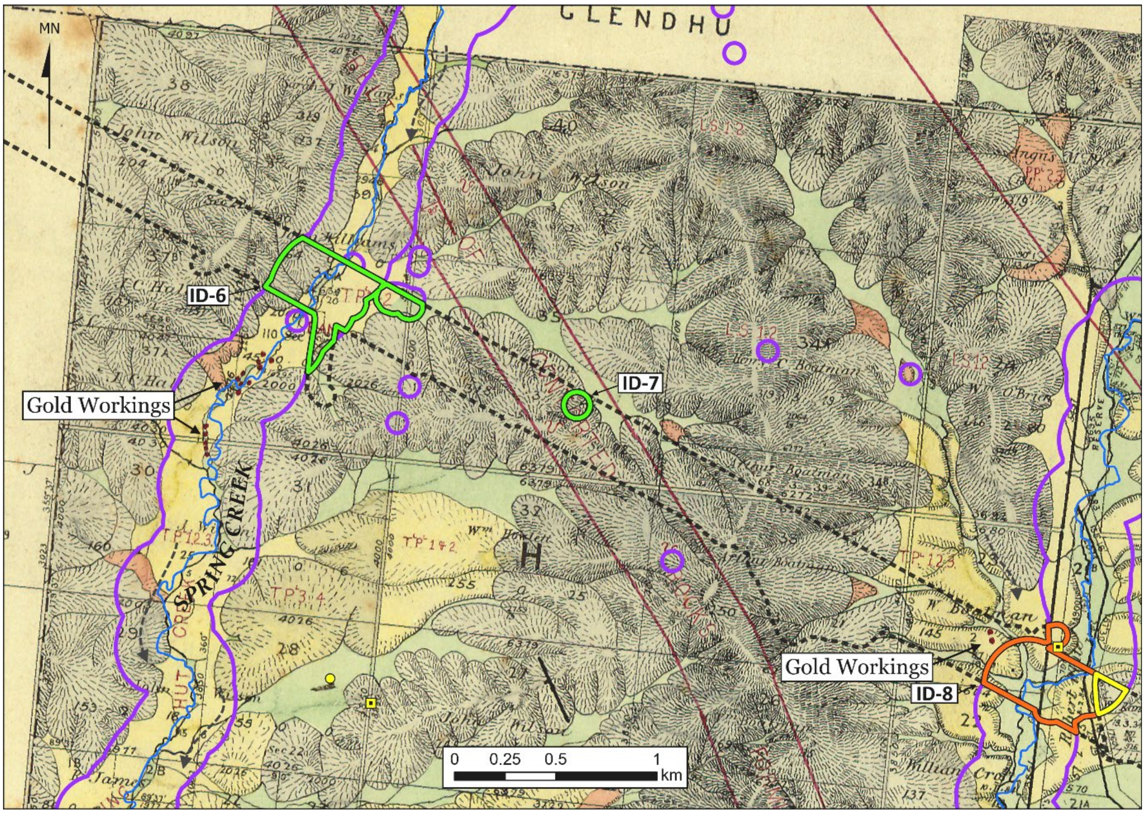

Figure 12. Same location as Figure 11, showing Focus Areas (ID-6 and ID-7) overlying an 1897 map of the Eversley area. The historical map includes red dots indicating the presence of gold workings.

Waterway movement

- No evidence identified.

Historical maps

LIDGEY, E., 1897. Parish of Eversley 1:31,680 (40 chains:1 inch) geological map. Plan No 60p. Geological Survey of Victoria.

References

BARKLY. (1898, November 8). *Avoca Mail* (Vic.: 1863 - 1900; 1915 - 1918), p. 2. Retrieved October 20, 2020, from http://nla.gov.au/nla.news-article202693787

PROSPECTING BOARDS. (1891, April 11). *Leader (Melbourne, Vic.: 1862 - 1918, 1935)*, p. 41. Retrieved October 20, 2020, from http://nla.gov.au/nla.news-article198040127

6.6 - ID-7 - Area of Cultural Heritage Sensitivity (Spring Creek)

Potential for Sludge: Negligible

- Focus Area ID-7 (**Figures 11** and **12**) is situated high in its catchment with no evidence identified of upstream mining.

Potential for Mining Impacts: No evidence identified

- No evidence for mining activity within ID-7 in mining datasets or the VHD was identified.
- The Lidgey (1897) geological map does not identify any mining activities within the Focus Area.

Historical research

- See ID-6 (Section 6.5)

Waterway movement

- Not applicable

Historical maps

LIDGEY, E., 1897. Parish of Eversley 1:31,680 (40 chains:1 inch) geological map. Plan No 60p. Geological Survey of Victoria.

6.7 - ID-8 - Area of Cultural Heritage Sensitivity (Glenlofty Creek)

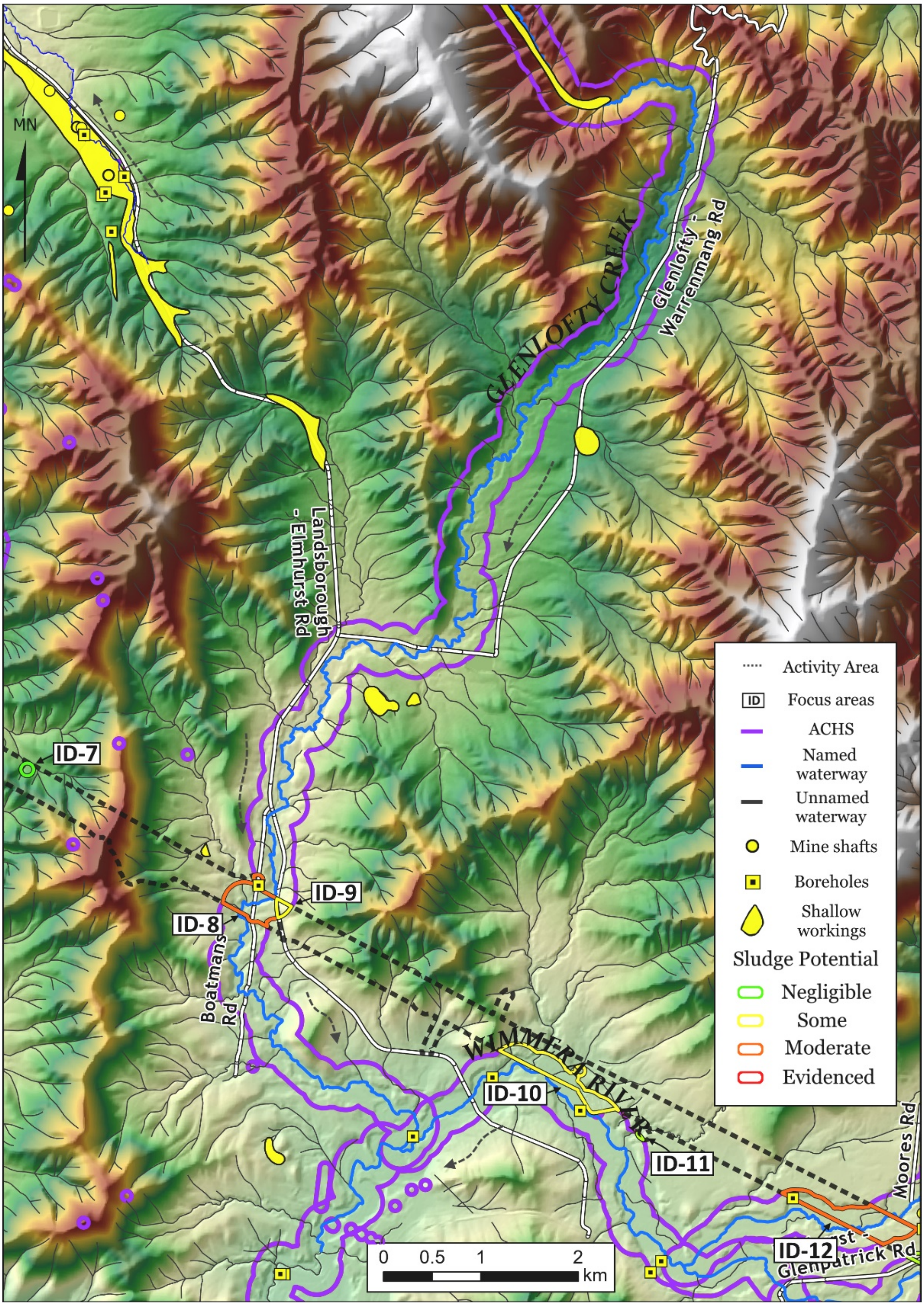

Figure 13. 10-metre Digital Terrain Model (DTM) showing Focus Areas ID-8 and ID-9 along Glenlofty Creek. Significant amounts of mining took place upstream of these areas (purportedly 1,000 miners in 1855), but there is no evidence of large-scale sluicing. ID-9 appears to be situated high enough above the creek line to be less affected by sludge, but there is some potential. However, ID-8 has moderate potential for sludge or mining waste deposits given its close proximity to gold workings, the high potential of significant volumes of sediment in 1855, and its topography.

<u>Potential for Sludge:</u> Moderate potential

- Focus Area ID-8 (**Figures 13** and **14**) is situated downstream of numerous shallow gold workings along Glenlofty Creek, as well as some shallow workings immediately upstream along an unnamed waterway.
- In 1855, there were purportedly 1,000 miners working along this creek, which had the potential to mobilise significant volumes of sediment.
- The paucity of information about these upstream mining activities suggest that large scale sluicing operations are unlikely to have taken place, but it is possible that some downstream sludge deposits may have resulted from those workings.

<u>Potential for Mining:</u> Some potential

- A gold prospection borehole was sunk along the northern boundary of this Focus Area (ID-8) in 1981.
- No other evidence for mining activity was identified for ID-8 in mining datasets or the VHD.
- Glenlofty Creek has been the focus of numerous short-lived episodes of mining, with the earliest phase (1855) ostensibly employing 1,000 men (see historical research section).
    - It is therefore possible that some evidence of mining impacts might be encountered in ID-8.
- Geological map produced of Eversley (Lidgey 1897) and Tchiree (Foster 1899) identifies the locations of numerous shallow gold workings upstream of the Focus Area (ID-8). These include gold workings approximately 50 metres upstream along the unnamed waterway to the west of this location.

<u>Historical research</u>

- There is limited mention of Glenlofty Creek or its shallow workings in the mining literature. However, the below historical newspaper articles provide a few mentions of seemingly short-lived episodes of mining in the general area (as evidenced by the shallow workings dataset **Figure 13**).
- *Mount Alexander Mail* (1855)
    - ‘THE RUSH AT THE CAMP – During the past week, many parties have gone over to a new diggings on W. Cameron's station, the name of the place, Glenlofty. It is somewhere about twenty-five miles from this. The accounts from it are various, some parties struck gold to the extent of half, an-ounce to the tub, but there are many blanks. There are about 1000 people there.’
- *The Ballarat Courier* (1877)
    - ‘MINING INTELLIGENCE – The prospecting party at Glenlofty, in the Avoca district, report (says the Age) having sunk two shafts, the one 21 feet, and the other 23 feet. They obtained a few specks of gold. The foreman of the part considers that if gold exists in payable quantities in that locality, the party are in its vicinity.’
- *The Ballarat Courier* (1877)
    - ‘MELBOURNE **–** The hon. the Minister of Mines has received a report from the Landsborough prospecting party dated Glenlofty, 4th April, from which it appears that seventeen holes had been sunk and bottomed in the locality, and several tunnels driven, without finding more than a few fine specks of gold. The foreman of the party having abandoned all hopes of success at that spot suggested the removal of his camp either to Glenlin, situated three or four miles from Crowlands, or to a district between Barkly and Darling Flat.’
- *The Argus* (1935)
    - ‘MINE MANAGERS REPORTS – GLENLOFTY. Elmhurst 18th – Line A: Bore No 1 bottomed at 20ft traces; bore No 2 bottomed at 22 and a half ft. Traces.’

<u>Waterway movement</u>

- No evidence identified.

<u>Historical maps</u>

LIDGEY, E., 1897*. Parish of Eversley* 1:31,680 (40 chains:1 inch) geological map. Plan No 60p. Geological Survey of Victoria.

FOSTER, H., 1899. *Parish of Tchirree geological map* 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 208/G/1.

References

MELBOURNE. (1877, April 14). *The Ballarat Courier (Vic: 1869 - 1883; 1914 - 1918)*, p. 3. Retrieved October 17, 2020, from http://nla.gov.au/nla.news-article207821162

MINE MANAGERS' REPORTS (1935, June 20). *The Argus (Melbourne, Vic.: 1848 - 1957)*, p. 6. Retrieved October 17, 2020, from http://nla.gov.au/nla.news-article12250613

MINING INTELLIGENCE. (1877, April 6). *The Ballarat Courier (Vic.: 1869 - 1883; 1914 - 1918)*, p. 2. Retrieved October 17, 2020, from http://nla.gov.au/nla.news-article207822246

THE RUSH AT THE CAMP. 1855. *Mount Alexander Mail (Vic. 1854 - 1917)*, 15 February, p. 4, viewed 17 Oct 2020, http://nla.gov.au/nla.news-article202631099

6.8 - ID-9 - Area of Cultural Heritage Sensitivity (Glenlofty Creek)

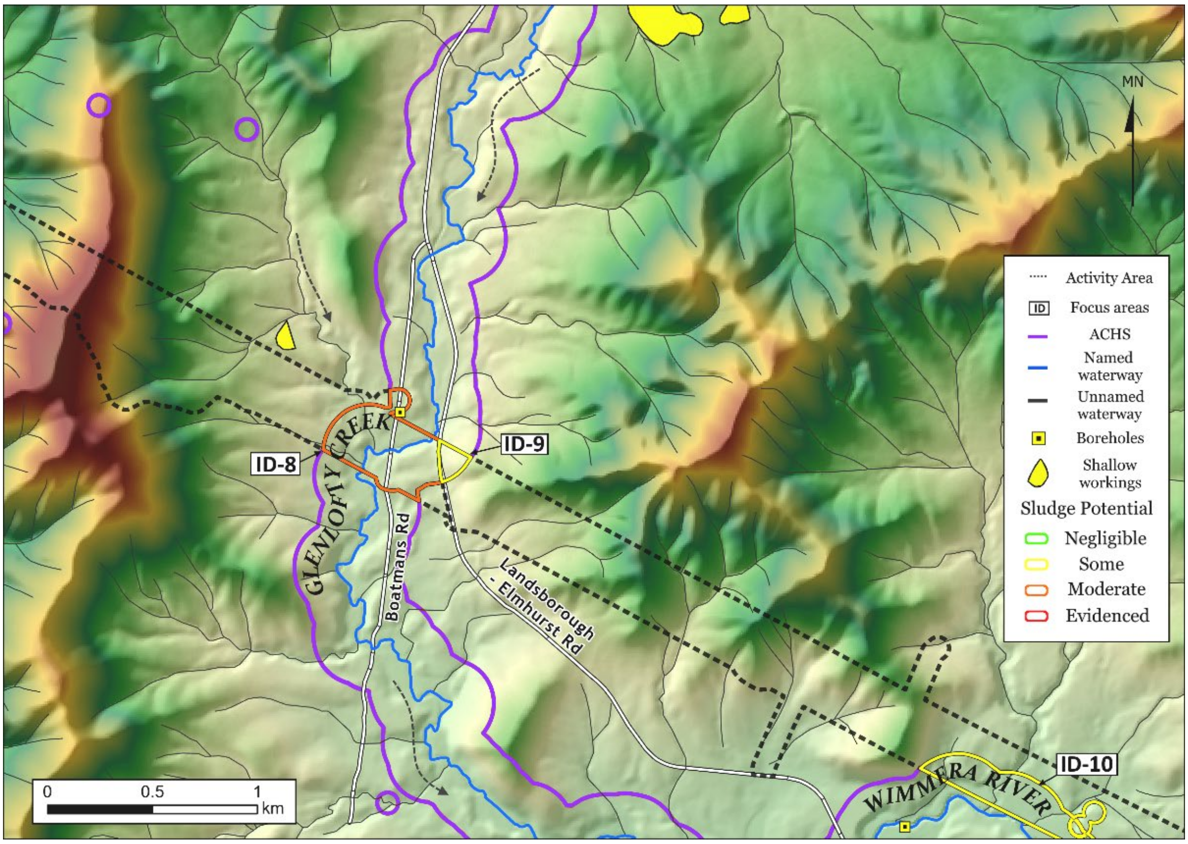

Figure 14. 10-metre Digital Terrain Model (DTM) showing Focus Areas along Glenlofty Creek. Significant amounts of mining took place upstream of these areas (purportedly 1,000 miners in 1855), but there is no evidence of sluicing. ID-9 appears to be situated high enough above the creek line to be less affected by sludge, but there is some potential. However, ID-8 has moderate potential for sludge or mining waste deposits given its close proximity to gold workings, the high potential of significant volumes of sediment in 1855, and its topography.

Potential for Sludge: Some potential

- Focus Area ID-9 (**Figure 14**) is situated above Glenlofty creek and is not as susceptible to significant accumulation of sludge deposits as ID-8.
- Refer to information provided for ID-8 (Section 6.7)

Potential for Mining: Some potential

- A gold prospection borehole was sunk along the northern boundary of ID-9 in 1981.
- No other evidence of mining activity was identified for ID-9 in mining datasets or the VHD.
- Glenlofty Creek has been the focus of numerous short-lived episodes of mining, with the earliest phase (1855) ostensibly employing 1,000 men (see ID-8).

Historical research

- See ID-8 (Section 6.7)

6.9 - ID-10- Area of Cultural Heritage Sensitivity (Wimmera River)

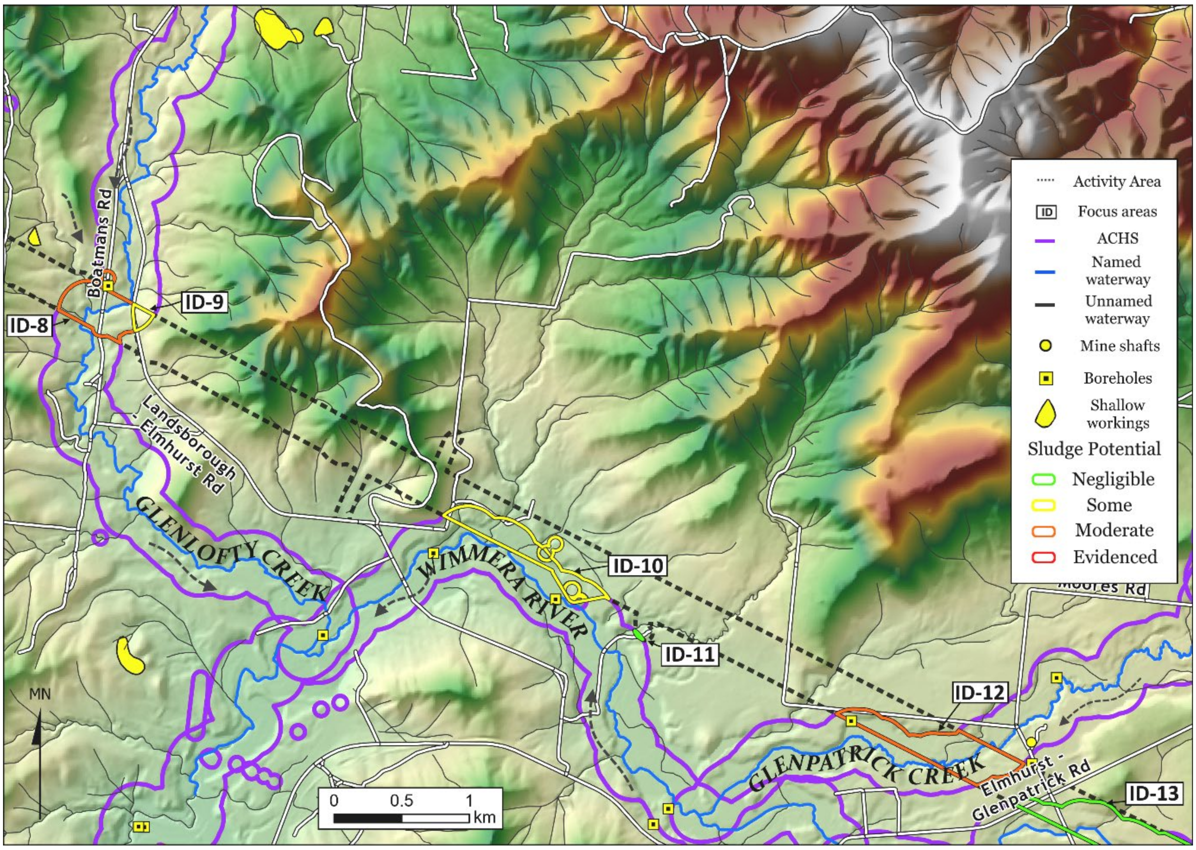

Figure 15. 10-metre Digital Terrain Model (DTM) showing Focus Areas along the Wimmera. No evidence for mining was identified within close vicinity of ID-10, but the area may have accumulated some mining waste from the Glenpatrick Creek Workings upstream (ID-12).

Potential for Sludge: Some potential

- Focus Area ID-10 (**Figure 15**) is situated downstream of the Glenpatrick Creek workings, which is known to have produced waterborne mining waste.
- The topography along this section of the Wimmera is suitable for the accumulation of sludge deposits.
- The catchment to the north of the Focus Area (ID-10) did not have any identified evidence of mining activity.
- The Wimmera is not a river system that is generally known to have experienced any significant amounts of sludge, but some localised accumulations of waterborne mining waste are still possible (see Davies et al. 2018:8).

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-10 in mining datasets or the VHD was identified.

Historical research

- *Reconstruction of historical riverine sediment production on the goldfields of Victoria, Australia* (Davies et al. 2018:8)
  - 'Sludge affected around three-quarters of river catchments in Victoria, and the only major river catchments not affected by sludge were the Glenelg and the Wimmera in the west, the Broken River in the north, and most streams east of the Tambo in Gippsland in the east of the state.'
    - The Wimmera is not a river system that is known to have experienced significant volumes of sludge, but some localised accumulations of waterborne mining waste are still possible.

Waterway movement

- No evidence identified.

References

Davies, P., Lawrence, S., Turnbull, J., Rutherfurd, I., Grove, J., Silvester, E., Baldwin, D. & Macklin, M. 2018. Reconstruction of historical riverine sediment production on the goldfields of Victoria Australia, *Anthropocene*, vol. 21, pp. 1-15.

6.10 - ID-11- Area of Cultural Heritage Sensitivity (Wimmera River)

Potential for Sludge: Negligible

- Focus Area ID-11 (**Figure 15**) is situated on a bank above the Wimmera along an unnamed waterway. There was no identified evidence of mining activities upstream of that unnamed waterway and it is elevated high enough above the Wimmera to be out of reach of upstream mining sediments.

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-11 in mining datasets or the VHD was identified.

Historical research

- No literature relating to mining or sludge were identified for this Focus Area (ID-11).

Waterway movement

- No evidence identified.

6.11 - ID-12- Area of Cultural Heritage Sensitivity (Glenpatrick Creek)

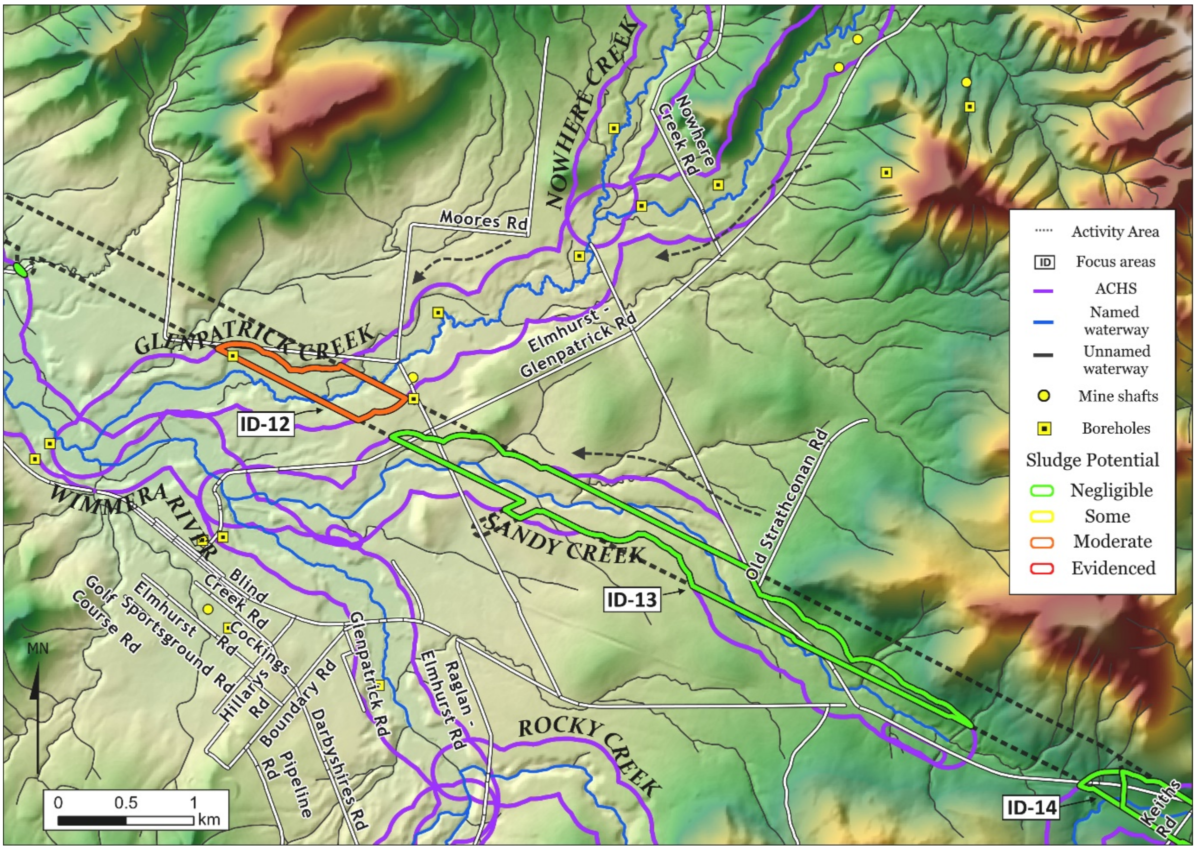

Figure 16. 10-metre Digital Terrain Model (DTM) showing Focus Areas along Glenpatrick and Sandy Creeks. There is evidence of significant upstream gold mining above ID-12. No evidence for mining was identified along or upstream of Sandy Creek (ID-13).

Potential for Sludge: Moderate potential

- Focus Area ID-12 (**Figures 16** and **17**) is situated along Glenpatrick Creek downstream of gold workings along Nowhere Creek and at the Glenpatrick Creek Diggings.
- These upstream mining operations included hydraulic sluicing, which is a producer of sludge. However, looking through historical newspapers, sludge enquiries, and other historical sources no specific evidence for sludge or any downstream nuisances stemming from the gold workings were identified.
- The topography is conducive to the accumulation of sludge deposits (wide, flat floodplain).
  - The topography showing in the 10-metre DTM would suggest that sludge deposits are most likely to have been deposited along the northern side of the creek.

<u>Potential for Mining:</u> Some potential

- No shallow workings are shown within ID-12, but an historical mine shaft is shown 170 metres north of the Focus Area. A borehole use for mining prospection was placed near the westernmost side of the Focus Area (along the southern boundary). These mining features and the close proximity of this site to high intensity upstream mining increase the likelihood that some evidence of mining activity may be encountered here. A probable shallow lead is shown running through this section in a geological map (Wall and Bennett 1979) (**Figure 17**). When coupled with the density of mining points in the vicinity of this area there is some potential for mining impacts (test pitting, surface works etc.).

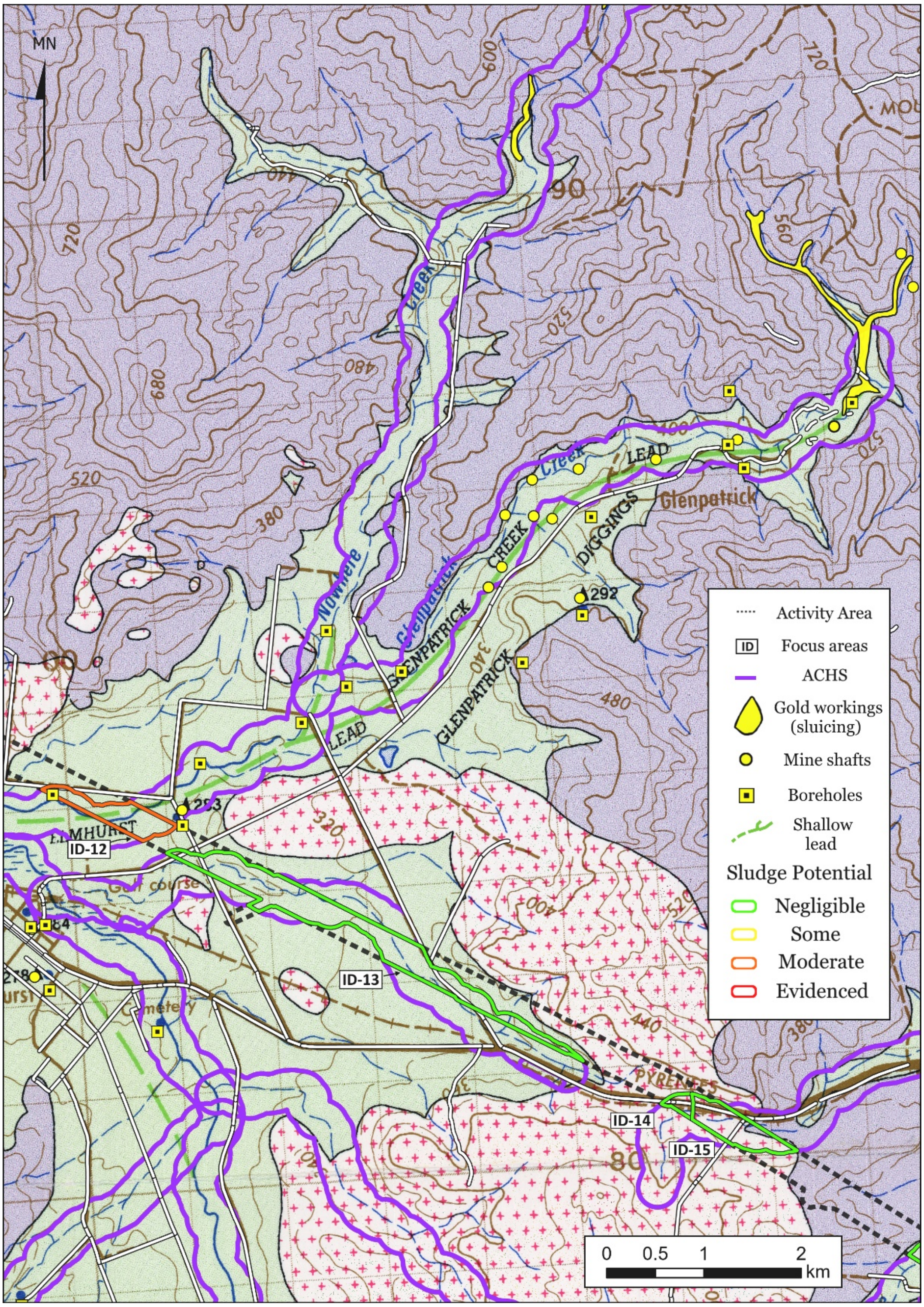

Figure 17. Focus Areas (ID-12 – ID-15) overlying a geological map showing the probable course of a shallow gold lead (thick dashed green line) that cuts through ID-12 and upstream gold mining activity along Glenpatrick Creek. That upstream mining activity includes hydraulic sluicing and thus has a moderate potential to maintain sludge deposits.

Historical research

- *The Star* (1857)
  - (GLENPATRICK, COUNTY UNNAMED) – 'Lot 1, 2, 3, 4, and 6 have each a frontage to the Glenpatrick Creek, and to the road to Glenpatrick Diggings.'
- *Reports of the Mining Surveyors & Registrars* (Secretary for Mines, 1866:79):
  - 'Glenpatrick is attracting considerable attention; several leases have been taken up in this gully, and the old ground, having been drained by means of a level, is now worked with very remunerative results by several co-operative companies. A small rush took place near the summit of one of the ranges near Glenpatrick, where a nugget, weighing 9 oz., was picked up, and some payable surfacing discovered. They have since erected a whim and puddling machine, and a second trial of stuff taken out of their first drive gave even more favorable returns. The Glenpatrick Co-operative Mining Company are about commencing their level for the purpose of draining their ground, the estimated length of which is 700 yards, the greater part of which must be tunnelled.'
- *Leader* (1897)
  - 'MINING IN THE PYRENEES – After lying dormant for many years the auriferous belt of country in the vicinity of Elmhurst, in that portion of the ranges between Avoca and Ararat, has recently come under notice, owing to the new discoveries made in tracing alluvial wash along the flats through which the Wimmera river winds its way, from Elmhurst, in the mountains, and debouches on to the Wimmera plains. About 6 miles from Elmhurst Skellet and party, at a depth of 40 feet, are getting satisfactory yields from wash carrying a coarse sample of gold. The mine is on the banks of the Glenpatrick Creek, which empties into the Wimmera River. Lower down the creek Steavenson and party have been earning good wages. Still lower down Messrs. Conway and party, after sinking a number of prospecting shafts, proved the deep ground at 60 feet, and obtained a heavy, well water worn quartz wash, showing payable prospects of gold. There are no actual workings lower down than Conway's but a line of bores was put down by Dr Williamson, of Decameron station, across the fiats between there and Elmhurst, and proved the very important fact that at 50 feet a heavy wash exists over 1000 feet in width. A shaft was sunk to the wash, which proved to be of excellent appearance and carried gold, but unfortunately the primitive appliance of a horse whip and bucket did not permit of the water being kept down, hence the work of developing the lead had to be abandoned.'
- *Historic gold mining sites in the south west region of Victoria* (Bannear 1999:21;22)
  - "Glenpatrick, in particular, was the focus of large-scale alluvial mining operations, though initially work was carried out with much difficulty because of a great underflow of water. Messrs Skellett, Hartle and Company had rectified this situation by September 1865 (after three years of exertions) by the construction of a large tail race. **The race not only drained much of the higher part of the gully, but also carried off the sluiced waste-materials.** Messrs Skellett, Hartle (also known as Midland Sluicing Company) continued to sluice successfully until the late 1860s. In September 1866, the sluicing company was reported as making £6 per man weekly. This company were joined by two other sluicing operations - Blane and Party, and Johnson and Party - and several parties of Chinese miners.

    While the sluicing parties worked the higher portions of the gully at Glenpatrick, the Glenpatrick Gold Mining Company commenced a prospecting shaft at the head of the gully in hope of picking up a deep lead. This company erected a whim and a puddler, but by June 1866 had found the horse-powered machinery inadequate for drainage purposes. The Glenpatrick Co-operative Company also sunk a shaft looking for a deep lead. Being higher up the gully, they soon hit water and were forced to construct a tailrace approximately 2,100 feet long, the greater part of which was established by tunnelling. The tailrace enable the Co-operative company to bottom their shaft, but no lead was found. Both companies had ceased to exist by the late 1860s." (21)
    - It is unclear where those sluiced waste-materials were drained to and whether they re-entered Glenpatrick Creek or the Wimmera further downstream.
  - "Mining in the division during the late 1880s, given its depressed state during the preceding 15 or so years, was pursued with some vigour. Aided by funds from the government widespread prospecting took place which resulted in some interest being shown in several areas, including the Glenpatrick alluvial workings, the Glendhu Reef, and in the Powys and Wimmera reefs near Landsborough. By the end of 1889, pumping machinery being erected at Glenpatrick by the New Victoria Company" (22)
- *Victorian Heritage Database* (6903):
  - 'Alluvial workings - The flats at the head of the creek have been extensively worked. The main features are patches of open shafts and associated heaps; remains of water races; bank sluicing; stone retaining; two

stone-retained diversion sluices, pebble dumps; and one hut site (stone fireplace). Hut sites - Stone fire place, west side of creek, near underground wildlife shelter; east side of creek, two stone fireplaces; site of Glenpatrick cemetery (no gravestones, some mounds, stone outlines and flat stones; stone fireplace on east side of the track; and several stone fireplaces at current site of township.'

  - https://vhd.heritagecouncil.vic.gov.au/places/6903

Waterway movement

- No evidence identified

Historical Maps

Wall, S. and Bennett, W.J. 1979. *Map No. 3 Beaufort.* Deep Lead Gold Deposits in Victoria. Bulletin No. 62.

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Secretary for Mines, 1866. Reports of the Mining Surveyors & Registrars (1866). No.8. Parliament of Victoria, Melbourne.

6.12 – ID-13 – Area of Cultural Heritage Sensitivity (Sandy Creek)

Potential for Sludge: Negligible

- Focus Area ID-13 (**Figures 16** and **17**) is situated along Sandy Creek, which did not have any identified evidence of upstream mining.

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-13 in mining datasets or the VHD was identified.

Historical research

- No literature relating to mining or sludge were identified for this Focus Area (ID-13).

Waterway movement

- No evidence identified

6.13 – ID-14 and ID-15 – Area of Cultural Heritage Sensitivity (Amphitheatre Creek)

Potential for Sludge: Negligible

- Focus Areas ID-14 and ID-15 (**Figure 18**) are situated near the uppermost reaches of Amphitheatre Creek and no evidence of upstream mining activities was identified.

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-14 or ID-15 in mining datasets or the VHD was identified.

Historical research

- No literature relating to mining or sludge were identified for these Focus Areas (ID-14 and ID-15).

Waterway movement

- No evidence identified

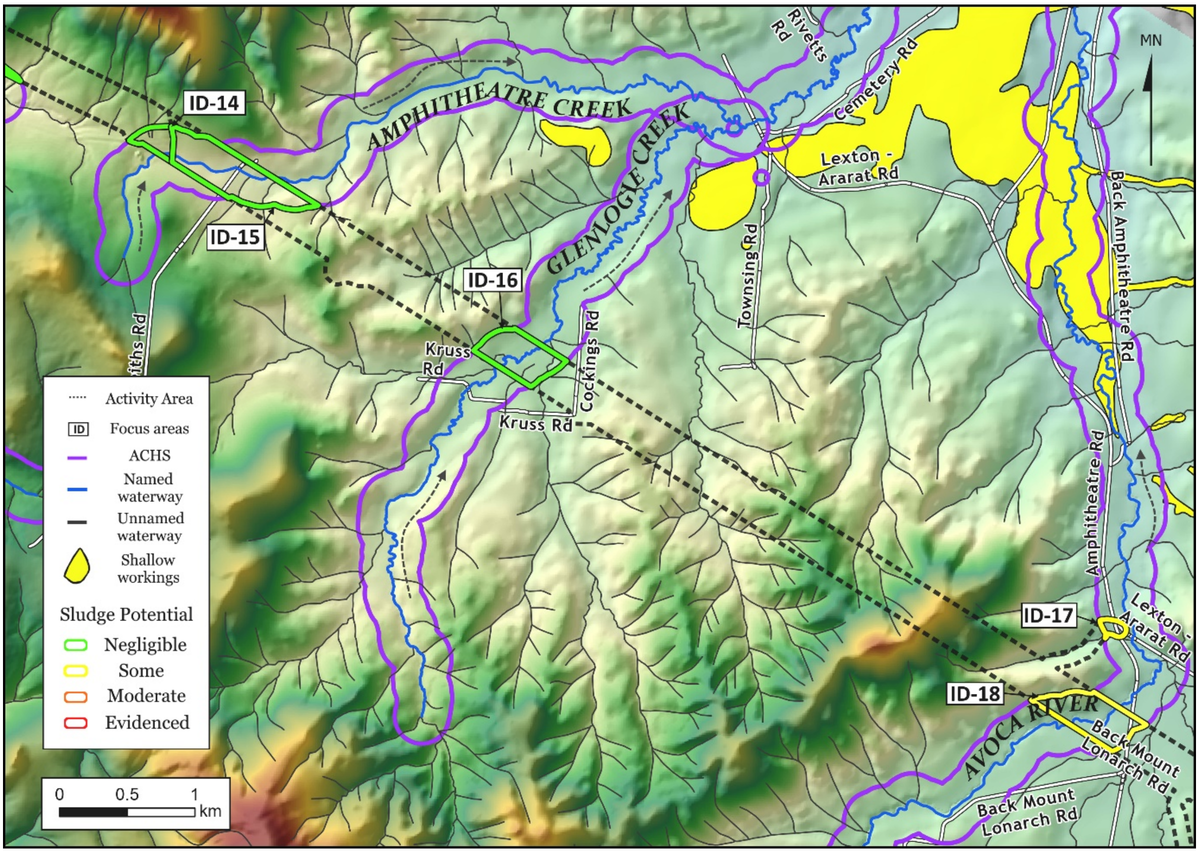

Figure 18. 10-metre Digital Terrain Model (DTM) showing Focus Areas (ID-14 and ID-15) along Glenlogie and Amphitheatre Creeks. No evidence for upstream mining was identified for these Focus Areas and so the risk of sludge is negligible. There is ample evidence for downstream mining activity, but none within the Focus Areas.

6.14 – ID-16 – Area of Cultural Heritage Sensitivity (Glenlogie Creek)

Potential for Sludge: Negligible

- Focus Area ID-16 (**Figure 18**) is situated along Glenlogie Creek and no evidence for upstream mining activities was identified.

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-16 in mining datasets or the VHD was identified.
- The Glenlogie township is known to have been the site of mining activity in the nineteenth century. However, this activity took place downstream, where the Avoca meets Glenlogie and Amphitheatre Creeks.

Historical research

- No literature relating to mining or sludge were identified for this Focus Area (ID-16).

Waterway movement

- No evidence identified.

6.15 – ID-17 – Area of Cultural Heritage Sensitivity (Avoca River)

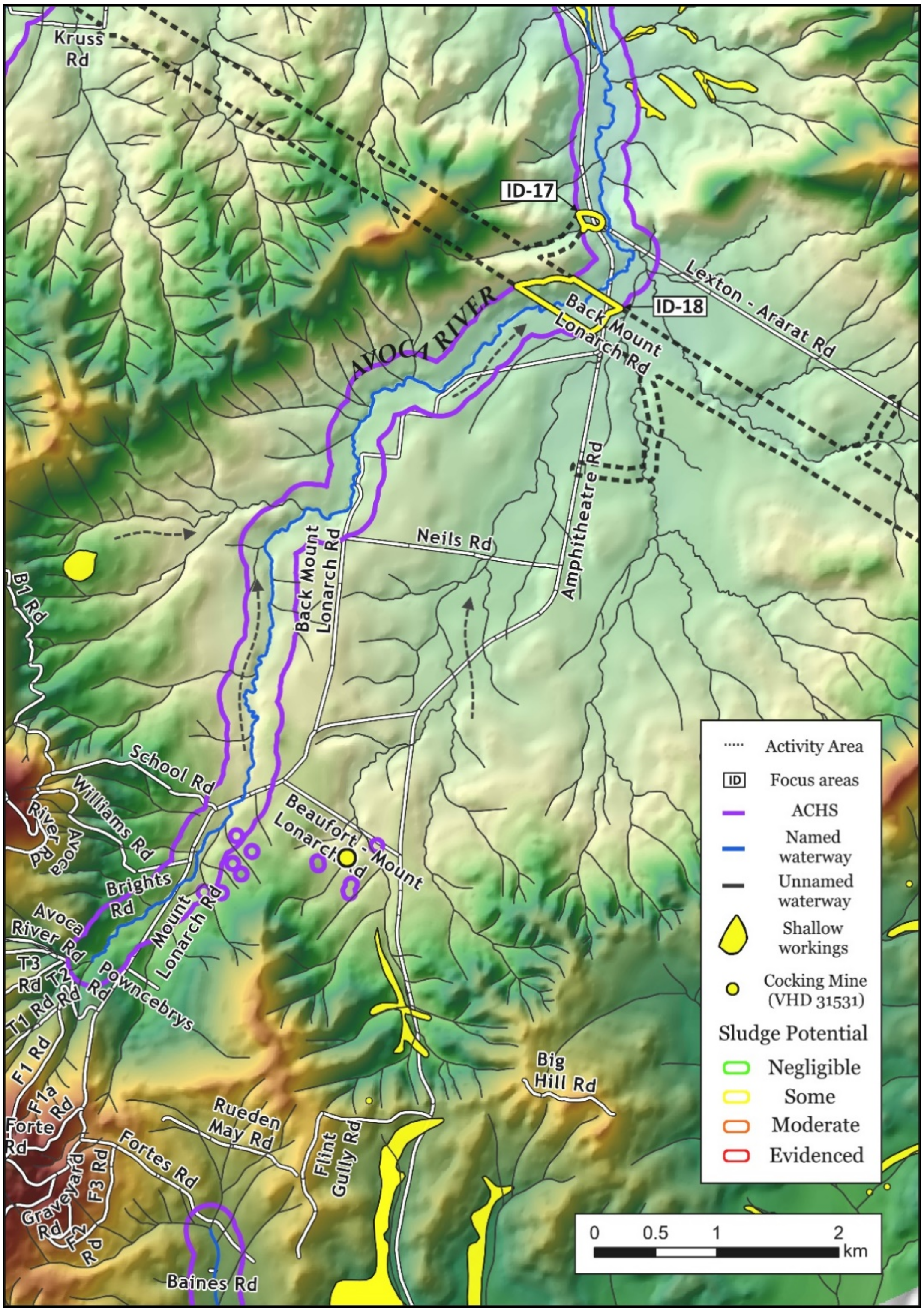

Figure 19. 10-metre Digital Terrain Model (DTM) of Focus Areas ID-17 and ID-18 along the Avoca. The terrain of is suitable for sludge accumulation and there is some evidence for shallow workings upstream. Note: the Avoca flows north through the Focus Areas.

<u>Potential for Sludge:</u> Some potential

- Focus Area ID-17 (**Figures 19** and **20**) is just north (downstream) of ID-18 and the same information applies (see 6.16).

<u>Potential for Mining:</u> Some potential

- This Focus Area ID-17 is situated north (downstream) of ID-18 and the same information applies (see 6.16).

6.16 – ID-18 – Area of Cultural Heritage Sensitivity (Avoca River)

Potential for Sludge: Some potential

- Focus Area ID-18 (**Figures 19** and **20**) is located approximately 7 km downstream of the upper reaches of the Avoca River.
- There is one recorded instance of unnamed shallow gold workings (occupying an area approx. 250 metres by 250 metres) upstream of this section of the Avoca. No further information was identified about that specific area of gold working.
- This Focus Area (ID-18) is also at the confluence of two other unnamed waterways, with the one to the immediate east of the Avoca also showing evidence of mining.
  - The Cocking Property Diggings are recorded on the VHD (31531) and are comprised of low intensity gold workings (shafts, pits, and mullock heaps).
  - Upstream of the Cocking Property Diggings is a larger area of shallow gold workings (over a kilometre long), which may be associated with the adjacent Charlton Flat diggings on the southern side of the Pyrenees Range.
    - No further information was uncovered about those shallow workings, but given their aspect they may have discharged sediment into the unnamed waterway that converges with the Avoca.
- The topography is suitable for some accumulation of sludge deposits at this location (ID-18). However, as indicated in the Cocking Property Digging's VHD description it is unlikely that this area experienced high intensity mining (hydraulic sluicing etc.). As such, there may be some potential for sludge, but probably not a significant volume.

Potential for Mining: Some potential

- No evidence for mining activity was identified for ID-18 in mining datasets or the VHD.
- However, there is mention of gold working in Gold and Minerals (Baragwanath 1946:157) (see historical research).
- A geological map (Wall and Bennett 1979) also indicates that a probable shallow gold lead runs through the Focus Area (ID-18) along the Avoca. It is therefore possible that the mining that Baragwanath refers to along the Avoca may have included this location. Note, that the identification of a 'probable lead' does not necessarily imply mining took place.

Historical research

- *Victorian Heritage Database* (31531)
  - 'Cocking Property Diggings': 'Several dozen backfilled and overgrown shafts/diggings in poor condition. No historical artefacts or other features were found in association with these diggings. Diggings are in the northern part of the paddock and cover an area of approximately 150 x 200 m. Some isolated pits may also be located across the remainder of the property. Shallow shafts/pits and mullock heaps. Pits are between 1-3 m in diameter and in poor condition.'
    - https://vhd.heritagecouncil.vic.gov.au/places/31531
  - A CHMP by Christine Williamson (CHMP 10163) provides additional historical information about these workings, which again suggests it was likely to be a low intensity operation.
- *Gold and Minerals* (Baragwanath 1946:157):
  - 'The Avoca Lead system is the most easterly of the leads trending north of the Divide to have many miles of the upper portion of their courses not covered by basalt flows. Heading from the granite country in the neighbourhood of Amphitheatre a few miles north of the Divide, a lead system conforming to the course of the Avoca River has been mined more or less successfully for a length of about 15 miles until in the vicinity of the township of Avoca, the deep ground proved to be too wet to be profitably worked.'
    - The distances given in this quote could place historical shallow workings within ID-18 (**Figure 20**).

Waterway movement

- No evidence identified.

Historical Maps

Wall, S. and Bennett, W.J. 1979. *Map No. 3 Beaufort.* Deep Lead Gold Deposits in Victoria. Bulletin No. 62.

References

Baragwanath, W. 1946. *Gold and Minerals*. Special report to Victoria Department of Mines.

de Lange, J and Williamson, C. 2008. Cocking Property Blue Gum Plantation, Mount Lonarch, Pyrenees Shire. Cultural Heritage Management Plan (10163). Unpublished report submitted to the Victorian Aboriginal Heritage Register.

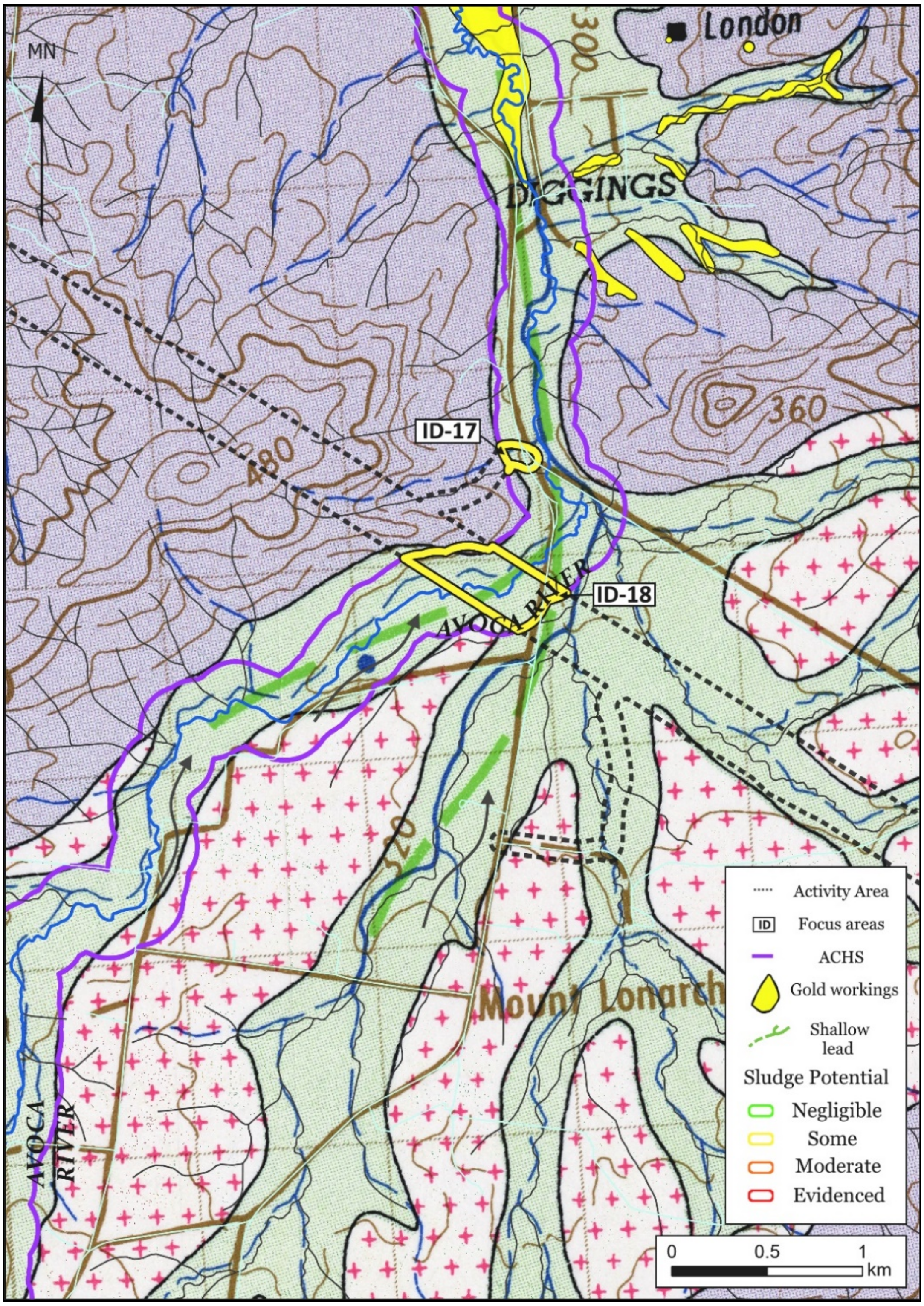

Figure 20. Geological map of Focus Areas ID-17 and ID-18 (Wall and Bennett 1979). The dashed green line running through the Focus Area (ID-18) is a probable course of a shallow gold lead (it should be noted that this is not necessarily evidence of mining). This area may have been subjected to the workings described in Baragwanath (1946:157). Note: the Avoca flows north through the Focus Area.

6.17 – ID-19 – Area of Cultural Heritage Sensitivity (Bet Bet Creek)

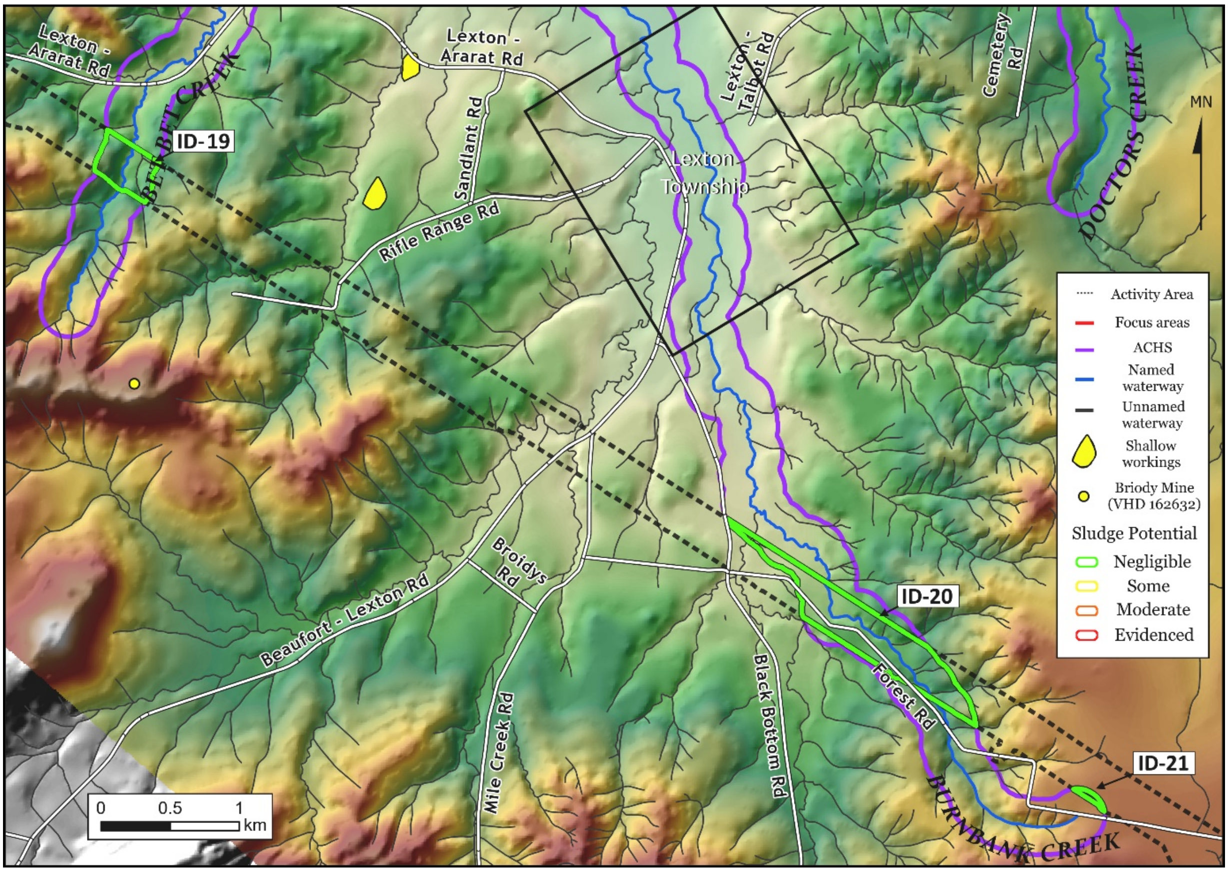

Figure 21. 10-metre Digital Terrain Model (DTM) of Focus Areas (ID-19, 20, and 21) in the Lexton area. The narrow valleys of Bet Bet and Burnbank Creeks are not suitable for sludge accumulation and there no evidence for upstream mining was identified for any of these Focus Areas.

<u>Potential for Sludge:</u> Negligible

- Focus Area ID-19 (**Figure 21**) within the upper reaches of Bet Bet Creek (no evidence of upstream mining was identified).
- This is a narrow river valley and therefore has limited potential to accumulate sludge deposits.
- Bet Bet Creek is a waterway that is known to have been affected by sludge, but this took place much further downstream near Eddington from mining in Timor (Shakespear et al. 1887:xxiii).

<u>Potential for Mining:</u> No evidence identified

- No evidence for mining activity within ID-19 in mining datasets or the VHD was identified.
- Bet Bet Creek is a long waterway that cuts through numerous goldfield areas and is closely associated with many historical mining activities. However, as ID-19 is situated along the uppermost reaches of this system there does not appear to be any evidence of localised mining activity.

<u>Historical research</u>

- Victorian Heritage Database (162632)
    - 'Briody Prospector Mine'**:** **'**While there is no specific documentary evidence about Briody Prospector Mine, it is reasonable to conclude that it was for extracting gold. There were no large discoveries of gold in the immediate vicinity of Lexton, although commercial quantities were extracted on a small scale from mines in the late nineteenth and early twentieth centuries, with the closest being the Luxor Mine two miles northwest of the Lexton Township and the Star of Lexton company shafts at unspecified locations in 1892. The precise history of the site is not known, but Oulton does provide information about the twentieth century mining history of the area close to the Briody quartz extraction pit. In the 1930s the Government provided basic prospecting materials, a tent and a railway ticket to unemployed men willing to try their luck at gold mining (Oulton 1985: 11 8). Some 15,650 men took advantage of the scheme and some of these made their way to an area of Crown land near Granite Hill, known as 'Cos', short for the Cosmopolitan Gold Sluicing Company which had earlier operated in the area. Briody Prospector Mine

could be related with the is scheme although is more likely to represent *ad hoc* gold prospection in the early twentieth century.'

        - https://vhd.heritagecouncil.vic.gov.au/places/162632
        - The Briody Prospector Mine is not upstream of Bet Bet Creek, but is upstream of the Activity Area further to the east. However, given the topography of the area, and the scale of the workings, the likelihood for sludge deposits across this part of the transect remains negligible.

Waterway movement

- No evidence identified

References

Shakespear, R.H., A.F. Walker and J. Rowan. 1887. *Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board. Melbourne: Parliament of Victoria.*

6.18 – ID-20 – Area of Cultural Heritage Sensitivity (Burnbank Creek)

Potential for Sludge: Negligible

- Focus Area ID-20 (**Figures 21** and **22**) is situated along the upper reaches of Burnbank Creek, with no identified evidence that specifically places any mining activities upstream.
- The Focus Area (ID-20) is at the top of a narrow valley, which is not conducive to sludge accumulation.

Potential for Mining: Some Potential

- No evidence for mining activity within ID-20 in mining datasets or the VHD was identified.
    - There is evidence of shallow gold workings 1.5 km west of the Lexton township, which is 500 metres north of the Activity Area and downstream of ID-20.
- Historical research indicates some shallow alluvial mining took place in some localised sections of Burnbank Creek, but no evidence was identified that places that mining within ID-20. Figure 22 shows an area of observed nineteenth century sluicing and pitting relating to mining, which is a few kilometres downstream of the activity area and is consequently not a risk for sludge impacts.
    - It should be noted that some maps label the unnamed waterway to the west of the creek 'Burnbank Creek' as well (Wall and Bennett 1979).

Historical research

- *The Ballarat Star* (1895)
    - 'LEXTON MINING – A few miners are obtaining small quantities of gold a short distance from the township, on the Burnbank Creek. So far, no defined lead can be found, only small particles here and there. It is a great pity something payable cannot be found; it would enliven our sleepy hollow, and provide work for a large number of the unemployed.'
        - Lexton is 2 - 3 km north of the northernmost reaches of ID-20
        - No indication what direction from the township the newspaper entry is referring to, but there is evidence of shallow gold working 1.5 km to the west of Lexton.
- *Gold and Minerals* (Baragwanath 1946:112;158):
    - 'Lexton goldfield is chiefly of interest as being the site on Burnbank Creek of a reputed gold discovery many years before workable goldfields were found but interest which arose in consequence of this discovery led to prospectors eventually finding Ballarat, Clunes, and other fields. The area of shallow alluvial in the neighbourhood of Lexton is comparatively small and was never rich. Sinking was shallow.' (112)
    - 'Burnbank Creek, passing through Lexton, was the site of one of the earliest gold discoveries in the State but notwithstanding its early discovery, very little alluvial or quartz mining was carried out in the neighbourhood.' (158)
- *EL1213* (Broadbent 1985):

— 'Bulk CN leach anomalies ranging up to 3175 parts per trillion over a background of less than 50 ppt to 300 ppt were obtained, mostly in the major drainage of Burnbank Creek, which was worked for alluvial gold in places.' (4)

— 'An inspection of the area revealed several small patches of high-level gravels which have been variably pitted and, in some cases, sluiced, by 19th century prospectors. These appear to be the most likely source for the anomalies. Two 1.5 km lines of 50 metre spaced soil samples were collected on roadside traverses spaced 3.5 km apart to determine whether there is any possibility that the gold in the gravels was locally derived.' (5) (**Figure 22**)

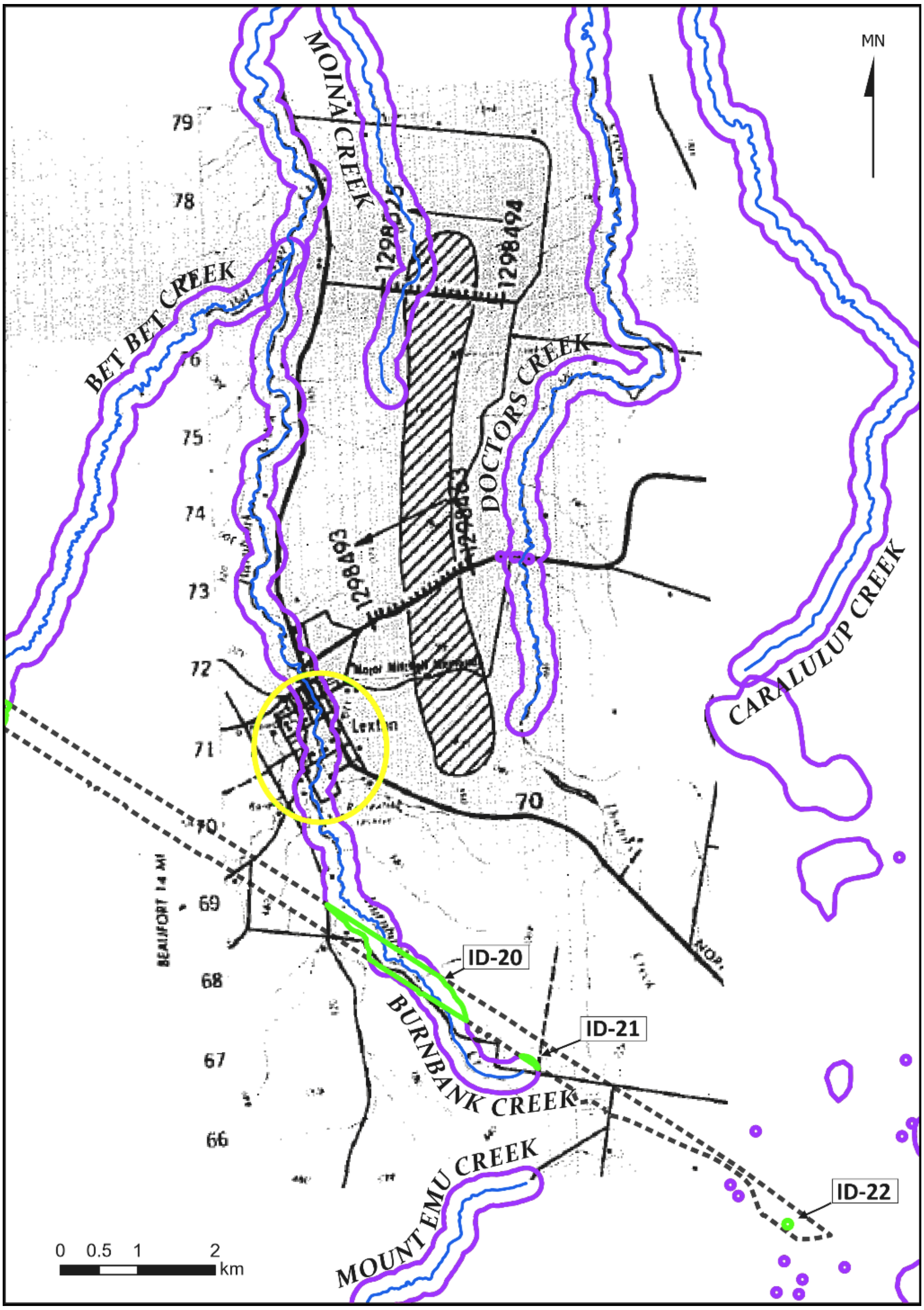

Figure 22. Figure adapted from EL1213 (Broadbent 1985:32), showing observed 19th century workings (hashed infilled polygon) in relation to Focus Areas ID-20 and ID-21. The Lexton township is within the yellow oval. As shown, there is no indication that nineteenth century gold workings have been observed in this section of the Activity Area (ID-20 or ID-21).

Waterway movement

- An unnamed 1852 map shows some changes to the waterway, but these are downstream and outside of the Activity Area. The surveyor did not map Burnbank Creek as far south as the Activity Area.
- The course of Burnbank Creek appears largely unchanged from its current extent in a map from 1883 (Hunter 1883).

Historical Maps

HUNTER, S.B., 1883. Parish of Lexton geological map 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 2718/G/1.

Unnamed, 1852. 'Rough Plan of Proposed Township and Agricultural Reserve at Burn Bank Pyrenees', Public Records Office Victoria, VPRS 8168.

Wall, S. and Bennett, W.J. 1979. Map No. 3 Beaufort. Deep Lead Gold Deposits in Victoria. Bulletin No. 62.

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LEXTON MINING. (1895, April 9). *The Ballarat Star (Vic.: 1865 - 1924)*, p. 4. Retrieved October 12, 2020, from http://nla.gov.au/nla.news-article203154228

6.19 – ID-21 – Area of Cultural Heritage Sensitivity (Burnbank Creek)

Potential for Sludge: Negligible

- Focus Area ID-21 (**Figures 21**, **22**, and **23**) is situated at the head of Burnbank Creek and no evidence for historical mining upstream was identified.

Potential for Mining: Some Potential

- No evidence for mining activity within ID-21 in mining datasets or the VHD was identified.
- See ID-20 (Section 6.18)

Historical research

- See ID-20 (Section 6.18)

Waterway movement

- No evidence identified

Historical maps

HUNTER, S.B., 1883. Parish of Lexton geological map 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 2718/G/1

Unnamed, 1852. 'Rough Plan of Proposed Township and Agricultural Reserve at Burn Bank Pyrenees', Public Records Office Victoria, VPRS 8168.

Wall, S. and Bennett, W.J. 1979. Map No. 3 Beaufort. Deep Lead Gold Deposits in Victoria. Bulletin No. 62.

6.20 – ID-22 – Aboriginal Cultural Heritage Location (closest to Waubra)

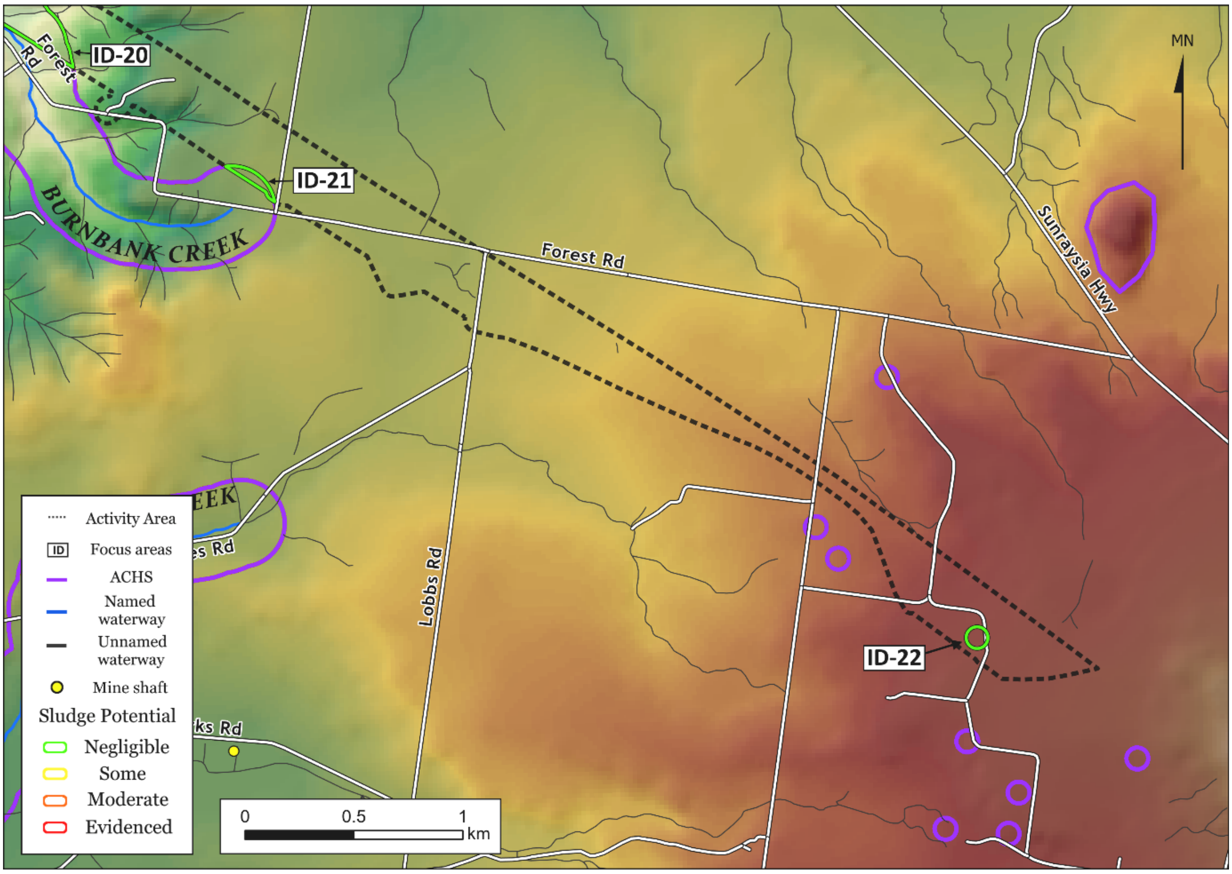

Figure 23. 20-metre Digital Terrain Model (DTM) showing the Focus Area (ID-22) near the eastern extent of the Activity Area. There are no waterways within close vicinity of ID-22 and no evidence for mining was identified within the area (besides a single mine shaft showing above the scale bar).

Potential for Sludge: Negligible

- Focus Area ID-22 (**Figure 23**) is situated at the top of the Hopkins River catchment and no evidence for upstream mining was identified.
- No waterways within close vicinity of ID-22

Potential for Mining: No evidence identified

- No evidence for mining activity within ID-22 in mining datasets or the VHD was identified.

Waterway movement

- Not applicable

Historical maps

- No relevant coverage found

Historical research

- Not applicable

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Garden, D. 2001. Catalyst or cataclysm? Gold mining and the environment. Victorian Historical Journal, 72(1-2):28–44.

Grove, J., Turnbull, J., Lawrence, S., Davies, P., Rutherfurd, I., Silvester, E., Colombi, F. and Macklin, M. 2019. Mining to mud: a multidisciplinary approach to understanding Victoria's riverine landscape as a product of historical gold mining, *Preview*, 2019(200):44–56.

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— 2019. *Sludge: Disaster on Victoria's Goldfields*. Melbourne: Black Inc.

Lawrence, S., Davies, P. and Turnbull, J. 2016. The archaeology of Anthropocene rivers: water management and landscape change in 'Gold Rush' Australia, *Antiquity*, 90(353):1348–1362.

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LA TROBE UNIVERSITY

La Trobe Archaeology Research Partnerships

Desktop review of mining-related impacts: Western Victoria Transmission Network Project (WVTNP) (Waubra to Sydenham)

Prepared by Greg Hil and Rebekah Kurpiel

Date: 10th of February, 2022

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Table of contents

1. PROJECT INTRODUCTION

This report presents the results of a desktop review of gold mining impacts within Areas of Cultural Heritage Sensitivity (ACHS) (as specified in Division 3, Part 2 of the *Aboriginal Heritage Regulations* 2018) across the WVTNP CHMP Activity Areas.

The review had two objectives: 1) to establish the likelihood that mobilised mining waste sediment (sludge) had been deposited within ACHS across the WVTNP Cultural Heritage Management Plan (CHMP) Activity Areas; and 2) to identify any other evidence of impacts resulting from gold mining within and in the vicinity of those ACHS. For the purposes of this report, a 'Focus Area' is any location classed as an ACHS that is intersected by a WVTNP CHMP Activity Area.

The desktop review took place over two stages and through two reports—with the first report covering Focus Areas from Bulgana to Waubra. This second report presents the results from the second stage of the desktop review from Waubra to Sydenham (i.e., Burnbank Creek to Taylors Creek).

This report provides information for 85 Focus Areas, which are situated across three Registered Aboriginal Party (RAP) areas:

- **Dja Dja Wurrung Clans Aboriginal Corporation**
    - Focus Areas: **ID-23**, **ID-24**, **ID-27**, **ID-28**, **ID-30**, **ID-30** to **ID-68**
- **Wadawurrung Traditional Owners Aboriginal Corporation**
    - Focus Areas: **ID-25**, **ID-29**, **ID-32**, **ID-69** to **ID-73**
- **Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation**
    - Focus Areas: **ID-74** to **ID-107**

Accompanying this report is a GIS shapefile that depicts the spatial extent of each Focus Area and provides a ranking associated with the potential for sludge to have been deposited within that locality. A separate ranking is also given that reflects the likelihood that mining activities has resulted in ground disturbance within each Focus Area.

This report includes:

- Guidance on how to identify sludge in the field, including photographic examples.
- Information pertaining to the implications of sludge for Aboriginal cultural heritage and its management.
- An explanation of the methodologies employed for ranking sludge and mining impact potential.
- The results of the desktop review.

For the first stage of the desktop review please refer to:

Hil, G. & Kurpiel, R. 2021. Predictive modelling of mining sludge and mining-related impacts: Bulgana to Waubra. La Trobe Archaeology Research Partnerships, La Trobe University, Melbourne.

As this assessment was limited to a desktop review, it is possible that additional, undocumented mining took place within and upstream of the Focus Areas. The findings of this review should not preclude the need for ground-truthing.

2. BACKGROUND – HISTORICAL GOLD MINING IMPACTS IN VICTORIA

In 1851, the discovery of easily worked Victorian gold sparked a gold rush that would continue-on largely uninterrupted till the start of the First World War. Thousands of gold seekers from all parts of the globe descended upon the colony's goldfields, trying their luck as each area boomed and busted. To extract gold from paydirt, miners employed a variety of tools and techniques, which differed depending upon local conditions and the maturity of the rush (Ritchie & Hooker 1999). Each method of mining impacted the environment in a different manner, both in the vicinity of works, but also in downstream areas (Garden 2001; McGowan 2001; Davies et al. 2020). At the very beginning of the rush, miners relied on rudimentary methods such as panning, fossicking, and through arbitrarily placed mineshafts. However, by the mid-1850s Victorian mining had progressed to more systematic techniques such as ground sluicing, puddling, and paddocking, which enabled far greater quantities of dirt to be processed at once. The introduction of hydraulic sluicing by 1860, which used high-pressure water hoses to rapidly disintegrate metres of earth, had a particularly transformative effect on ground surfaces and the local environment (Davies et al. 2018).

A near-universal use of water to extract gold from paydirt greatly impacted Victoria's waterways, as waterborne mining waste significantly increased the amount of sediment that entered creeks and river systems (Grove et al. 2019). Waterways choked by sediment burst their banks during heavy rains, causing large floodplain areas downstream of mining to be inundated under thick deposits of mud (Lawrence et al. 2016). Referred to at the time as 'sludge', this was a widespread problem in Victoria and was the focus of numerous governmental inquiries and newspaper editorials (**Figure 1**) (Lawrence & Davies 2014; 2019).

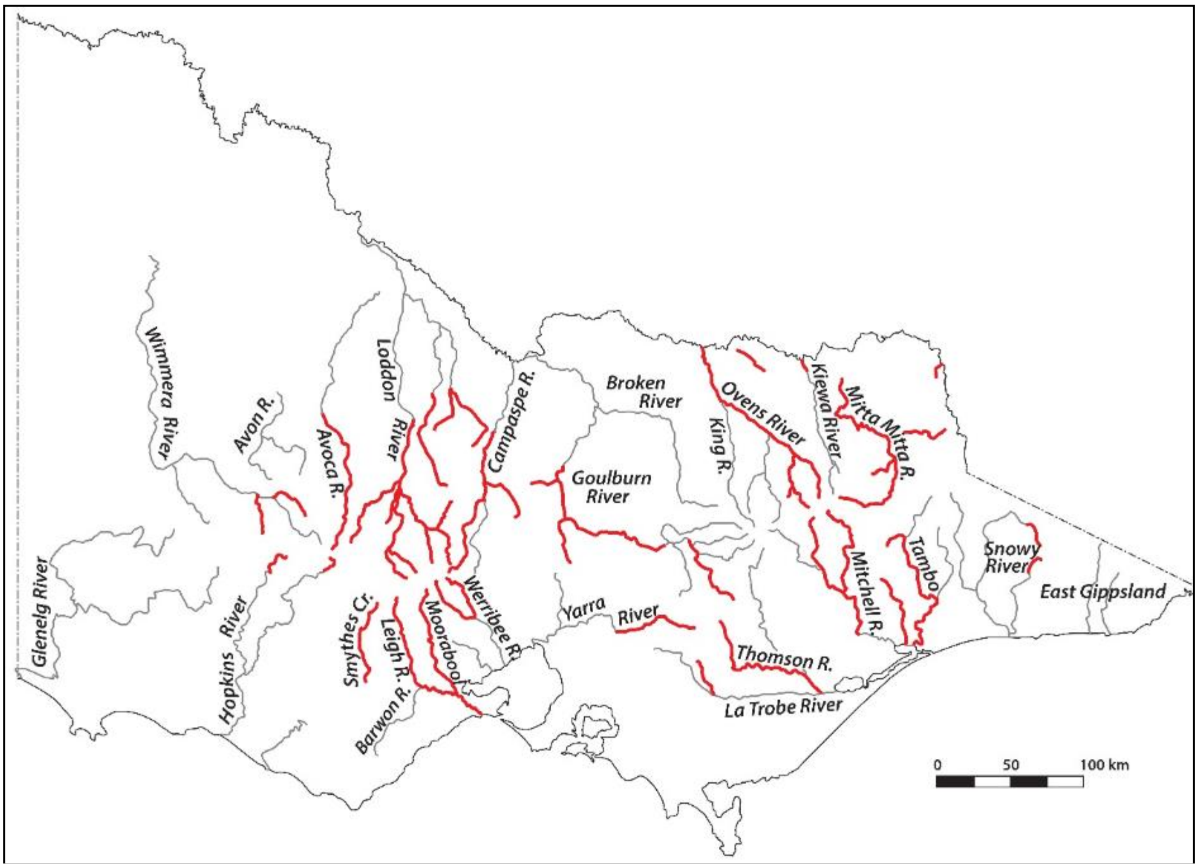

Figure 1. A map produced by the Rivers of Gold project (Lawrence et al. 2018; Grove et al. 2019) of all major rivers in Victoria purportedly affected by sludge in 1886 (based on testimonies in an 1887 governmental inquiry) (from Davies et al. 2018:9).

Victoria's historical mining activity and the sludge it produced has resulted in contrasting examples of altered ground surfaces, in which some areas have been dug into and greatly disturbed, while other areas have been capped by sediment and thus protected from subsequent impactful activities (Hil et al. 2020). Understanding local mining history and delineating between these two scenarios can help archaeologists to anticipate scenarios where cultural heritage material has been buried (protected) and where it may have been impacted (Lawrence et al. 2018).

3. SLUDGE IDENTIFICATION

Sludge is easiest to identify in exposed stratigraphic sections. Examples of good exposures include the banks of creeks and rivers, gullies, and drainage ditches (**Figure 2**), but sediments can also be investigated through the use of an auger (**Figure 3**).

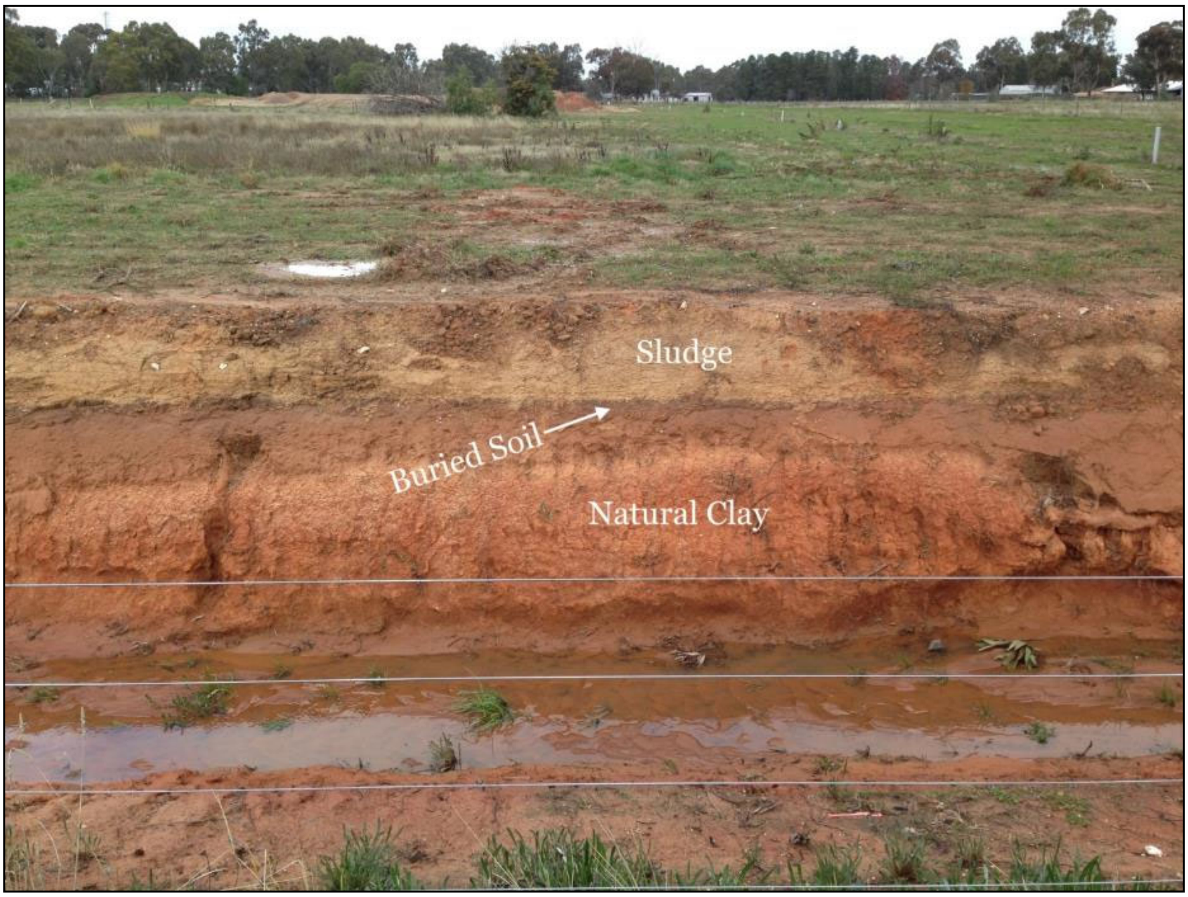

Figure 2. An example of a sludge exposure along a drainage ditch near Bendigo Creek. A CHMP was prepared at this location (CHMP 14621) and Aboriginal cultural heritage was located beneath sludge deposits during subsurface testing. The original ground surface is visible as the dark band situated beneath the buff-coloured material (sludge).

The colour and composition of sludge differs depending upon the material it originated from and the mining technique used to produce it. However, sludge tends to be 'buff-coloured' (a product of its waterborne genesis) and is lighter in appearance than floodplain alluvium and most topsoils. Grainsize alone is not a diagnostic feature as sludge can be anywhere from as fine as talcum powder to as coarse as quartz pebbles (**Figure 6**). Instead of colour or texture look for its tell-tale laminations (horizontal banding). Like rings of a tree, each band represents a single episode of sludge deposition. These are more easily viewed within an auger or a freshly scraped section/baulk (**Figure 3**).

Figure 3. An example of sludge showing within the core of an auger. Note the horizontal laminations and the range of colours and texture.

As sludge is a product of fluvial processes it sometimes contains pebbles, charcoal, European or Aboriginal cultural heritage material carried with it from upstream. In exposed sections this material can appear in long truncated lenses (**Figure 6**). The laminations present within sludge distinguish it from floodplain material, which tends to crack vertically as a result of wetting and drying expansion/contraction cycles **(Figure 4**). It should also be noted that a clear point of contact can typically be observed between sludge and pre-existing ground surfaces (**Figure 5**).

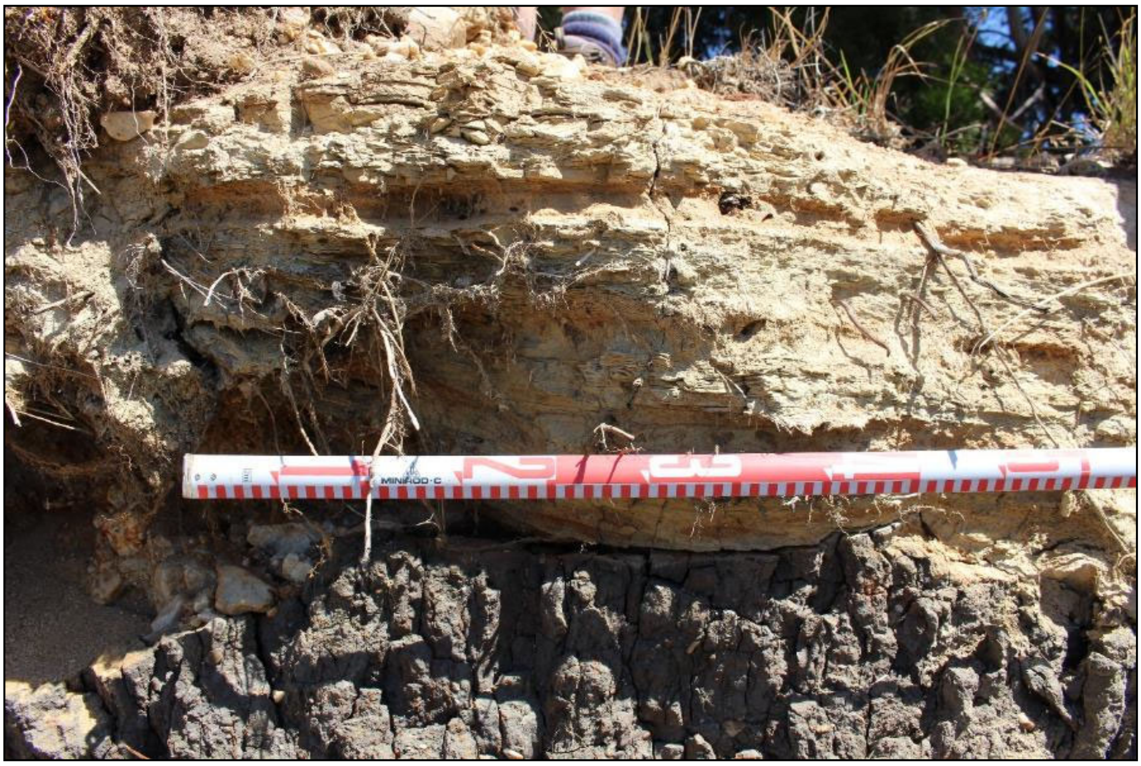

Figure 4. A close-up of sludge produced from quartz crushing overlying floodplain material. Note the contrast between the floodplain's vertical cracking and the horizontal laminations evident in the sludge.

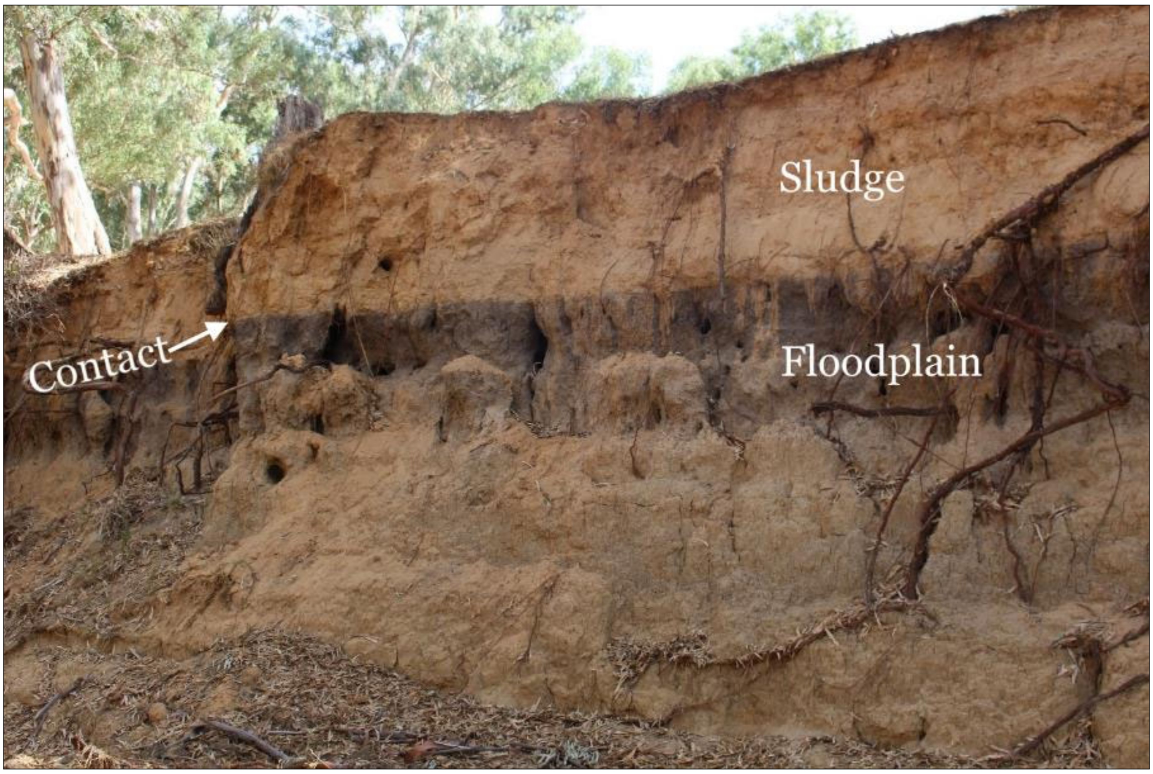

Figure 5. Another exposure of sludge overlying floodplain deposits. Note the clearly defined point of contact.

Figure 6. Another section of exposed sludge along the same drainage ditch as **Figure 2**. Note the variability of colour and grainsize and widely dispersed pebble lenses.

4. IMPLICATIONS OF SLUDGE FOR ABORIGINAL CULTURAL HERITAGE

If an undisturbed ground surface containing Aboriginal cultural heritage is buried by sludge deposits this has implications from an Aboriginal cultural heritage management standpoint (Lawrence et al. 2018; Hil et al. 2020). In 2010, VCAT ruled that Significant Ground Disturbance (SGD) must have affected the 'original' ground surface (Colquhoun & Ors v Yarra CC [2010] VCAT 1710). The same applies to any 'high impact activities' that may have previously affected (or will affect) a given area. This means the depth of any impacts must be greater than the depth of any overlying anthropogenic deposits (not just sludge) to be classed as SGD.

If sludge is anticipated to be present within a particular area, the methodology of a cultural heritage assessment (e.g. conducted as part of a CHMP) should reflect that potential. For example, an archaeological survey taking place as part of a CHMP Standard Assessment may not identify examples of cultural heritage on the surface in sludge-affected areas. In such cases, an absence of cultural heritage material on the ground surface may not be indicative of subsurface absence or the potential for intact cultural deposits to be present, because these will be underneath the sludge, sometimes well below the current ground surface. Moreover, if an area is buried by sludge and later subject to relatively shallow ground disturbance, the surface of that area may appear disturbed even though underlying natural topsoil deposits remain intact. For example, if broken bricks or other examples of modern detritus were identified during an archaeological survey of the localities depicted in **Figures 2** and **6**, the presence of that material would not demonstrate that all (or any) of the original ground surface had been previously disturbed.

Sludge has sometimes been referred to historically as 'swamp cement' (Peterson 1996; Kotsonis & Joyce 2003). When freshly deposited clayey (i.e. fine grained) sludge is exposed to high temperatures it can bake into a hard surface. An archaeologist uncovering sun-baked sludge beneath topsoil during excavation could potentially misidentify it as a culturally sterile basal layer. It is therefore important to have a contextual understanding of a given location prior to subsurface testing to ensure that sludge capping a prior ground surface is not misinterpreted as 'natural clay'.

5. METHODS

The likelihood that mobilised mining waste sediment (sludge) was deposited in each Focus Area was investigated through a combination of historical research and GIS-based spatial analysis.

Datasets relating to Victorian mining were retrieved from online databases and imported into GIS. These data sources included, but were not limited to, shapefiles relating to known areas of shallow gold working, historical mineshafts, publicly accessible borehole data, and the Victorian Heritage Database. A 10-metre-resolution Digital Terrain Model (DTM) was paired with a watercourse polyline to establish relationships between prior mining activities and the sub-catchments of investigated creek and river systems.

Historical maps and gold mining plans were retrieved from online databases and georeferenced within GIS. These maps provided an additional source of information about mining impacts, such as the probable paths of gold leads or areas of previously observed mining activities or impacts. The maps were also checked to investigate whether there was evidence suggesting the course of each waterway had shifted over time. Further sources of historical mining information came from historical newspapers (via Trove), expired and current mining exploration licences, gold mining literature, and governmental reports and inquiries into mining impacts.

5.1 Sludge assessment

Each Focus Area was assessed for the likelihood that sludge had been deposited based on a combination of the following natural and cultural factors:

1. The presence, type, and intensity of upstream mining activity

   Some techniques employed by miners produced greater volumes of sludge than others. Sludge is a waste product of gold extraction that is created when mine tailings are mobilised by water. Methods of mining that relied heavily on the use of water to extract gold from alluvium (such as ground sluicing, puddling, and hydraulic sluicing) produced greater quantities of sludge than shallow gold workings (e.g., mineshafts and prospect pits) or deep lead mining.

2. The position of a Focus Area within a river catchment or sub-catchment

   Areas situated higher up in a catchment have fewer potential upstream sources of mobilised mining sediment, whereas a river that is fed by a significant number of smaller creek and river systems has a greater likelihood of being impacted by sludge.

3. The Focus Area's local topography

   Water flows faster through a steep, narrow river valley than a wide, open floodplain. Higher energy (faster flowing) sections of a river system provide less opportunity for sludge deposition than areas of lower energy/waterflow.

These three factors were dovetailed with the outlined historical research and GIS analysis to rank each study area as having: Negligible potential; Some potential; Moderate potential; or Evidenced potential. 'Evidenced potential' is the assessment result allocated to Focus Areas where specific evidence for sludge impacts was identified (e.g., a newspaper article reports that sludge has impacted a property within or adjacent to that Focus Area).

5.2 Mining assessment

A four-tier ranking system was also used for assessing the potential for mining impacts within each Focus Area: Negligible; Some potential; Moderate potential; or Evidenced potential.

Negligible was used in situations where no evidence of mining within or in the vicinity of a Focus Area was identified in mining datasets, the VHD, or through historical research. 'Some potential' was used in situations where a particular waterway or general location was known to have been worked by miners, but there is no evidence to suggest it took place within the Focus Area. Moderate potential was used for examples where mining took place within the immediate vicinity and the historical record does not rule out that it may have occurred within the Focus Area. 'Evidenced potential' was reserved for examples where evidence was identified that strongly suggested mining took place specifically within a Focus Area.

6. RESULTS

Figures 7a and **7b** show the path of the combined WVTNP CHMP Activity Areas from Waubra (Burnbank Creek) to Sydenham (Taylors Creek) in relation to major river catchments and the shallow workings dataset. A full list of Focus Area rankings is presented in **Table 1**.

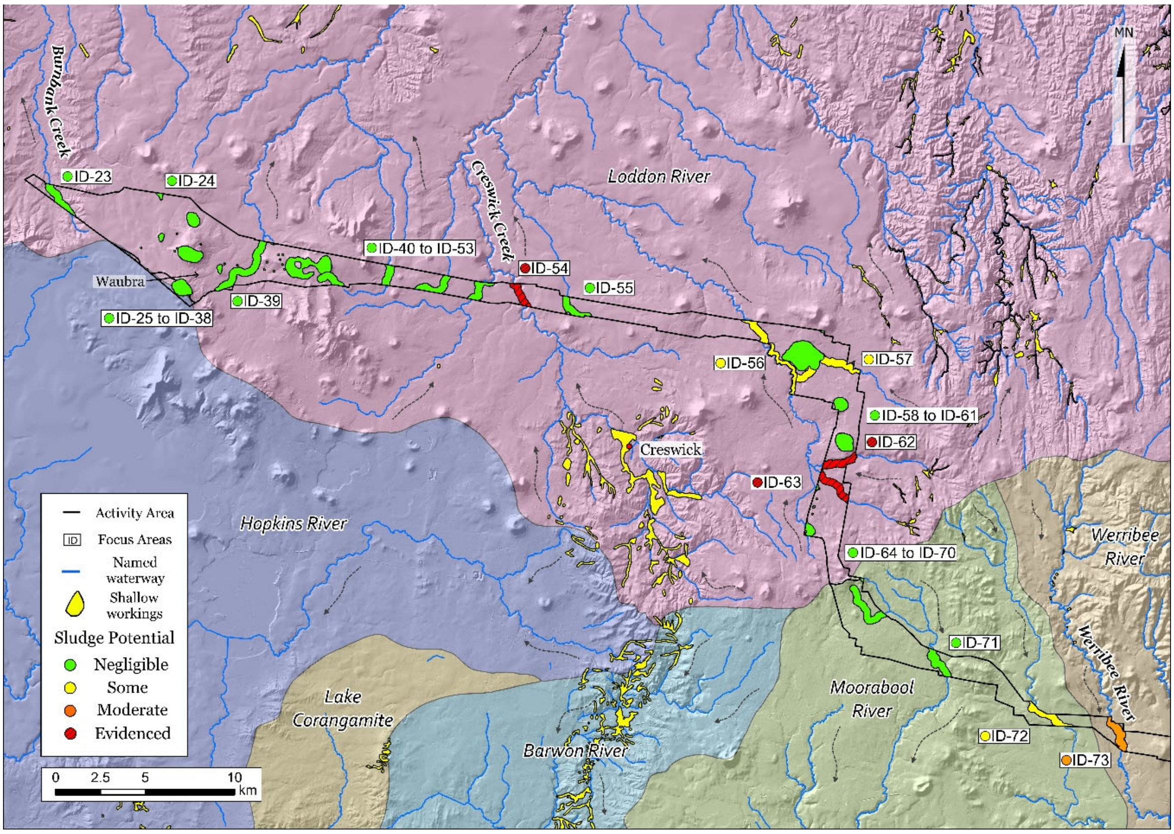

Figure 7a. The WVTNP Activity Area from Burnbank Creek to Werribee River overlying a 10-metre DTM, major river catchments, named waterways, the shallow workings dataset, and sludge potential rankings for Focus Areas **ID-23** to **ID-73**. The concentration of shallow workings near centre relate to the Creswick goldfield.

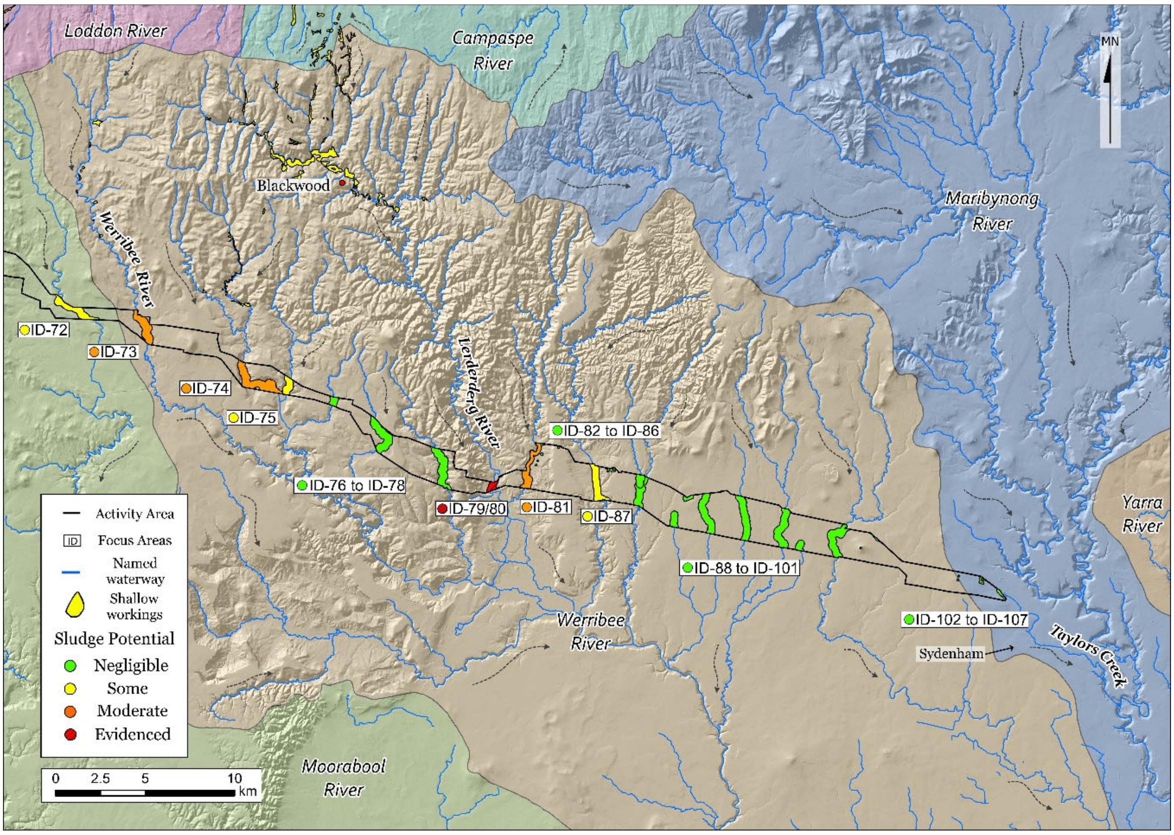

Figure 8b. The WVTNP Activity Area from Werribee River to Taylors Creek overlying a 10-metre DTM, major river catchments, named waterways, the shallow workings dataset, and rankings for Focus Areas **ID-23** to **ID-73**. The concentration of shallow workings near the top-left corner relate to the Blackwood goldfield.

As shown in **Figures 7a** and **7b**, this portion of the WVTNP Activity Area intersects five major river catchments (the Loddon, Hopkins, Moorabool, Werribee, and Maribyrnong Rivers). The two largest concentrations of historical gold workings within those catchments are the Creswick and Blackwood goldfields. As indicated by the shallow workings dataset, these areas represent, by far, the greatest extent of alluvial gold working upstream of the Activity Area, and both are known to have produced significant volumes of sludge. However, whilst the gold workings associated with the two goldfield areas are spread across many square kilometres, the topography is such that their discharged waterborne sediment (sludge) was funnelled downstream into just two major waterways, Creswick Creek and the Lerderderg River. The three Focus Areas associated with those two waterways (**ID-54**, **ID-79**, and **ID-80**) were undoubtedly affected by sludge, but their local topography limited the extent of that impact to those three Focus Areas. As a result, whilst Creswick Creek (**ID-54**) is known to have carried significant volumes of sludge, Glendaruel Creek (**ID-53**) and Tourello Creek (**ID-55**)—to its east and west, respectively— had negligible potential to maintain sludge deposits.

The Focus Areas associated with the Lerderderg River (**ID-79** and **ID-80**) are likely to have prior ground surfaces that are now buried beneath mining sediment. If present, those capped ground surfaces are likely to extend both upstream and downstream of the Activity Area across the adjacent floodplain areas. The full extent of downstream areas affected by sludge produced by the Blackwood goldfield has yet to be established, but it may include areas many kilometres further downstream.

Outside of the Creswick and Blackwood goldfields there was also high intensity alluvial mining activities upstream of Rocky Lead Creek (**ID-62**) and Pinchgut Creek (**ID-63**)—with both described as carrying significant volumes of sludge during the nineteenth centuries within government inquiries and historical newspapers. Mining activities upstream of those areas included shallow alluvial mining, hydraulic sluicing, deep lead mining, and dredging. Evidence of similarly intensive mining activities were also identified along and upstream of Werribee River, Korjamnunnip Creek, and Goodman Creek. However, in those locations no explicit historical references to sludge affecting Focus Areas were identified. Based on the intensity of those mining activities there is still moderate potential for sludge, along with buried ground surfaces, to be identified along those waterways and within those Focus Areas.

Not showing in **Figures 7a** and **7b** are thousands of mineshafts, quarry sites, and other features associated with mining that are also likely to have produced sludge and contributed to the risk rankings given to each Focus Area.

There were four Focus Areas that are evidenced to have been impacted by localised mining activities (Birch Creek, Bullarook Hill, Stony Hut Creek, and Goodman Creek). However, none of those Focus Areas intersected the shallow workings dataset—with evidence coming instead from datapoints associated with mining activities (such as quarries, gravel pits, boreholes, and unnamed mineshafts). Overall, none of the Focus Areas appear likely to have been greatly impacted by mining activities beyond the effects of sludge, which has possibly capped prior ground surfaces.

Some evidence of historical waterway movement within the Focus Areas was identified during this review. Historical maps of Glendaruel Creek (**ID-53**), for example, suggested the waterway was fairly mobile between 1855 and 1882. However, it is difficult to rule out the potential for inaccurate surveys of this lesser-known waterway during the nineteenth century. Werribee River (Focus Area **ID-73**) also experienced some historical alteration in the form of an embankment and a straight cutting that was made between two of its bends sometime prior to 1937.

The importance of establishing the history of local dams and reservoirs when considering the potential for sludge to have affected downstream areas has also been highlighted by this review. These water storage features capture and accumulate waterborne sediment through time. It stands to reason that the construction of a large reservoir would significantly reduce the downstream impact of upstream mining activities. As such, it is important to determine the date a reservoir was first constructed in relation to any identified upstream mining activities. In some cases, miners were also prohibited from discharging sediment into waterways that fed into reservoirs (e.g., Langdons Creek and Hepburn Lagoon– see **ID-57** and **ID-58**). This ban occurred decades before all Victorian miners were prohibited from doing the same to all waterways. For example, Newlyn Reservoir on Birch Creek, is likely to have captured waterborne sediments discharged from both Rocky Lead Creek and Pinchgut Creek following its construction in 1873, which contributed to the reduction of Birch Creek's (Focus Area **ID-56**) potential to maintain deposits of sludge from 'moderate' to 'some.' The catastrophic failure of Hepburn Lagoon dam in 1870 (sending 400 million gallons of water into Birch Creek within 15 minutes), is also likely to have scoured sediments previously captured in the bed and banks of waterways situated downstream.

Lastly, it is important to note that although historical mining provides one example of a highly intensive landscape change activity. There are countless other examples of historical landscape change that may have also altered pre-colonial ground surfaces during the nineteenth and early twentieth centuries. An absence of upstream historical mining does not preclude the potential for pre-colonial ground surfaces to have been capped within a given area, any more than the absence of local mining activities preclude the potential ground surfaces to have been altered through other forms of localised surficial disturbance.

Table 1. A summary of the rankings given for each Focus Area.

RAP/Admin Area	Location	Focus Area	Sludge Potential	Mining Potential
DDWCAC	Burnbank Creek	ID-23	Negligible	Some
DDWCAC	Koo Wee Rup Plain	ID-24	Negligible	Negligible
WTOAC	Near Waubra	ID-25	Negligible	Negligible
DDWCAC	Near Waubra	ID-26	Negligible	Negligible
DDWCAC	Near Waubra	ID-27	Negligible	Negligible
DDWCAC	Volcanic Cone	ID-28	Negligible	Negligible
WTOAC	Near Waubra	ID-29	Negligible	Negligible
DDWCAC	Near Waubra	ID-30	Negligible	Negligible
DDWCAC	Near Waubra	ID-31	Negligible	Negligible
WTOAC/DDWCAC	Volcanic Cone	ID-32	Negligible	Negligible
DDWCAC	Volcanic Cone	ID-33	Negligible	Negligible
DDWCAC	Volcanic Cone	ID-34	Negligible	Negligible

DDWCAC	Near Waubra	ID-35	Negligible	Negligible
DDWCAC	Near Waubra	ID-36	Negligible	Negligible
DDWCAC	Near Waubra	ID-37	Negligible	Negligible
DDWCAC	Near Waubra	ID-38	Negligible	Negligible
DDWCAC	Mount Greencock Creek	ID-39	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-40	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-41	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-42	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-43	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-44	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-45	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-46	Negligible	Negligible
DDWCAC	Near Mount Bolton	ID-47	Negligible	Negligible
DDWCAC	McCallum Creek	ID-48	Negligible	Negligible
DDWCAC	Volcanic Cone	ID-49	Negligible	Negligible
DDWCAC	Beckworth Creek	ID-50	Negligible	Negligible
DDWCAC	Beckworth Creek	ID-51	Negligible	Negligible
DDWCAC	Kilkenny Creek	ID-52	Negligible	Negligible
DDWCAC	Glendaruel Creek	ID-53	Negligible	Negligible
DDWCAC	Creswick Creek	ID-54	Evidenced	Negligible
DDWCAC	Tourello Creek	ID-55	Negligible	Negligible
DDWCAC	Birch Creek	ID-56	Some	Evidenced
DDWCAC	Langdons Creek	ID-57	Some	Negligible
DDWCAC	Hepburn Lagoon	ID-58	Negligible	Negligible
DDWCAC	Volcanic Cone	ID-59	Negligible	Negligible
DDWCAC	Green Hill	ID-60	Negligible	Negligible
DDWCAC	Bullarook Hill	ID-61	Negligible	Evidenced
DDWCAC	Rocky Lead Creek	ID-62	Evidenced	Some
DDWCAC	Pinchgut Creek	ID-63	Evidenced	Some
DDWCAC	Birch Creek	ID-64	Negligible	Negligible
DDWCAC	Near Dean	ID-65	Negligible	Negligible
DDWCAC	Near Dean	ID-66	Negligible	Negligible
DDWCAC	Near Dean	ID-67	Negligible	Negligible
DDWCAC	Birch Creek	ID-68	Negligible	Negligible
WTOAC	Musk Creek	ID-69	Negligible	Negligible
WTOAC	Devils Creek	ID-70	Negligible	Negligible
WTOAC	Moorabool River West	ID-71	Negligible	Negligible
WTOAC	Moorabool River East	ID-72	Some	Negligible
WTOAC/WWWCHAC	Werribee River	ID-73	Moderate	Negligible
WWWCHAC	Korjamnunnip Creek	ID-74	Moderate	Negligible
WWWCHAC	Dale Creek	ID-75	Some	Negligible
WWWCHAC	Stony Hut Creek	ID-76	Negligible	Evidenced
WWWCHAC	Myrniong Creek	ID-77	Negligible	Negligible
WWWCHAC	Korkuperrimul Creek	ID-78	Negligible	Negligible
WWWCHAC	Lerderderg River	ID-79	Evidenced	Negligible
WWWCHAC	Lerderderg River	ID-80	Evidenced	Negligible
WWWCHAC	Goodman Creek	ID-81	Moderate	Evidenced
WWWCHAC	Near Goodman Creek	ID-82	Negligible	Negligible
WWWCHAC	Near Goodman Creek	ID-83	Negligible	Negligible
WWWCHAC	Near Goodman Creek	ID-84	Negligible	Some
WWWCHAC	Near Goodman Creek	ID-85	Negligible	Some
WWWCHAC	Near Goodman Creek	ID-86	Negligible	Negligible
WWWCHAC	Merrimu Reservoir	ID-87	Some	Negligible
WWWCHAC	Near Coimadai	ID-88	Negligible	Negligible
WWWCHAC	Near Coimadai	ID-89	Negligible	Negligible
WWWCHAC	Near Coimadai	ID-90	Negligible	Negligible
WWWCHAC	Boggy Creek	ID-91	Negligible	Negligible
WWWCHAC	Djerriwarrh Creek	ID-92	Negligible	Negligible
WWWCHAC	Arnolds Creek West	ID-93	Negligible	Negligible
WWWCHAC	Koo Wee Rup Plain	ID-94	Negligible	Negligible
WWWCHAC	Arnolds Creek East	ID-95	Negligible	Negligible
WWWCHAC	Little Blind Creek	ID-96	Negligible	Negligible
WWWCHAC	Toolern Creek	ID-97	Negligible	Negligible
WWWCHAC	Ryans Creek	ID-98	Negligible	Negligible
WWWCHAC	Kororoit Creek	ID-99	Negligible	Negligible
WWWCHAC	Near Kororoit Creek	ID-100	Negligible	Negligible
WWWCHAC	Swamp/Wetland	ID-101	Negligible	Negligible
WWWCHAC	Near Sydenham	ID-102	Negligible	Negligible
WWWCHAC	Near Sydenham	ID-103	Negligible	Negligible
WWWCHAC	Near Sydenham	ID-104	Negligible	Negligible
WWWCHAC	Near Sydenham	ID-105	Negligible	Negligible
WWWCHAC	Near Sydenham	ID-106	Negligible	Negligible
WWWCHAC	Taylors Creek	ID-107	Negligible	Negligible

6.1 – ID-23 – Area of Cultural Heritage Sensitivity (Burnbank Creek)

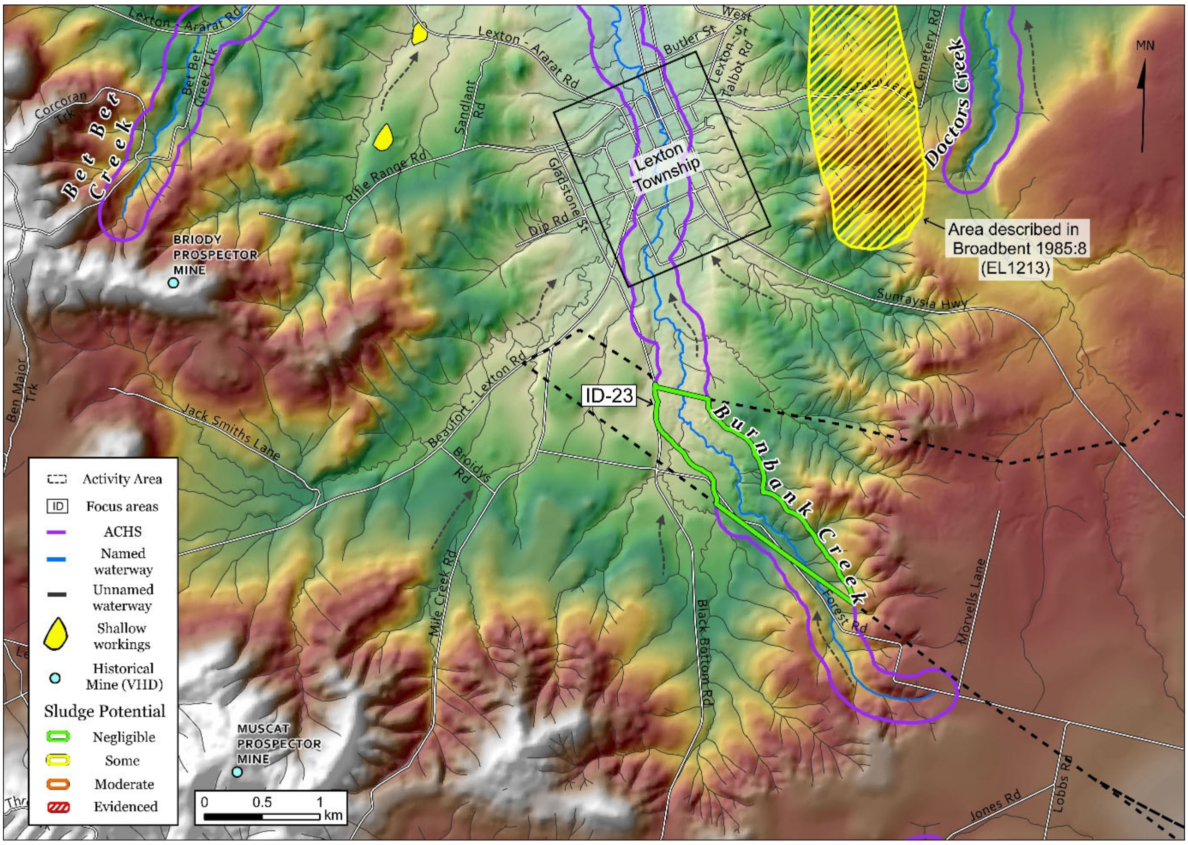

Figure 9. A 10-metre Digital Terrain Model (DTM) of Focus Area **ID-23** along Burnbank Creek. The narrow upper reach of Burnbank Creek is not suitable for sludge accumulation and no evidence for upstream mining was identified within the Focus Area. However, based on the evidence of historical mining in the Lexton area and historical mining sites recorded downstream, there does remain some potential for historical mining to have impacted the survey area. A downstream area with several observed sections of historical gold workings (described in 1985) is denoted through yellow hashing.

Potential for Sludge: Negligible

- Focus Area **ID-23** (**Figure 8**) is situated along the upper reaches of Burnbank Creek, with no identified evidence that definitively places mining activities upstream.
- The Focus Area (**ID-23**) is mostly situated at the top of a narrow valley, which is not conducive to sludge accumulation.

Potential for Mining: Some

- No evidence for mining activity within **ID-23** in mining datasets or the VHD was identified.
  - There is evidence of shallow gold workings 1.5 km west of the Lexton township, which is over 3 km metres northwest and downstream of the focus area.
- Historical research indicates some shallow alluvial mining took place in some localised sections of Burnbank Creek, but no evidence was identified that places that mining within **ID-23**. A 1985 field survey associated with mining Exploration Licence 1213 observed 'several small patches of high-level gravels which have been variably pitted and, in some cases, sluiced, by 19th century prospectors' within an area beginning 1.8 km north of **ID-23** (**Figure 8**). As those areas of observed gold working occur downstream of the focus area, the potential for sludge within **ID-23** remains negligible. However, there does remain some potential for evidence of mining to be identified within Focus Area.
  - Some maps label the unnamed waterway to the west of the creek 'Burnbank Creek' as well (Wall and Bennett 1979).

Historical research (selected passages)

- *The Ballarat Star* (April 9th, 1895)
  - 'LEXTON MINING – A few miners are obtaining small quantities of gold a short distance from the township, on the Burnbank Creek. So far, no defined lead can be found, only small particles here and there. It is a great pity something payable cannot be found; it would enliven our sleepy hollow, and provide work for a large number of the unemployed.'
    - Lexton is 2 - 3 km north of the northernmost reaches of **ID-23**

        - No indication what direction from the township the newspaper entry is referring to, but there is evidence of shallow gold working 1.5 km to the west of Lexton.

    - *Gold and Minerals* (Baragwanath 1946:112;158):
        - ‘Lexton goldfield is chiefly of interest as being the site on Burnbank Creek of a reputed gold discovery many years before workable goldfields were found but interest which arose in consequence of this discovery led to prospectors eventually finding Ballarat, Clunes, and other fields. The area of shallow alluvial in the neighbourhood of Lexton is comparatively small and was never rich. Sinking was shallow.’ (112)
        - ‘Burnbank Creek, passing through Lexton, was the site of one of the earliest gold discoveries in the State but notwithstanding its early discovery, very little alluvial or quartz mining was carried out in the neighbourhood.’ (158)
    - *EL1213* (Broadbent 1985:4):
        - ‘Bulk CN leach anomalies ranging up to 3175 parts per trillion over a background of less than 50 ppt to 300 ppt were obtained, mostly in the major drainage of Burnbank Creek, which was worked for alluvial gold in places… …An inspection of the area revealed several small patches of high-level gravels which have been variably pitted and, in some cases, sluiced, by 19th century prospectors. These appear to be the most likely source for the anomalies. Two 1.5 km lines of 50 metre spaced soil samples were collected on roadside traverses spaced 3.5 km apart to determine whether there is any possibility that the gold in the gravels was locally derived.’ (**Figure 8**).

Waterway movement

- An unnamed 1852 map depicts a 500-metre-long section of Burnbank Creek within **ID-23** (the portion closest to Lexton). That mapped section suggests that no significant changes to the creek’s course have taken place since that date.
- The course of Burnbank Creek also appears largely unchanged from its current alignment in a map from 1883 (Hunter 1883).

Historical Maps

HUNTER, S.B., 1883. Parish of Lexton geological map 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 2718/G/1.

Unnamed, 1852. ‘Rough Plan of Proposed Township and Agricultural Reserve at Burn Bank Pyrenees’, Public Records Office Victoria, VPRS 8168.

Wall, S. and Bennett, W.J. 1979. Map No. 3 Beaufort. Deep Lead Gold Deposits in Victoria. Bulletin No. 62.

References

Baragwanath, W. 1946. Gold and Minerals. Special report to Victoria Department of Mines.

Broadbent, G.C. 1985. EL 1213 LEXTON, VICTORIA STATUTORY. SIX MONTHLY REPORT FOR PERIOD ENDING 16th SEPTEMBER 1985. Unpublished report to CRA Exploration Pty. Limited.

LEXTON MINING. (1895, April 9). *The Ballarat Star (Vic: 1865 - 1924)*, p. 4. from http://nla.gov.au/nla.news-article203154228

6.2 – ID-24 to ID-39 – ACHS (between Burnbank Creek and Mount Greencock Creek)

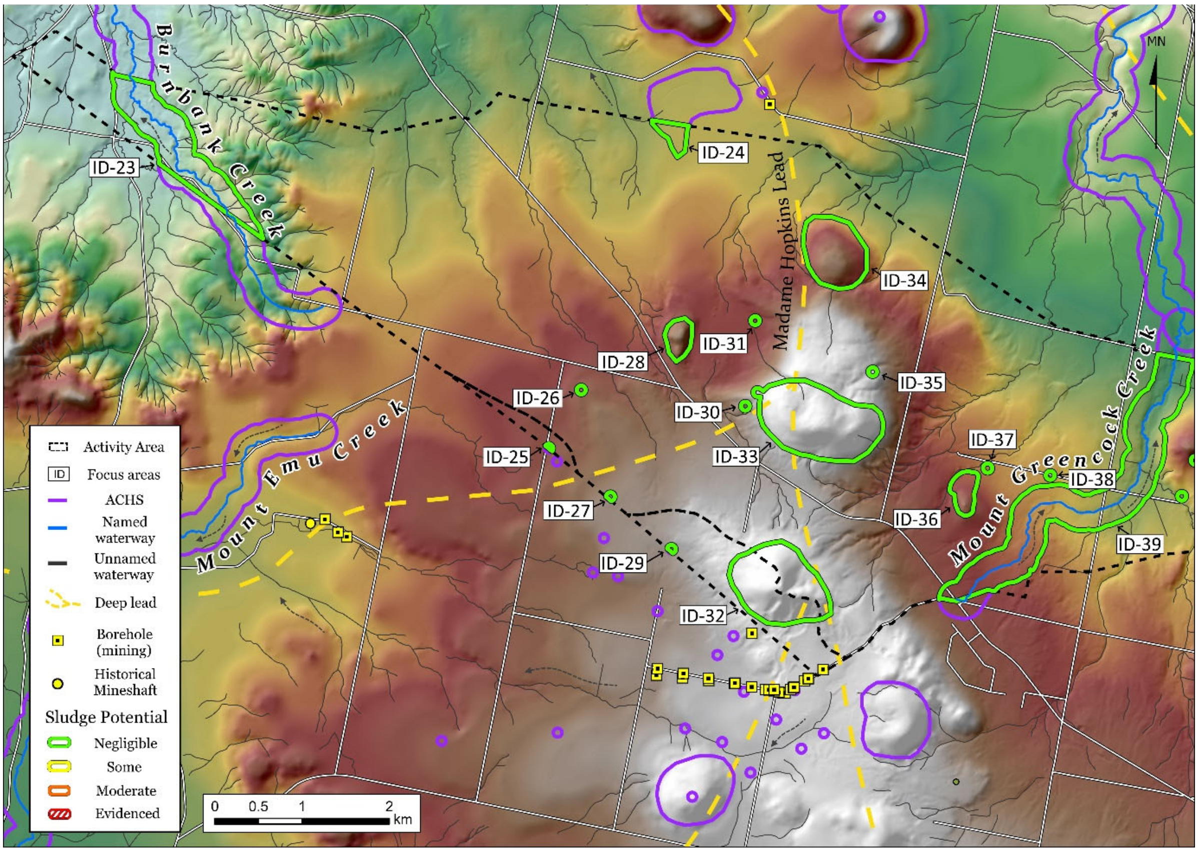

Figure 10. A 10-metre Digital Terrain Model (DTM) of Focus Areas **ID-24** to **ID-39**. No evidence of historical mining activity was identified within or surrounding Focus Areas **ID-24** to **ID-39** across digitised mining datasets/literature or the VHD. The absence of upstream historical mining activity across the Focus Areas suggests a negligible potential for sludge.

Potential for Sludge: Negligible

- Focus Area **ID-24** is an ACHS associated with a section Koo Wee Rup Plain with no identified evidence of upstream historical mining and negligible potential for sludge (**Figure 9**).
- Focus Areas **ID-25** to **ID-38** are ACHS associated with, or downslope of, volcanic cones that surround Waubra. No evidence of gold mining activities were identified within or upslope of these focus areas and these thus have a negligible potential for sludge.
- Focus Area **ID-39** is an ACHS associated with Mount Greencock Creek, which had no identified evidence of upstream historical gold mining activities and thus also has a negligible potential for sludge.

Potential for Mining: Negligible

- No evidence for mining activity within or upstream/upslope of Focus Areas **ID-24** to **ID-39** was identified in mining datasets/literature or the VHD.
- No evidence for mining activity upstream or along Mount Greencock Creek (**ID-39**) was identified in mining datasets/literature or the VHD.
- The gold-bearing Madame Hopkins Deep Lead passes beneath this section of the WVTNP Activity Area (depicted by a gold dashed line in **Figure 9**). The deep lead extends over 50 kilometres from Wareek (northwest of Maryborough) to Windermere (west of Ballarat) and its trajectory has been inferred through boreholes and a limited number of mineshafts. The lead was first targeted by miners in the 1890s to the northeast of Lexton, with unsatisfactory results—followed by additional attempts seven kilometres north of the Activity Area between 1900 and the 1930s. A transect of prospection boreholes are shown in **Figure 9** running east/west to the south of the Activity Area (downslope of **ID-32**). Gold mining exploration is continuing across this section of the Madame Hopkins Deep Lead under Exploration Licence 5301. However, given the significant depth of the deep lead's gold-bearing deposits, any surficial disturbances by gold miners would likely correspond to boreholes or mineshafts, across a limited surface area.

Historical research (selected passages)

- *Deep Lead Deposits of Victoria* (Canavan 1988:28)
  - 'No underground mining was attempted on the Madame Hopkins Lead until the 1890s when the New Madame Hopkins Company sank a shaft (Lat. 37°04'; Long. 143°341). Difficulty with running sand and excess water prevented the shaft from reaching bottom. According to Hunter the site of the shaft was chosen incorrectly. The next attempt

to work the lead was made by 'Talbot Alluvial'. Work was ineffective and was interrupted by the First World War. Only 6,700 m3 of wash was extracted having a grade of about 9-5 g/m^3. Title to the ground was acquired in 1930 by an English company which formed Talbot Alluvials Ltd, Madame Hopkins G.M. Co. Ltd, Homebush G.M. Co. Ltd and Lamplough G.M. Co. Ltd. Only the first three companies held leases and only Talbot Alluvials Ltd undertook underground work. They operated through the old shaft of 'Talbot Alluvial' and through a new shaft, 'Norbury's', 4·5 km to the northwest. Underground development and exploration appear to have been satisfactory; the latest machinery and pumping equipment were used, and production of gold was commenced. Nevertheless, water problems, other mining problems, and possibly inexperience in deep lead mining, forced the mine to close in 1940.'

    - This passage refers to works along the Madame Hopkins Deep Lead to the north of and thus outside of the WVTNP Activity Area. It suggests there had been limited exploration of the Madame Hopkins Deep Lead across the Activity Area by 1988.

- *EL 5301* (D'Auvergne 2017)
    - 'No significant gold mineralisation has been recognised in the Ordovician rocks in EL 5301. The north trending Madame Hopkins deep lead bisects the tenement. The origin of its gold is believed to be from an unidentified source further afield. The definition of the lead is relatively poor at the southern (upstream) end but becomes better defined as it deepens northwards.'

Waterway movement

- No evidence identified

Historical maps

- No relevant coverage identified

References

Canavan, F., 1988. *Deep lead gold deposits of Victoria*. Geological Survey of Victoria Bulletin 62. Department of Minerals and Energy, Victoria, 101 pp.

D'Auvergne, P., 2017. Petra Minerals Pty Ltd. EL 5301, Madame Hopkins. Partial relinquishment report, period ending 19 October 2017. Earth Resources Division Expired Exploration Reports File.

6.3 – ID-40 to ID-50 – ACHS (between Mount Greencock Creek and Beckworth Creek)

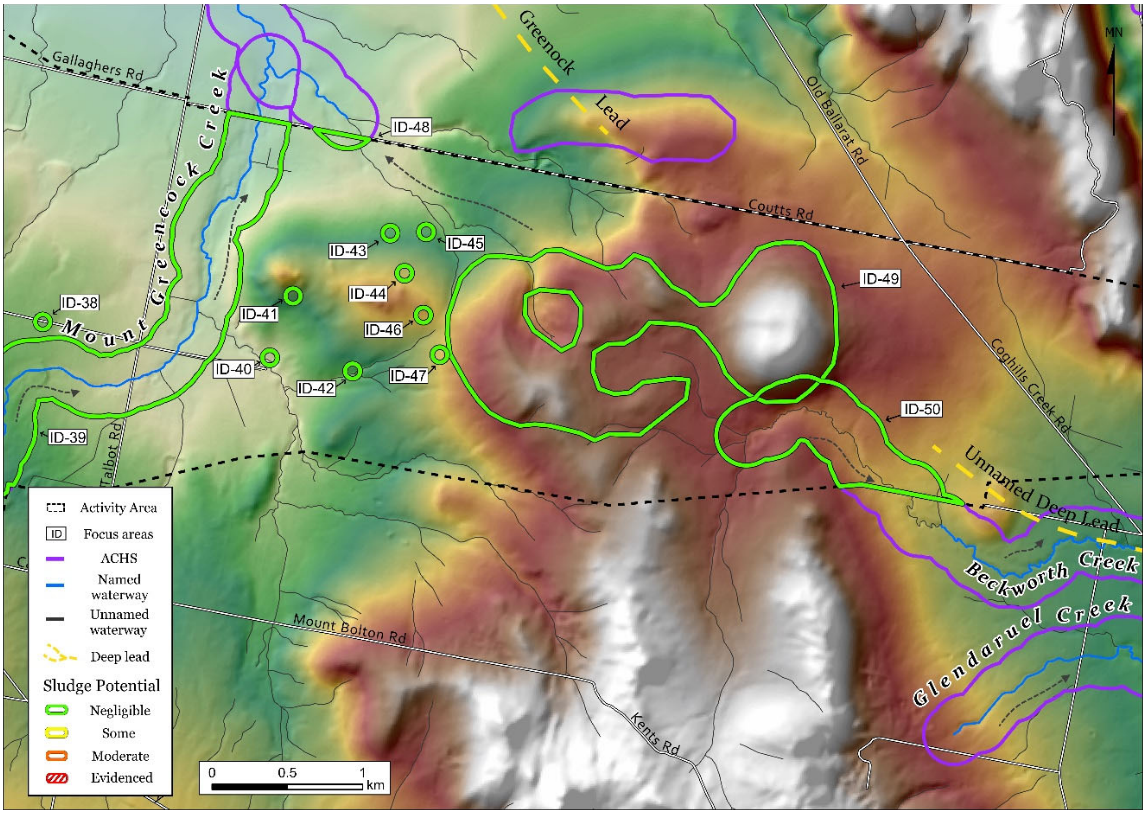

Figure 11. A 10-metre Digital Terrain Model (DTM) showing Focus Areas **ID-40** to **ID-50** between Mount Greencock Creek and Beckworth Creek. No evidence of historical mining activity was identified within or surrounding Focus Areas **ID-40** to **ID-50** across digitised mining datasets/literature or the VHD. The absence of upstream historical mining activity suggests a negligible potential for sludge.

Potential for Sludge: Negligible

- Focus Areas **ID-40** to **ID-47** are situated across undulating ground between Mount Greencock Creek and an ACHS associated with volcanic cones southwest of Mount Beckworth (**Figure 10**). No evidence of mining was identified across digitised mining datasets/literature or the VHD either upstream of Mount Greencock Creek or upslope. These focus areas thus have negligible potential for sludge.
- Focus Area **ID-49** is an ACHS associated with a volcanic cone with no identified evidence of historical mining across digitised mining datasets/literature or the VHD and thus has negligible potential for sludge.
- Focus Area **ID-50** is an ACHS associated with Beckworth Creek, which had no identified evidence of upstream historical mining across digitised mining datasets/literature or the VHD and thus has negligible potential for sludge.

Potential for Mining: Negligible

- No evidence for mining activity within Focus Areas **ID-40** to **ID-50** was identified either in mining datasets/literature or the VHD.
- In 1999, an archaeological field survey (associated with CHMP 1226) was conducted by Andrew Long & Associates of 2 km^2 between Mount Greencock Creek (**ID-39**) and the west side of Focus Area **ID-49**. The purpose of the survey was to identify unrecorded Aboriginal or historical archaeological places/sites (Long 1998). No historical features associated with mining were identified during that survey. The potential for historical mining impacts across Focus Areas **ID-40** to **ID-47** are thus negligible.
- No evidence for mining activity was identified across the upper reaches of Beckworth Creek (**ID-50**), either in mining datasets/literature or the VHD.

Waterway movement

- No evidence identified

Historical research

- No historical evidence for mining across these Focus Areas was identified

References

Long, A. 1998. *Fraser's Plantation, Waubra; A Pre-Afforestation Archaeological Survey.* An unpublished report prepared for Aboriginal Affairs Victoria and Heritage Victoria by Andrew Long & Associates (CHMP report 1226).

6.4 – ID-51 to ID-53 – ACHS – Beckworth Creek, Kilkenny Creek, and Glendaruel Creek

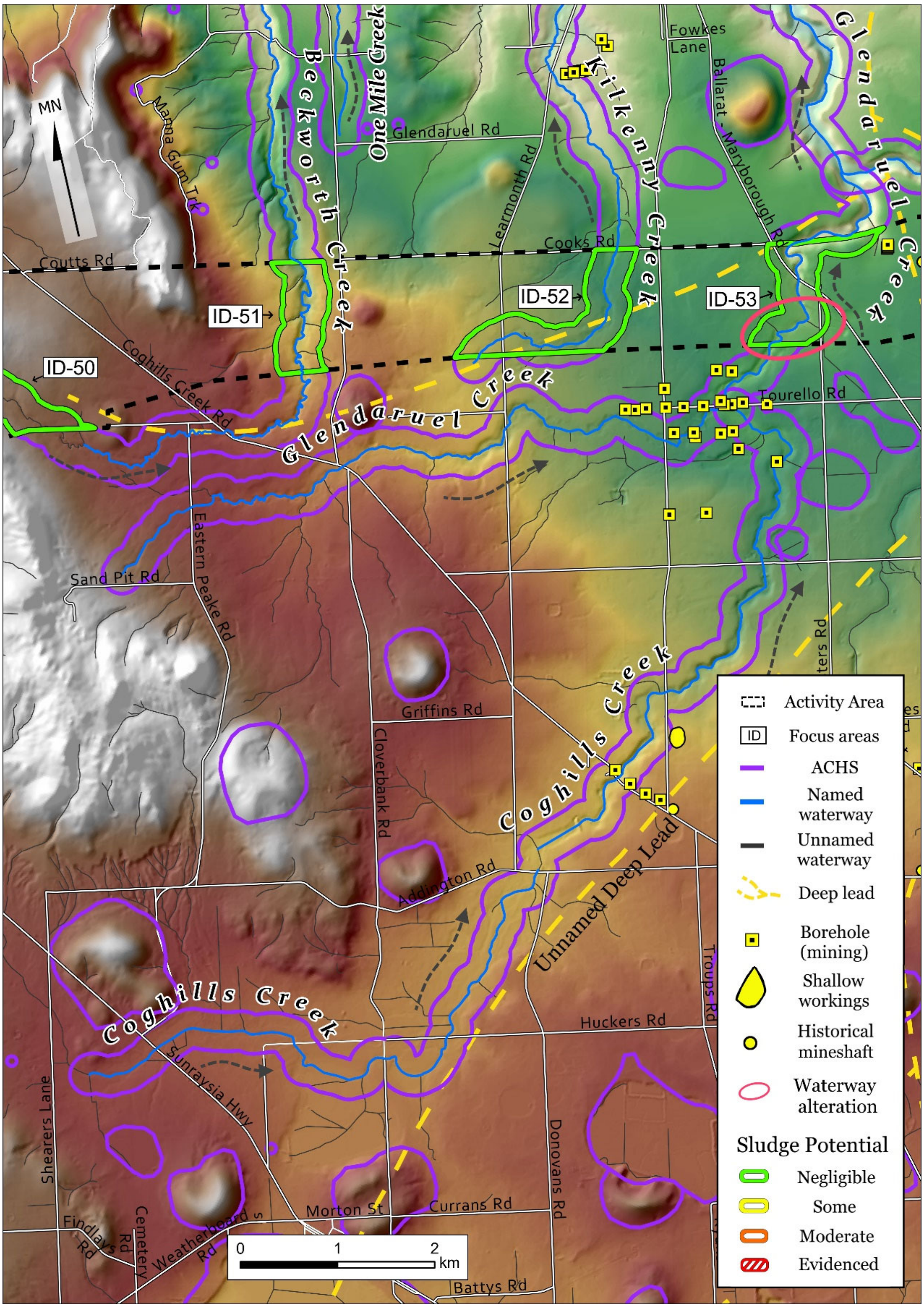

Figure 12. A 10-metre Digital Terrain Model (DTM) showing Focus Areas **ID-51** to **ID-53** associated with Beckworth Creek, Kilkenny Creek, and Glendaruel Creek. No evidence of historical mining activity was identified within or upstream of Focus Areas **ID-51** and **ID-52** across digitised mining datasets/literature or the VHD. The upstream watershed of **ID-53** has some evidence of historical mining activity, but that activity is mostly associated with deep lead prospection, and therefore the potential for sludge in **ID-53** is negligible.

Potential for Sludge: Negligible

- Focus Areas **ID-51** is associated with a section of Beckworth Creek downstream of Focus Area **ID-50** (**Figure 11**). No evidence of mining was identified across digitised mining datasets/literature or the VHD within or upstream of this section of the creek. This Focus Areas thus has negligible potential for sludge.

- Focus Area **ID-52** is an ACHS associated with a section of Kilkenny Creek. No evidence of mining was identified across digitised mining datasets/literature or the VHD within or upstream of this section of the creek. This Focus Area thus has negligible potential for sludge
- Focus Area **ID-53** is an ACHS associated with a section of Glendaruel Creek. Upstream of the Focus Area, along Glendaruel Creek, are 24 boreholes associated with gold mining. The boreholes, which were drilled between 1967 and 1998, were used to establish the depth/condition of deep lead gold deposits and are not representative of significant upstream surficial disturbance in the area. Coghills Creek intersects Glendaruel Creek further upstream and also has deep lead boreholes (drilled in the 1890s) as well as an historical mineshaft and a small patch of shallow gold workings (Mines Department Victoria 1890). Although these features are indicative of gold mining activity, the amount of sediment produced from their works, as well as their distance upstream of the Activity Area suggest a negligible potential for sludge within **ID-53**.

Potential for Mining: Negligible

- No evidence for mining activity within Focus Areas **ID-51**, **ID-52**, or **ID-53** was identified either in mining datasets/literature or the VHD.
- A mapped, unnamed deep lead passes through **ID-52** and **ID-53**. However, as no boreholes were identified across this section of the lead, its mapped location appears to be speculative rather than being associated with prior mining activities. Therefore, the potential for mining impacts across these two Focus Areas is negligible.

Waterway movement

- Historical maps of lands around Mount Beckworth suggest the course of Beckworth Creek (through Focus Area **ID-51**) has remained largely unchanged from the 1850s to the present day (VDSM 1855; DLS 1875; Murray & Taylor 1883).
- Kilkenny Creek was not identified in maps pre-dating 1883 (within Focus Area **ID-52**). However, a map from 1883 suggests the creek's course has remained largely unchanged from 1883 to the present day (Murray & Taylor 1883).
- Maps of Glendaruel Creek (Focus Area **ID-53**) dating from 1855, 1875, and 1882 suggest changes the creek's course through the southern-half of the focus area (marked in pink in **Figure 11**). **Figure 12** shows the creek's course in 1855 (yellow line) and 1875 (dashed red line) against a modern creek line (blue). Maps from the 1880s depict the creek on its current trajectory (GSV 1882; Murray & Taylor 1883). Aerial imagery suggests the dam was constructed between 1961 and 1976 and is therefore not likely to be responsible for this change in alignment.

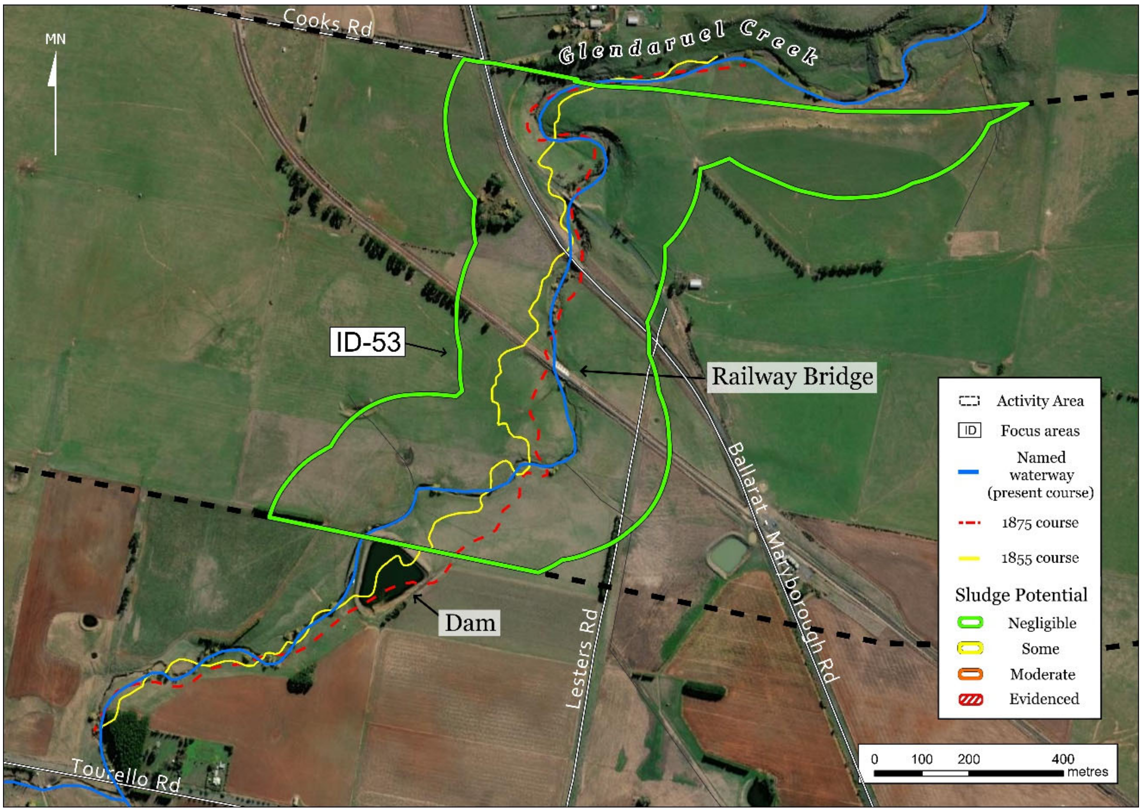

Figure 13. Aerial image of Focus Area **ID-53** along Glendaruel Creek. Traced sections of the creek's course from 1855 and 1875 are shown.

Historical maps

Department of Land and Survey. 1875. *Glendaruel Countries of Talbot and Ripon*. Held: Public Records Office Victoria (VPRS 8168/P0002, PROCG6).

Geological Survey of Victoria. 1882. *Learmonth (with notes)* 1:31,680 (40 chains:1 inch) geological map Plan No GF36. Department of Mines, Victoria.

Murray, R.A.F. & Taylor, D. 1883. *Clunes, Mt Greenock and Talbot Goldfields* 1:31,680 (40 chains:1 inch) geological map. Department of Mines, Victoria.

Victoria Division of Survey Mapping. 1855. *Beckworth and Glendaruel. Country Lands near Mount Beckworth. McCullums Creek*. Held: Public Records Office Victoria (VPRS 8168/P0002, CN95).

Victoria Surveyor General's Office. 1855, *Lands in the parishes of Glendaruel and Ascot, between 11 & 17 miles N.W. from Ballaarat around Mt. Cavern and Coghills home-station, Counties of Talbot and Ripon*, Surveyor General's Office, Melbourne.

Historical research

- No historical evidence for mining within these Focus Areas was identified

References

Mines Department Victoria. 1890. *Boring for gold, Ballarat Mining District. Windermere, Ballarat Common, Coghills Creek, Berry No 1 (Smeaton), Hepburn Estate (Smeaton), Clunes, Warrenheip and Lal Lal. Parishes of Dowling Forest, Glendaruel, Spring Hill, and Eglinton*. Annual report of the Secretary for Mines for the year 1890. Mines Department, Victoria, pp. 78-86.

6.5 – ID-54 – ACHS Creswick Creek

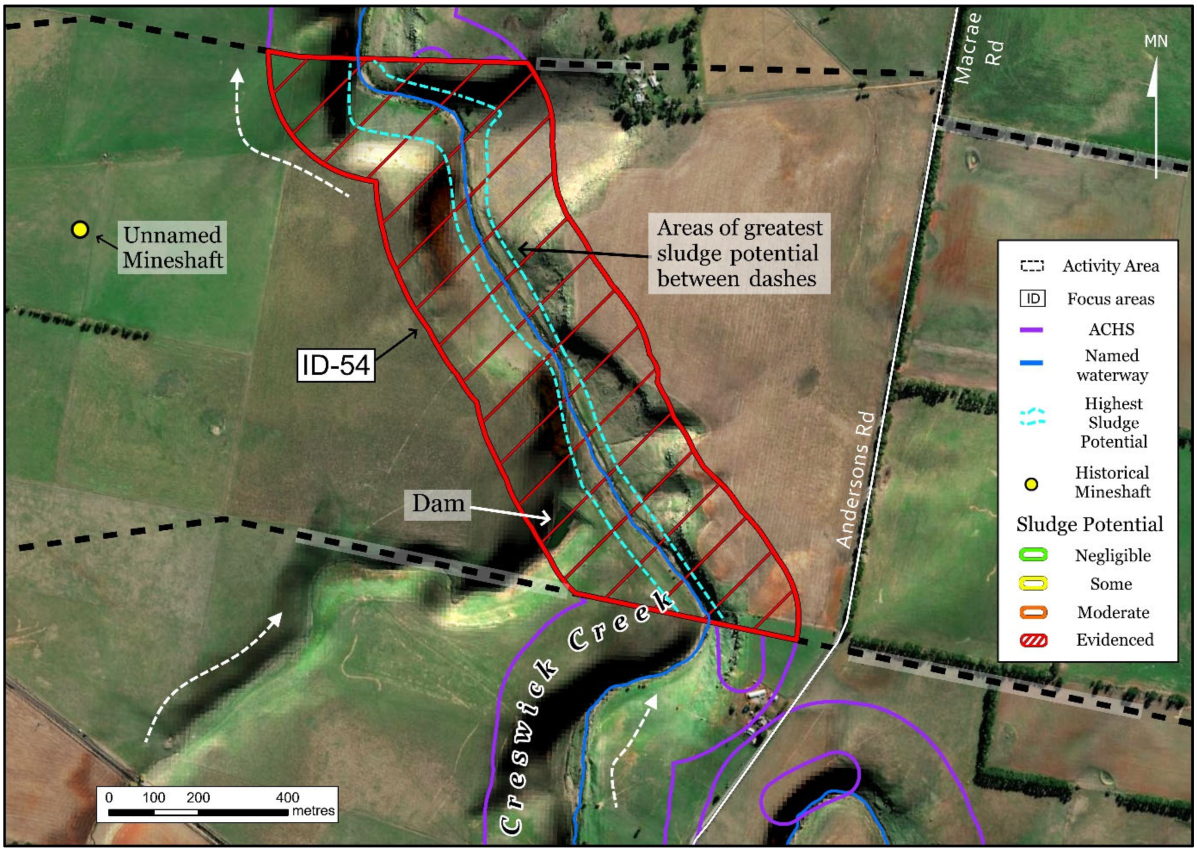

Figure 14. A recent aerial image of Creswick Creek (**ID-54**) overlying a 10-metre resolution Digital Terrain Model (DTM). This section of the Activity Area is known to have been affected by significant levels of upstream mining and sludge. However, due to the deeply incised nature of this section of Creswick Creek, accumulated sludge deposits are likely to be restricted to the relatively small surface area showing between the dashed turquoise lines. There is an unnamed historical mineshaft recorded approximately 520 metres to the west of the Focus Area. The dam denoted in this figure was constructed post-1976.

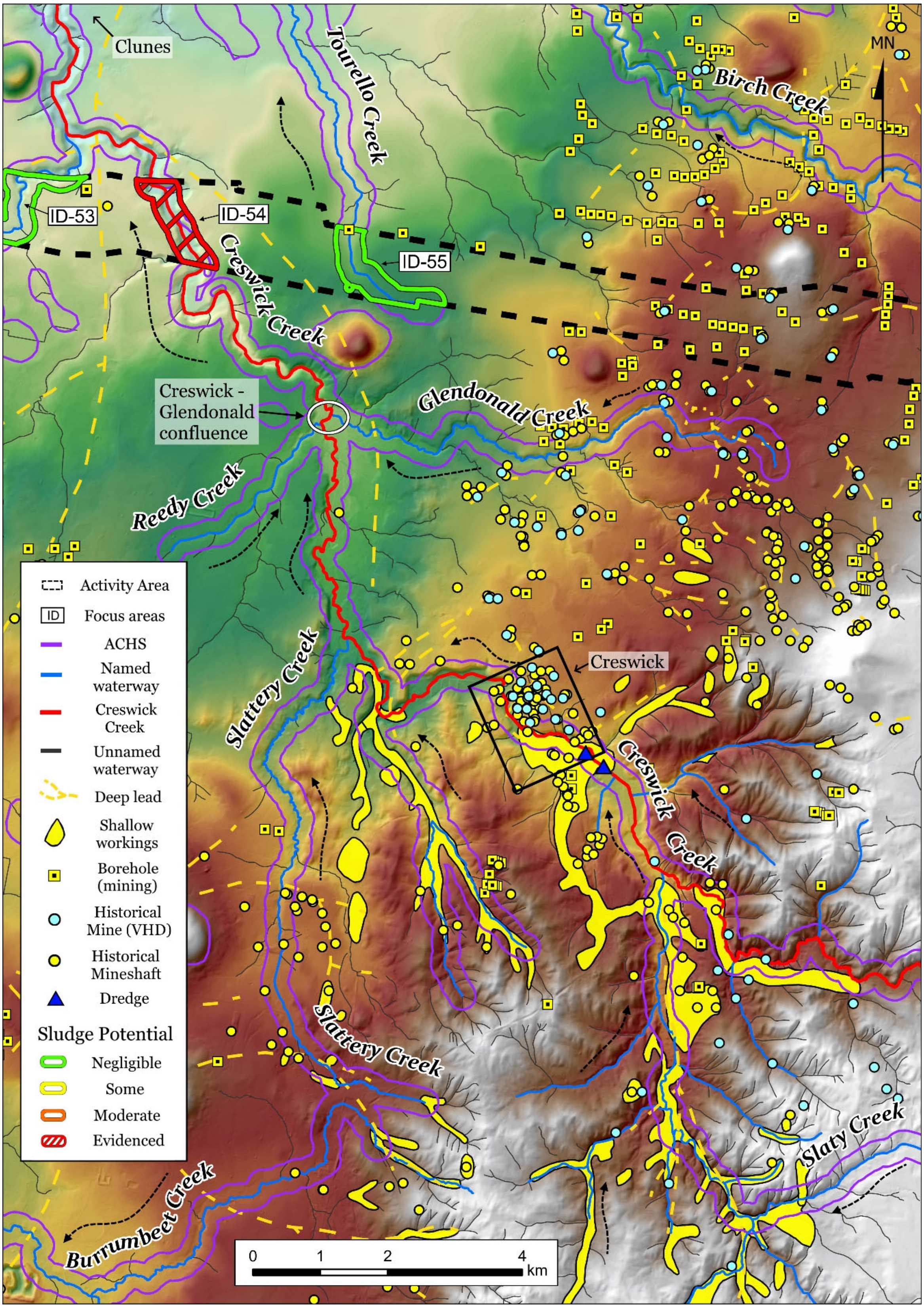

Figure 15. A 10-metre resolution Digital Terrain Model (DTM) highlighting Focus Areas **ID-54** and **ID-55** (Creswick Creek and Tourello Creek). A significant amount of historical mining has taken place upstream of **ID-54**, along Creswick Creek and other upstream waterways. Mining operations along Glendonald Creek during the 1880s are also known to have discharged large volumes of sludge into Creswick Creek. Two dredges operating upstream of the Creswick Township post-1900 also produced significant volumes of waterborne sediment. Denoted historical mineshafts, deep leads, and mine sites recorded in the VHD highlight the intensity of upstream mining near this section of the Activity Area. However, beyond a single unnamed historical mineshaft to the west of **ID-54** there was other indication that mining took place near or within the Focus Area.

<u>Potential for Sludge:</u> Evidenced

- Focus Area **ID-54** is associated with a 1.5 km long section of Creswick Creek (**Figures 13** and **14**). Creswick Creek is the primary watercourse for Creswick and its historical goldfield, and is known to have been significantly impacted by sludge and mining activities throughout the second half of the nineteenth century and the early twentieth century.
- The historical record suggests that the section of Creswick Creek that runs through **ID-54** carried significant volumes of sludge throughout the gold rush era. That sludge originated both from the gold workings adjacent to and upstream of the Creswick township along Creswick Creek, but also from gold mining activities along Slattery Creek and Glendonald Creek, both of which feed into Creswick Creek upstream of the Focus Area.
- The composition and intensity of the sludge that affected **ID-54** would have differed depending upon its source and the type of mining that produced it. For example, gold mining sediment originating from the earliest stages of the Creswick gold rush (early-1850s), would have travelled approximately 12 km downstream before reaching the Focus Area and by then would have been mostly comprised of fine-grained materials (with the heavier materials settling much closer to those early gold workings). In 1886, Creswick Creek was described as 'merely discoloured by sluicing water, and partially filled' just upstream of its junction with Glendonald Creek (only three kilometres upstream of **ID-54**). However, downstream of that junction (towards the Focus Area) Creswick Creek became polluted or 'much injured' by 'thick pipe-clay' originating from the deep lead mining that was taking place along Glendonald Creek (Shakespear et al. 1887:xxii). Stratigraphically, if sludge deposits were able to accumulate across the Focus Area's creek banks, and were not remobilised, one might expect to see a difference in colour and texture/grainsize in that sludge through time.
- Whilst the Focus Area is known to have been affected by sludge, the implications of that for Aboriginal cultural heritage material is less certain. This section of Creswick Creek is a deeply incised river valley with steep terraces on either side. In some sections of the Focus Area there is a difference in elevation of more than 30 metres between the edge of the upper terraces and the creek's centre-line. This topographic configuration has two major implications. Firstly, given the narrow width of the creek (just 12-metres-wide in some instances), and its steep-sided slopes, there is not as much potential for the accumulation of significant volumes of sludge as there would be if the creek was adjacent to a low-lying floodplain. In other words, the potential surface area that could accumulate sludge deposits is far less along this section of Creswick Creek than a comparable river system surrounded by easily inundated low-lying floodplains. Secondly, this steep-sided river valley would have facilitated faster passage for sludge moving through this section of the river system. During heavy winter rains Creswick Creek would likely have been cleared of some portion of its accumulated mining sediment, as has been noted in newspapers during the 1850s (*The Star* December 29th, 1858; *Geelong Advertiser* May 31st, 1859).
- In summary, whilst there is evidence to suggest that **ID-54** was repeatedly impacted by sludge throughout the gold rush period, due to the Focus Area's topography, the potential for significant, widespread accumulations of mining sediment and capped prior ground surfaces is less certain. The parts of the Focus Area with the greatest potential for accumulated sludge and/or buried Aboriginal cultural heritage materials are the creek's lower-lying terraces along either side of the creek terraces (denoted through a dashed turquoise line - **Figure 14**) – rather than across the upper terraces. A pedestrian survey along the creek line could establish the presence or depths of sludge, and whether any capped surfaces with ACH materials are present.

<u>Potential for Mining:</u> Negligible

- Although significant amounts of historical mining have taken place within, and adjacent to, many parts of Creswick Creek, the section associated with **ID-54** has negligible potential for evidence of mining activities.
- No evidence for mining activity within Focus Area **ID-54** was identified either in mining datasets/literature or the VHD. The closest recorded mining activity is an unnamed historical mineshaft over 500 metres away from the nearest western edge of the Focus Area.

<u>Historical research (selected passages)</u>

The following are selected passages from historical sources on the Creswick goldfield, Creswick Creek, and other upstream mining activities. The first reference 'Water and Gold: Interpreting the landscape of Creswick Creek' provides an overview of gold mining across the Creswick goldfield, particularly the relationship of mining to Creswick Creek (Davies et al. 2015). A further timeline of mining activities across the Creswick goldfield is found in 'Historic gold mining sites in the south west region of Victoria' (Bannear 1999:22-28). Information regarding the release of sludge into Creswick Creek in 1886 is provided in an 1887 Royal Commission report (Shakespear et al. 1887). These sources are joined by historical newspaper articles that describe the release of sludge into Creswick Creek by quartz crushing activities in the 1860s and dredging in the early twentieth century.

- *Water and Gold: Interpreting the landscape of Creswick Creek* (Davies et al. 2015)
  - 'Gold was first discovered at Creswick Creek towards the end of September 1851. By April 1852 there were 600 people in the vicinity. Miners focused on shallow auriferous leads around the site of the present town and adjoining ground to the north and east. Slaty Creek was opened in 1853 and in 1854 the mining population expanded dramatically when a series of shallow leads was opened to the west and south of town. The low hills that were the focus of the 1854 rush included Grahams, Bald, Clarke's, Hard, White, Humbug and Lucknow, and the associated gullies such as Long, Mopoke, Nuggety and Spring' (Davies et a. 2015:11)
  - 'The hills opened during the 1854 rush were well suited to sluicing, being covered with up to 30 feet (10 m) of gold-bearing soil' (Davies et al. 2015:11).
  - 'Puddling was also widespread on the Creswick field. Although horse puddlers could only process a fraction of the ground that could be worked by sluice parties, they required much less water than sluicing and could generally be used all year round. The Mining Surveyor reported 159 of these machines at work in August 1859, and this number remained fairly

constant until drought in the mid-1860s forced many puddlers out of business. The practice soon resumed, however, with better rainfall and the construction of dams, as there were 180 puddlers reported in the Creswick Division in 1866. By 1881 there were only 18 puddlers reported working at Creswick, which reflects the decline of surface alluvial mining by this period' (Davies et al. 2015:13).

- 'Gold yields from surface alluvial claims began to dwindle by 1860 and in the following years many miners from Creswick departed for other fields in Victoria or joined the rush to Otago in New Zealand. This trend was exacerbated by very dry conditions in 1864-65' (Davies et al. 2015:14).
- 'Deep lead mining north of Creswick began in the late 1850s as the miners sank shafts to reach the shallow alluvial leads angling down the hills and under the basalt flows to the north. These companies met with mixed success in the following years, although by the 1880s mines including the Madam Berry, Berry Consols, Lone hand, Ristori Freehold and New Australasian were among the richest deep leads in Victoria. By the early 1890s, however, these mines were almost worked out, and the machinery was removed and sold. A limited amount of quartz mining also occurred in the Creswick area from the 1880s, especially around Allendale' (Davies et al. 2015:14).
- 'Bucket dredging began in the bed of Creswick Creek around 1899, and preparations were also underway for the first hydraulic sluicing in the Creswick division. By 1903 there were two dredges at work along the creek, operated by the Creswick Creek and Enterprise Bucket companies. The industry peaked during 1906-08, with the two dredges operating and at least eight sluicing plants at work. These included: The Great Creswick Sluicing Company, Creswick Gold Estates Sluicing Company, Creswick Sluicing Company (Slaty Creek), Portuguese Flat Sluicing Company, Creswick Spring Gully Sluicing Company, Creswick Black Lead Sluicing Company and Creswick Nuggetty Gully Sluicing Company (Bannear 1996). The industry fell away in the following years, however, as profits from dredging and sluicing rapidly declined' (Davies et al. 2015:14).
- 'Downstream water users felt the full effects of sludge and it is clear that the damage continued for many decades. Several parliamentary enquiries and Royal Commissions were convened in order to deal with the problem… …The first complaints of major disruption came in the late 1850s from businesses in the goldfields towns. Residents in Creswick wrote to the Council complaining that Victoria Street below Cambridge Street was impassable because of the sludge, and shopkeepers in Albert Street complained that the sludge was keeping their customers away' (Davies et al. 2015:56; Royal Commission 1859:3-5).
- 'The sludge from Creswick flowed north along Tullaroop Creek to join sludge flowing into the Loddon from Castlemaine, Daylesford, and Maryborough and by the early 20th century this was causing concern for those involved in the development of infrastructure for irrigated agriculture. The irrigation industry was becoming a powerful interest group and in addition to objecting to the inundation of agricultural land adjacent to the sludge-choked rivers, irrigators were afraid that the sludge would be carried into the new dams being constructed as irrigation storages. They feared that sediment from the sludge would settle out in the dams with the potential to significantly diminish storage capacity. This anxiety was borne out by evidence presented to the Sludge Abatement Board in 1908 when witnesses testified that Laanecoorie Weir, built on the Loddon in 1891, had already accumulated more than three metres of silt in its basin' (Davies et al. 2015:57; SAB 1909:92).

- *Historic gold mining sites in the south west region of Victoria* (Bannear 1999)
  - 'Due to the dryness of the environment, sluicing was extremely seasonal, and when a good stream of water came through, work was carried on both day and night. This was the case on Humbug Hill [in the Creswick goldfield] in the winter of 1859, where a sluicing party worked shifts (6 hours on, 12 hours off) managing to wash 1,500 cubic yards of soil before the water run out. For their efforts they obtained 245 ounces of gold. The Humbug Hill operation, which involved cutting faces, turning the water along the base of the face and collapsing blocks of ground from 20 to 50 tons, appears to be the principal sluicing technique used at Creswick' (Bannear 1999:23)
    - This passage provides an example of the intensity of mining activities at Creswick and the amount of material discharged into its waterways.
- Royal Commission: *Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board. Melbourne: Parliament of Victoria* (Shakespear et al. 1887)
  - 'SLATY CREEK, CRESWICK. On this creek, which forms the head of Creswick Creek, very extensive sluicing works have been carried out, and, with ample water, considerable operation may again be undertaken. At present, not more than twenty men are sluicing in the creek, but even there are sending down a large quantity of sludge. One party working near the head have a face some 30 feet deep, supplied by a race tapping the head of the creek, and anticipate many years of prospective work. Two other parties sluicing above Cabbage Tree Flat have anticipated work for ten years with a face of, say, *25* feet. . . No boxes are used in this creek, on account of the tenacious character of the clay; all are ground sluicing. There does not appear to be any means of stacking sludge near the works, and to construct impounding sludge dams across the main Slaty Creek nearer Creswick would be costly. **A large quantity of silt has been and is being carried down the creek by the winter rains.** (Shakespear et al. 1887:xxi).
  - 'CRESWICK CREEK. The Glen Donald Creek, which discharges through the small township of Hollingwood, receives the sludge from the following deep alluvial mines:-Lone Hand, Lord Harry, Madame Berry, and Australasian Extended, Davis Nos. 1 and 2, and Australasian Eaglehawk Companies. The three former convey the sludge for a considerable distance in races, and after some attempt at impounding, but the latter delivers directly, into the creek without any settling dams. In all the cases the sludge dams might be enlarged, and banks made higher, and thus rendered sufficiently effective; but at present sludge is run off consisting of a thick pipe-clay. **Creswick Creek, above the junction with Glen Donald Creek, is merely discoloured by**

sluicing water, and partially filled, but below the junction the creek is much injured. Bell's Company, near Creswick, deliver direct into Creswick Creek, but the operations are of a smaller character. (Shakespear et al. 1887:xxii).

  - This passage describes the condition of Creswick Creek just upstream of the Focus Area in the mid-1880s, as well as the mobilisation of sludge by Glendonald Creek.

— J.S. Patterson – Mining manager of the Davies Freehold Company (Witness 1886 Royal Commission)

'947. You have got sludge dams? – No, we have no sludge dams.
948. Do you settle the water for re-use at all? – No.
949. You run the sludge straight away? – Straight away.
950. Into Glen Donald Creek? – **Into Glen Donald Creek. And it runs from there to Creswick Creek**.'
(Shakespear et al. 1887:25).

  - This is witness testimony from 1886 by a miner who admitted to allowing gold mining sludge to discharge into Glendonald Creek (and then into Creswick Creek).

— William Guthrie Spence – Secretary to the Miners' Association (Witness 1886 Royal Commission)

'999. Has any action ever been taken under the Sludge Act? – No.
1000. Then the Sludge Act has not tended to settle the difficult? – It only opened the way, but no steps have been taken yet. The difficulty with the Madame Berry Company was got over by the company arranging with other landowners to run over their property and paying for it. The party who obtained the injunction was shunted by that means, otherwise the mine would have had to stop. **In one case the sludge was running from the Madame Berry into the Glen Donald Creek mentioned by Mr. Patterson.**
1001. It is run now into the Glen Donald Creek? – Yes. So is the Lord Harry [name of a local mine] sludge.
1002. So is the Lone Hand? [another local mine] – Yes.' (Shakespear et al. 1887:26).

  - This witness testimony from 1886 acknowledges that local mines were allowing sludge to enter Glendonald Creek.

- *The Ballarat Star* (July 16th, 1869)

  — 'THE RISE AND PROGRESS OF QUARTZ MINING AT CLUNES – Ten years ago, or less, the Murray cod was no uncommon inhabitant of the Toollooroop [sic] Creek, and a pair of black swans disputed the right of bathers to invade a large water-hole opposite Mr M'Donald's home-station. Now every water-hole is filled with the sludge and tailings from the mines for more than twenty miles beyond Clunes. The first attempt to conserve the water of the creek was made by the Port Phillip Company, and a dam was erected across the creek. After a time the reservoir so made became little better than a sludge hole, **the sludge from Creswick gradually accumulating at the dam**, and choking the outlet pipe. This dam was carried away by the storm waters some years ago, but without doing much damage to the town of the mines, beyond flooding out a few of the inhabitants, carrying away all the bridges and creating a sensation of a somewhat startling character.'

    - This 1869 newspaper describes the effects of gold mining sludge on waterways downstream of Creswick, including the filling in of a dam and numerous waterholes with sediment.

- *The Ballarat Star* (March 15th, 1907)

  — 'SLUDGE ABATEMENT BOARD – **The sludge was several feet thick from the dredges in the Creswick Creek, near Clunes**. The street drainage flowed into the creek, and the wastewater from the butter factory, but not much solid matter found its way into the creek either from the butter factory or the roads.'

- *Weekly Times* (March 15th, 1907)

  — 'SLUDGE ABATEMENT – Creswick dredging plants have in the past, owing to imperfect works and methods, **discharged a good deal of sludge into Creswick Creek**.'

Waterway movement

- Historical maps of Creswick Creek within or near **ID-54** do not show any significant alterations to the creek's course between 1850 and the present day (Pritchard 1850; GSV 1882; Hunter 1909).
- There is a dam along an unnamed waterway in the southwestern corner of the Focus Area (**Figure 13**). Historical aerial imagery suggests the dam was constructed sometime after 1976.

Historical maps

Geological Survey of Victoria. 1880. Creswick Gold Field, 1:31 680 (40 chains:1 inch), Department of Mines, Victoria.

Geological Survey of Victoria. 1882. *Learmonth (with notes)* 1:31,680 (40 chains: 1 inch) geological map. Plan No GF36. Department of Mines, Victoria.

Hunter S.B., 1909. *Sketch map of alluvium and deep leads systems. Beaufort, Avoca, Maryborough, Ballarat West, Berry – Moolort - Loddon, Creswick, Marong* 1:126,720 (2 miles:1 inch) geological map. Geological Survey of Victoria.

Pritchard, O. 1850. *Survey of Tullaroop and Bullarook Creeks, from their sources in the Main Range to their Junction with the Deep Creek* (LODDON15). Held: Public Records Office Victoria (VPRS 8168/P0002, 002693).

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SLUDGE ABATEMENT. (1907, July 27). *Weekly Times (Melbourne, Vic: 1869 - 1954)*, p. 39., from **http://nla.gov.au/nla.news-article221258481**

THE RISE AND PROGRESS OF QUARTZ MINING AT CLUNES. (1869, July 16). *The Ballarat Star (Vic: 1865 - 1924)*, p. 2., from **http://nla.gov.au/nla.news-article112890724**

6.6 – ID-55 – ACHS Tourello Creek

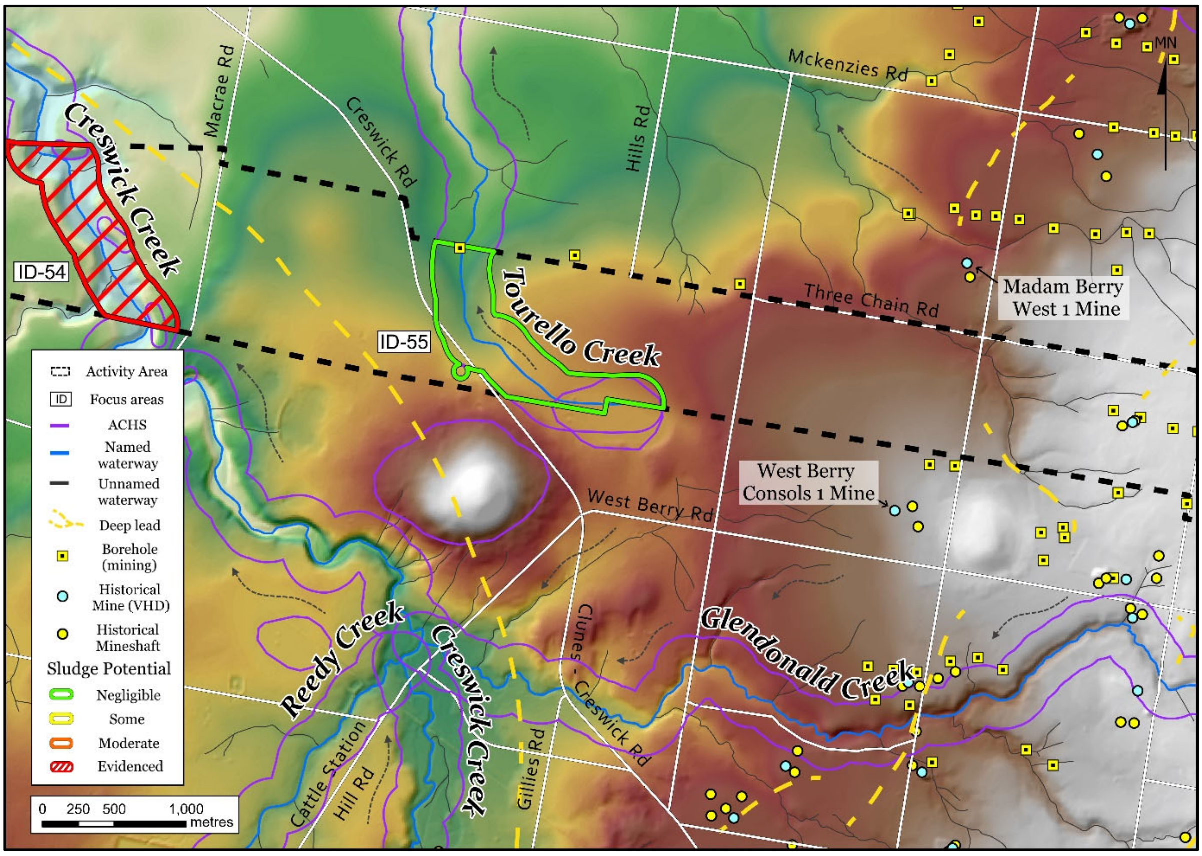

Figure 16. A 10-metre resolution Digital Terrain Model (DTM) showing Focus Areas **ID-55** associated with Tourello Creek. No evidence of historical mining activity was identified upstream of the Focus Area across digitised mining datasets/literature or the VHD. The absence of upstream historical mining activity suggests a negligible potential for sludge. A single borehole was identified along the northern edge of the Focus Area. This is associated with efforts to establish the trajectory of deep leads through the region, and is not likely to relate to significant surficial disturbances within the area.

Potential for Sludge: Negligible

- Focus Area **ID-55** is an ACHS associated with Tourello Creek (**Figure 15**). No evidence of mining was identified upstream of Tourello Creek across digitised mining datasets/literature or the VHD. This Focus Area thus has negligible potential for sludge.
- The two nearest historical mines, 'West Berry Consols 1 Mine' and 'Madam Berry West 1 Mine', are upslope of **ID-55**, but are upstream of unnamed waterways that do not discharge into Tourello Creek.

Potential for Mining: Some

- The only identified evidence of mining activity within Focus Area **ID-55** is a single borehole drilled by CRA Exploration Party Ltd in 1982. That borehole is associated with attempts to establish the trajectory of deep leads through the region and is not likely to correspond to further surficial disturbances to ground surfaces within the Focus Area. No further evidence for mining activity was identified across **ID-55**, either in mining datasets/literature or the VHD.

Waterway movement

- No evidence identified

Historical research

- No historical evidence for mining across this Focus Area was identified

Historical maps

Geological Survey of Victoria. 1880. Creswick Gold Field, 1:31 680 (40 chains:1 inch), Department of Mines, Victoria.

6.7 – ID-56 – ACHS Birch Creek

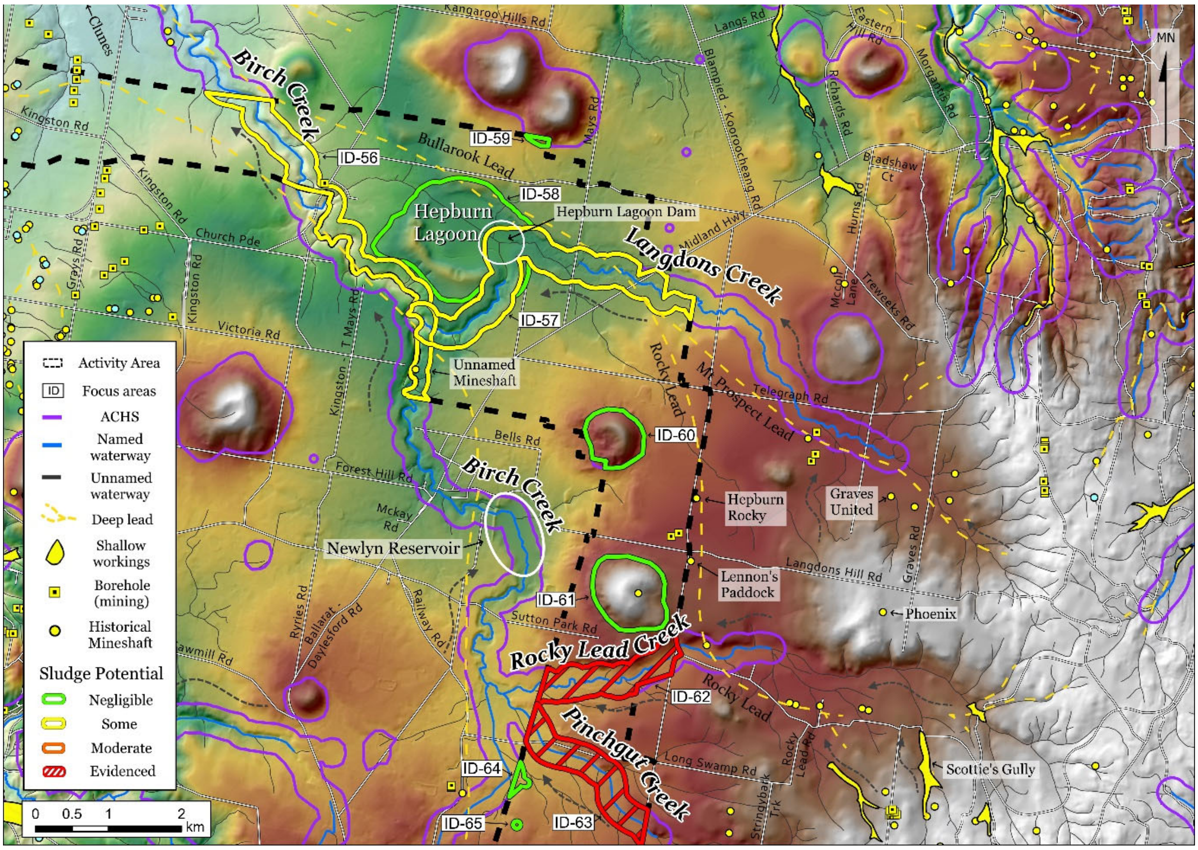

Figure 17. A 10-metre resolution Digital Terrain Model (DTM) showing Focus Areas **ID-56** to **ID-65** along Birch Creek and places mentioned in text. Focus Area **ID-56** is associated with a long section of Birch Creek, which is downstream of a range of high intensity historical mining activities. Langdons Creek's sub-catchment had deep lead mining, and has 'some' potential to maintain sludge deposits upstream of Hepburn Lagoon dam. Rocky Lead Creek (**ID-62**) and Pinchgut Creek (**ID-63**) each had shallow and deep lead mining activities in their sub-catchments that are evidenced to have discharged sludge into both respective waterways, and into Birch Creek. Historical sources indicate that this section of Birch Creek is deeply incised, and sludge has typically moved quickly through it—downstream to Clunes. Therefore, whilst the creek did have upstream sources of sludge, there is only 'some' potential for that material to been deposited along the waterway and for that material to remain present today. Subsequent figures will provide more information about Langdons Creek (**Figure 17**) and Rocky Lead and Pinchgut Creek (**Figure 18**).

Potential for Sludge: Some

- Focus Area **ID-56** is an ACHS associated with Birch Creek (also referred to in the literature as Birch's Creek, Birche's Creek, or Bullarook Creek) (**Figure 16**). Some parts of Birch Creek are known to have been significantly affected by sludge during the nineteenth and early twentieth centuries. However, the worst-affected areas begin approximately six km downstream of the Focus Area (below mining operations closer to Clunes). Mining activities along Rocky Lead Creek and Pinchgut Creek are both known to have discharged sludge into Birch Creek (approximately six km upstream of the Focus Area – see **ID-62** and **ID-63**) during the mid-1860s. However, the topography of the area, a deeply incised waterway, is not well-suited to the accumulation of significant quantities mining sediment. Birch Creek is also known to have been scoured clear during heavy rains and flooding (Shakespeare et al. 1887:35). In 1870, Hepburn Lagoon dam failed, sending 400 million gallons of water into Birch Creek within 15 minutes (see **ID-58**). That prodigious volume of water is likely to have remobilised previously accumulated sludge within and adjacent to the waterway. In consideration of these various factors and evidence presented in the Historical Research section, the Focus Area (**ID-56**) is deemed to have 'some potential' to maintain historical sludge deposits.

- Sludge is known to have entered Birch Creek upstream at Rocky Lead Creek and Pinchgut Creek during the 1860s and early 1870s, and again between 1895 and 1907 (See **ID-62** and **ID-63**). Newlyn Reservoir was constructed around 2.5 km upstream of Focus Area **ID-56** in 1873 and captured waterborne sludge from that date onwards. As such, it is likely the mining waste that entered Birch Creek during the 1860s made its way into the Focus Area (as indicated by 1886 Royal Commission witness testimony (Shakespeare et al. 1887:35)). However, given the topography of the Focus Area, subsequent flood waters may have remobilised those waste sediments.
- Mining activities also took place upstream of Langdons Creek, which enters Birch Creek within the Focus Area. However, the Hepburn Lagoon dam captured sediment from those activities from at least 1857 till its failure in 1870. The upstream mining activities along that creek are unlikely to have produced significant volumes of sediment, particularly after 1881 (see **ID-57**).
- Areas downstream of the Focus Area (**ID-56**) are described as being significantly affected by sludge in the 1886 Royal Commission (see Shakespear 1887:43). Two (of numerous other) mining companies responsible for that sludge are noted as being the Lord Harry and Berry No. 1.

Potential for Mining: Evidenced

- A single unnamed mineshaft located near the southern end of the Focus Area was identified in the historical mineshaft dataset. No further evidence for mining activity was identified across **ID-56**, either in mining datasets/literature or the VHD. As no further information was identified about the mineshaft, it is not possible to speculate as to the extent of surficial disturbances caused by that mining activity.

Waterway movement

- Historical maps of the Focus Area suggest the course of Birch Creek has not experienced significant alteration between 1850 and the present (Pritchard 1850; Department of Crown Lands and Survey, 1857; GSV 1880).

Historical research (selected passages)

- *Royal Commission: Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board.* (Shakespear et al. 1887)
  - '**No damage has yet occurred to Birche's Creek,** the mines from which such is feared in the future being as yet only prospective. Settling dams, passing the sludge from one into the other, will probably effect sufficient settlement to admit of the water, though discoloured, being passed from several mines into Birche's Creek, below the water-supply weir, without detriment to stock. Some of the mine waters are brackish, but not excessively, and would not affect the creek water, excepting during the dry period, and at that time the natural creeks are more or less so. Between the Smeaton Reserve United Company and the Rocky Lead Company, however, the ground is taken up for future mining operations, but no company is yet at work' (Shakespear et al. 1887:xxii).
  - Witness testimony in 1886 from John Parkin – Local farmer and miner

    '1312. Have you seen the sludge that is delivered from the Madame Berry and the Lone Hand? Yes.
    1313. Do you consider that that would be injurious to stock, when it gets into the Glen Donald Creek? I can only answer from what I have seen previous, when the Rocky Lead was working the creek in summer time, the Clunes Water Reserve was not made at the time, and no person ever found fault with the creek at that time, it just moved, and **I think I could have written my name upon it.**
    1314. Was that Birch's Creek? That was Birch's Creek, and that creek does not look as if there was any sediment settled there at all now. We have had big floods since that though.
    1315. **Then the floods have washed the sediment down from there and cleared the creek? The creek is as clear as ever it was. I knew it before, and I know it after.**
    1316. How many years is it since the Rocky Lead was working? It must be something near twenty years.
    1317. The Rocky Lead is working now, is it not? No, not the Rocky Lead, not that very place, but a continuation is working now which has been left for a considerable time.
    1318. That is discharging into Birch's Creek now, is it? There is no other place.
    1319. Have you been there recently. Can you speak from your own knowledge – I mean of what they are doing now? Yes, it is not coming into Birch's Creek now; but it comes into the Hepburn Lagoon, and that runs into Birch's Creek.
    1320. Is there a regular outlet from the lagoon into Birch's Creek? Yes.
    1321. Are they stacking their sludge in the Hepburn Lagoon? No, I do not think so.
    1322. Are they running their sludge at present into Birch's Creek? They have no sludge to run at present. They are not washing.
    1323. In former days there was some sluicing up near Rocky Lead, was not there? Yes.
    1324. **Did they deliver into Birch's Creek? Yes.**
    1325. **Are you aware whether that sludge water carried sludge down Birch's Creek as far as this [Allendale]. Did it deposit the sludge up there, or did it bring it down as far as this? The creek was very muddy down here.**
    1326. And the creek above this point has got clearer, has it? It is clear now.' (Shakespeare et al. 1887:35)

    - John Parkin's testimony indicates that sludge from sluicing along Rocky Lead Creek entered Birch Creek upstream during the 1860s. That sludge made it down as far as Allendale and made the creek 'very muddy.' However, as noted previously, those waste sediments may have been remobilised through subsequent flood events.

Historical maps

Department of Crown Lands and Survey, 1857. *Country lands in the Parish of Bullarook on the Bullarook Creek from 5 to 9 miles North East of Creswick*, County of Talbot, Dept. of Crown Lands and Survey, Melbourne.

Geological Survey of Victoria. 1880. Creswick Gold Field, 1:31 680 (40 chains:1 inch), Department of Mines, Victoria.

Pritchard, O. 1850. *Survey of Tullaroop and Bullarook Creeks, from their sources in the Main Range to their Junction with the Deep Creek* (LODDON15). Held: Public Records Office Victoria (VPRS 8168/P0002, 002693).

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Shakespear, R.H., A.F. Walker and J. Rowan. 1887. *Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board.* Melbourne: Parliament of Victoria.

6.8 – ID-57 – ACHS Langdons Creek

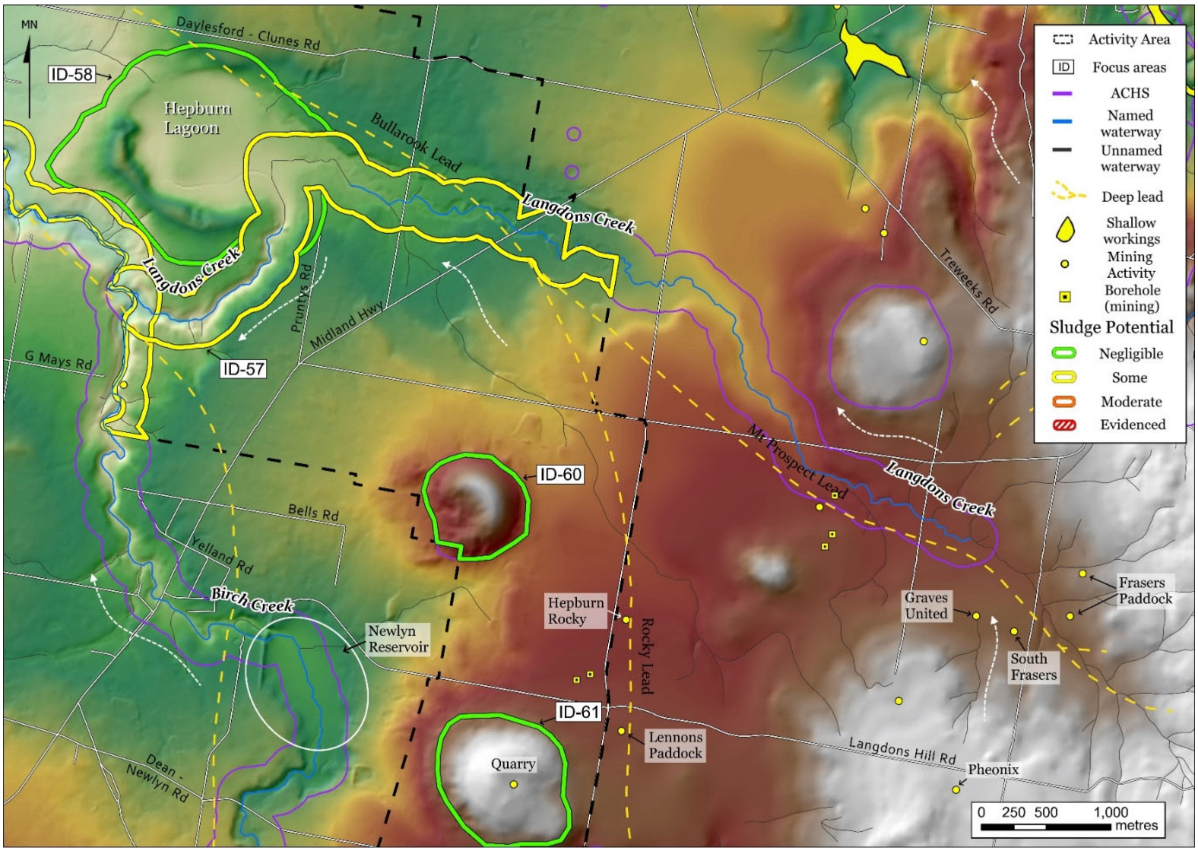

Figure 17. A 10-metre Digital Terrain Model (DTM) showing Focus Areas **ID-57**, **ID-58**, **ID-60**, and **ID-61** associated with ACHS relating to Langdons Creek, Hepburn Lagoon, and two volcanic cones. Langdons Creek's (**ID-57**) had upstream deep lead mining along the Rocky Lead from the 1860s and the Mount Prospect Lead off-and-on from the mid-1890s till 1944. As Hepburn Lagoon was an important source of drinking water these upstream mining activities were scrutinised by local officials and in 1881 miners paid a £500 deposit to guarantee that no damage would take place to waterways situated downstream. Pre-1880s mining in the area was fairly limited and is unlikely to have produced significant volumes of waste sediment— sludge discharged into Langdons Creek would have been deposited upstream or within the Hepburn Lagoon Dam and not further downstream. Overall, Langdons Creek has 'some' potential to maintain deposits of sludge upstream of Hepburn Lagoon, all other showing Focus Areas have negligible potential. Bullarook Hill (**ID-61**) had a datapoint associated with an unnamed quarry from an unspecified date near its centre.

Potential for Sludge: Some

- Focus Area **ID-57** is an ACHS associated with Langdons Creek (**Figures 16** and **17**). This waterway is known to have had upstream deep lead mining, both along the Rocky Lead (from the 1860s) and the Mount Prospect Lead (off-and-on from the mid-1890s till 1944).
- The Rocky Lead (also referred to as the Bullarook Lead or Hepburn Rocky Lead) is associated with mines such as Lennon's Paddock deep lead mine and the Hepburn Rocky deep lead mine. In 1886, the Rocky Lead was noted by the Royal Commission into Victorian sludge as responsible for 'polluted' mining water being discharged into Langdons Creek (Shakespear et al. 1887:49). The Commission details an agreement made a few years earlier by the Rocky Lead mining companies and the Water Commissioners, whereby the sludge produced by the mines was stored in dams on site, with the settled water then being permitted to enter the creek. The companies even went so far as to deposit a guarantee of £500 that 'no damage to the water would take place.' That agreement was put into effect

in 1881 (*The Ballarat Courier* November 26th, 1881), but it is not apparent whether any similar, earlier agreements were in place. A newspaper article from 1867 states 'a machine of dirt [was] washed on Friday' by Lennon's Paddock Company, suggesting they were processing deep lead alluvial wash dirt on site (*The Ballarat Star* January 15th, 1867). Another article from 1881 outlines the history of the Rocky Lead mines and suggests some wash dirt was puddled on site (*The Argus* November 7th, 1882). As sludge dams were much less prevalent in the 1860s, that washing is very likely to have discharged some volume of sediment into local waterways. Lennon's Paddock Company is positioned above and between Birch Creek and an unnamed waterway that leads to Langdons Creek, so it is not entirely certain into which waterway their waste sediment was discharged. However, on the whole, historical sources suggest that mining operations along the northern sections of the Rocky Lead were carried out on a fairly small scale, and may not have produced significant quantities of waterborne sediment (Baragwanath 1946:149; Canavan 1988:33). Any discharged sludge from those mining activities would have entered Langdons Creek less than a kilometre upstream of Hepburn's Lagoon (**ID-58**) – thus sections of the Focus Area upstream of that confluence would not have been affected by the activities described in this paragraph.

- The Mount Prospect Lead was targeted by deep lead miners from around 1894 when shafts by Graves United mining and Frasers Paddock were first sunk. Early returns were favourable, sparking a great deal of stock market speculation and newspaper inquiry (*The Ballarat Star* May 18th, 1895). However, by the second-half of 1895 the lead was found to be patchy and works along the lead were soon greatly diminished. A newspaper from 1895 accuses Graves United of 'pollution of the water' (Langdons Creek), but no specific mention of sludge was identified across any other historical sources (*The Ballarat Star* November 7th, 1895). By the mid-1890s sludge produced by deep lead mining operations was less likely to have been permitted to flow freely into local waterways, and was likely retained in dams on site—particularly given the previous agreements made between local miners and the Water Commission.
- Langdons Creek feeds into (and out of) Hepburn Lagoon (**ID-58**). As noted in **ID-58**, there was a dam across the eastern side of Hepburn Lagoon, which stored water coming in from Langdons Creek from at least 1857. That dam would have captured most of the sludge carried by Langdons Creek, preventing it from continuing downstream to the southern-half of the Focus Area. In 1870, the dam failed catastrophically, releasing '400 million gallons' of water into the lower portion of Langdons Creek over the course of 'a quarter of an hour' (*The Ballarat Star* August 1st, 1871). That flooding event is likely to have remobilised accumulated sediment, but at speeds unfavourable for immediate redeposition. In other words, any sludge remobilised by the dam failure would have moved too quickly to settle in significant volumes across adjacent flood plains within the Focus Area or further downstream within **ID-56**.
- In summary, deep lead mining activities upstream of Langdons Creek are likely to have produced waterborne mining sediment for at least some period of their operation. However, the volume of sediment produced does not appear to have been significant and would likely have been remobilised a great distance downstream by the Hepburn Lagoon dam failure in 1870. An agreement was made by Rocky Lead mines upstream of Langdons Creek in 1881 not to discharge any sediment into the watercourse. As such, there is a 10-year window in which some sludge may have been able to accumulated along either side of the creek, particularly upstream of Hepburn Lagoon – giving the area 'some' potential to retain sludge deposits.

<u>Potential for Mining:</u> Negligible

- No evidence for mining activity within Focus Area **ID-57** was identified either in mining datasets/literature or the VHD.
- Bullarook Lead, which is shown running through the Focus Area in **Figures 16** and **17**, is likely speculative and does not appear to be based on borehole data (Baragwanath 1946:146).

<u>Waterway movement</u>

- An 1857 map of the area suggests the course of Langdons Creek through the Focus Area did not change significantly during the gold mining period, barring the construction of the Hepburn Lagoon dam by 1857 and its failure in 1870 (Department of Crown Lands and Survey 1857).
- Historical aerial imagery suggests multiple dams were constructed within the Focus Area (along Langdons Creek) upstream of Hepburn Lagoon between 1961 and 1976. A large dam was also constructed downstream of Hepburn Lagoon between 1976 and 1979.

<u>Historical research (selected passages)</u>

The following are selected passages from historical sources concerned with Langdons Creek and its upstream mining activities. Examples of that research include an overview of the relevant deep leads by Baragwanath (1946), witness testimony from the 1886 Royal Commission into sludge, and newspaper articles referred to in text. Historical sources associated with the catastrophic failure of Hepburn Lagoon are included in the next Focus Area (**ID-58**).

- *Gold and Minerals* (Baragwanath 1946:149)
    - 'There are several old alluvial mines and also two recently-worked (closed about the middle of November), viz., the Graves United and South Fraser's. The principal mines opened in the past are known as the Rocky lead, Lennon's Paddock, Hepburn Rocky lead, Fraser's Paddock, and the Phoenix. In many portions they were extremely good, while in other portions, principally at Lennon's Paddock and Hepburn Rocky lead, the gold won did not quite cover expenses. Starting in the south-west corner, several shafts were sunk. The lead here proved to be fairly-rich. I am unable to obtain actual figures as to yields, but the general opinion among miners is that the mines were very profitable. The wash here consists of sub-angular and angular boulders and gravel about 50 per cent of it being sandstone, there is a small quantity of ferruginous cement, probably due to the basaltic covering; this portion of lead is apparently worked out. In the north portion of Block 1 are some old workings on the continuation of this lead, marked Lennon's Paddock; a shaft was sunk,

and the wash driven eastward. For some reason the mine was abandoned, although only partly worked, and I am informed that all tools, skips, etc., were left below. Due north of this is the Hepburn Rocky lead, which was worked for some years, but as a call-paying mine, the gold not being quite sufficient to pay expenses, although a good quantity of gold was won. Fraser's lead, Graves United, and South Fraser's, all lying to the north of the Phoenix, were working in September 1895, but are all shut down, the two latter being non-payable. Graves United has averaged about 26 ounces per week with only four picks at work on the wash, but owing to the very hard reef rock and lead work required, did not cover expenses. The first machine of dirt from South Fraser's won 19 ounces. Patches as high as 7 ounces to the set have been obtained in these two mines, but on an average they have not paid wages, being too patchy. The shaft at South Fraser's was sunk 135 feet to the wash, which is from 4 feet to 5 feet in thickness.'

- *Royal Commission: Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board. Melbourne: Parliament of Victoria* (Shakespear et al. 1887:49)

  — Witness testimony: Joseph Edwin Meyers – Chairman of the Clunes Water Commissioners and Mayor of the Borough

  1804. Is it not the case that the ground is taken up largely from the Smeaton Reserve to the Rocky
  Lead? Yes.
  1805. What arrangements then will be made, or what conditions enforced, by the Commission as to dealing with the mine-waters from those mines? The Commission object strongly to those mines, the introduction of any impure water from any mines into the creek. With the Rocky Lead, an arrangement has been entered into, and I will give the particulars of it. The Rocky Lead has an agreement with the Water Commissioners. **They have made arrangements for storing the sludge in dams. It runs from the dams along the road in a drain into Langdon's Creek, which discharges into the lagoon**. At the present time, owing possibly to the large extent of the lagoon, about 300 acres, no discolouration perceptible has taken place. The company deposited a guarantee of £500 with the Commissioners that no damage to the water should take place.
  1806. The Rocky Lead, then, are storing their sludge? Yes, in dams; and from the dams the water finds its way along the road to the creek.
  1807. You get the overflow to the creek? Yes, but by the time it reaches the creek after passing through the lagoon it has been purified, and we find no fault with it.

- *The Ballarat Star* (January 15th, 1867)

  — 'MINING INTELLIGENCE – Lennon's Paddock Company …**A machine of dirt washed on Friday and got 26 oz**, being the result of three days' work with two picks. The ground looks so good that the mining manager calculates on 40 oz next time. Eight men are employed below, in from 3 to 4 feet thickness of washdirt, with gold visible in it for 2 feet upwards from the reef. Four or five machines will be got out this week.'

- *The Ballarat Star* (November 26th, 1881)

  — 'HEPBURN ROCKY LEAD COMPANY – …The Rocky Lead Company had been engaged pegging out ground in the locality for nearly fifteen years, in order to start a company, but he did not succeed until he was joined by two or three local men, and then he was fortunate in carrying out his object. (Applause). There was then a most extraordinary difficulty in the way. The trustees of the estate would not, under any circumstances, allow the ground to be worked until terms were come to with the Clunes Water Commission. **They said that the company must lodge a guarantee of £500 with the commission, to secure against any damage by sludge to the waterworks,** or otherwise the ground would not be let for mining purposes. In order to get clear of the difficulty the directors had to succumb to the terms of the trustees.'

- *The Argus* (November 7th, 1882)

  — 'THE GOLD MINES OF VICTORIA IN 1882. Hepburn Rocky Lead… …The tributary in Lennon's Paddock claim was worked for a distance of 1,400ft., when an accident occurred which put a stop to their operations. The cage, owing to some mischance, was pulled over the poppet-heads, and drawn into the engine-house. The driver barely escaped death, and the machinery was injured… …The first machine, after they had got into the main lead, yielded 30oz. of gold; and it was while wash dirt for the next machine was being raised that the accident occurred. **About one-half of a machine was puddled** with a return on 17 and a half oz. of gold. Since Lennon's paddock claim was abandoned the lead has been neglected.'

    - This article is written by geologist R. Brough Smyth and contains a great deal more information about the Hepburn Rocky Lead and mining in the area.

- *The Ballarat Star* (May 18th, 1895)

  — 'THE GRAVES UNITED. Great interest is naturally being manifested in the development of the above claim. The lead is a new one, and as there is an open and extensive area ahead, the success or otherwise of this mine means a great deal to the district. Since the first excellent yield the shares have fallen something precipitately, and the public are naturally anxious to know if this fall represents a change in the prospects of the mine to a like extent.'

- *The Ballarat Star* (November 7th, 1895)
    - 'GRAVES UNITED COMPANY. A WRIT FOR ROYALTY. THE COMPANY ABRUPTLY WOUND UP… … In the course of further discussion the chairman said that Mr Graves had been highly compensated for the damage done to his land, and, in addition, he supplied the company with the whole of the timber required, although it was not the most suitable that could be obtained. **He forgot, also, that other people suffered by the pollution of the water, and received no consideration at all.** It seemed to him to be a monstrous thing to expect royalty in a locality like that when the sufficient gold could not be obtained to meet the expenses of the working men.'

Historical maps

Department of Crown Lands and Survey, 1857. *Country lands in the Parish of Bullarook on the Bullarook Creek from 5 to 9 miles North East of Creswick*, County of Talbot, Dept. of Crown Lands and Survey, Melbourne.

Geological Survey of Victoria. 1880. Creswick Gold Field, 1:31 680 (40 chains:1 inch), Department of Mines, Melbourne.

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HEPBURN ROCKY LEAD COMPANY (1881, November 26). *The Ballarat Courier (Vic: 1869 - 1884; 1914 - 1918)*, p. 4. from **http://nla.gov.au/nla.news-article249284232**

MINING INTELLIGENCE. (1867, January 15). *The Ballarat Star (Vic: 1865 - 1924)*, p. 2, from **http://nla.gov.au/nla.news-article112860750**

Shakespear, R.H., A.F. Walker and J. Rowan. 1887. *Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board.* Melbourne: Parliament of Victoria.

THE GOLD MINES OF VICTORIA IN 1882. (1882, November 7). *The Argus (Melbourne, Vic: 1848 - 1957)*, p. 9, from **http://nla.gov.au/nla.news-article11558377**

THE GRAVES' UNITED. (1895, May 18). *The Ballarat Star (Vic: 1865 - 1924)*, p. 4., from **http://nla.gov.au/nla.news-article203161824**

6.9 – ID-58 and ID-59 – ACHS Hepburn Lagoon and a volcanic cone

See **Figures 16** and **17**

Potential for Sludge: Negligible

- Focus Areas **ID-58** is an ACHS associated with Hepburn Lagoon (**Figures 16** and **17**). This large body of water is fed by Langdons Creek (**ID-57**), which is a waterway that is likely to have carried some amount of mobilised mining sediment during the gold rush period. However, from at least 1857 to 1870 there was a dam along the eastern side of the lagoon that would have captured mining waste that entered it. However, as a still body of water, any mobilised mining sediments (sludge) that entered are not likely to have led to any buried prior ground surfaces, that were not already inundated by water. As such, outside of areas covered by the **ID-57**, Hepburn Lagoon has negligible potential for deposited sludge.
- Focus Area **ID-59** is an ACHS associated with a volcanic cone, which does not have identified evidence of upstream mining and thus has negligible potential for sludge.
- Hepburn Lagoon's dam failed in 1870, releasing huge volumes of water into Langdons Creek, which is likely to have remobilised some portion of accumulated mining sediments (*The Ballarat Star* August 1st, 1871).
- In the 1886 Royal Commission into Victorian sludge, it was noted that '[Mines] have made arrangements for storing the sludge in dams. It runs from the dams along the road in a drain into Langdons Creek, which discharges into the lagoon. At the present time, owing possibly to the large extent of the lagoon, about 300 acres, no discolouration perceptible has taken place' (Shakespear et al. 1887:49).

Potential for Mining: Negligible

- No evidence for mining activity within Focus Area **ID-58** or **ID-59** was identified either in mining datasets/literature or the VHD.

Waterway movement

- Not applicable

Historical research (selected passages)

- *The Ballarat Star* (August 1st, 1871)

    — 'BALLARAT CIRCUIT COURT – Octavius Langtree, C.E., stated that he had known Hepburn's Lagoon for the past three or four years. He had visited the dam at the time when it gave way. It was, before it gave way, about 268 acres in extent. It was about five feet in level above the top of the inner dam. The width of the top of the outer dam was about fifteen feet, and that of the bywash about 33 feet from his own measurements. Could not say that the bywash had boards across it for the conservation of water at the time of the bursting of the dam. The boards had been seen by him before the dam gave way. Five hundred and seven-four million gallons was the capacity of the dam without the boards being in the bywash. That of course included the inner dam, which was full and covered five or six feet. The inner dam would have conserved 174 million gallons. The boards, which were like the model produced, were across the front of the bywash. **There were no dams on Langdon's Creek, but on the Bullarook Creek—the one being a continuation of the other —there was a dam.** The inner dam, from appearances which he saw, had not burst. About 400 million gallons of water was released by the giving way of the outer dam. The sectional area of flood waters on the 8th September, the day of the bursting of the dam—in Langdon's Creek, above the dam —was 156 square feet, and the velocity five miles per hour. He calculated 70,200 cubic feet of water would run past per minute. **All the waters when the dam burst went down the creek**. The safe capacity of the run, with the boards out, would be, allowing 18 inches, about 10,000 cubic feet per minute. The dam that burst was not sufficient to contain the water of the flood of September 1870.'

- *Royal Commission: Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board.* Melbourne: Parliament of Victoria (Shakespear et al. 1887:49)

    — 'Witness testimony: Joseph Edwin Meyers – Chairman of the Clunes Water Commissioners and Mayor of the Borough

    They have made arrangements for storing the sludge in dams. It runs from the dams along the road in a drain into Langdon's Creek, which discharges into the lagoon. At the present time, owing possibly to the large extent of the lagoon, about 300 acres, **no discolouration perceptible has taken place**. The company deposited a guarantee of £500 with the Commissioners that no damage to the water should take place.

    1806. The Rocky Lead, then, are storing their sludge? Yes, in dams; and from the dams the water finds its way along the road to the creek.

    1807. You get the overflow to the creek? Yes, but **by the time it reaches the creek after passing through the lagoon it has been purified, and we find no fault with it**.'

Historical maps

Department of Crown Lands and Survey, 1857. *Country lands in the Parish of Bullarook on the Bullarook Creek from 5 to 9 miles North East of Creswick*, County of Talbot, Dept. of Crown Lands and Survey, Melbourne.

Geological Survey of Victoria. 1880. Creswick Gold Field, 1:31 680 (40 chains:1 inch), Department of Mines, Victoria.

References

BALLARAT CIRCUIT COURT. (1871, August 1). *The Ballarat Star (Vic: 1865 - 1924)*, p. 4, from **http://nla.gov.au/nla.news-article197564725**

Shakespear, R.H., A.F. Walker and J. Rowan. 1887. *Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board.* Melbourne: Parliament of Victoria.

6.10 – ID-60 and ID-61 – ACHS Green Hill and Bullarook Hill (Langdon Hill)

See **Figures 16** to **18**

Potential for Sludge: Negligible

- Focus Areas **ID-60** and **ID-61** are ACHS associated with Green Hill and Bullarook Hill (showing on some maps as Langdon Hill) (**Figures 16 to 18**). These landscape features are well-elevated above adjacent waterways and thus have negligible potential for accumulated mining waste sediment.

Potential for Mining: Some

- There is an unnamed and undated reference to a quarry near the centre of Bullarook Hill (**ID-61**). Historical aerials from 1961, 1976, and 1979, or those post-dating 2011 do not suggest any recently disturbed ground surfaces at this location. No quarry shows on a 1983 geological map, from which the names of these landscape features was determined (GSV 1989).

Waterway movement

- Not applicable

Historical research

- No historical evidence for mining across this Focus Area was identified

Historical maps

Geological Survey of Victoria., 1989. Castlemaine 1:100 000 deep leads map. Department of Industry Technology & Resources, Victoria.

6.11 – ID-62 – ACHS Rocky Lead Creek

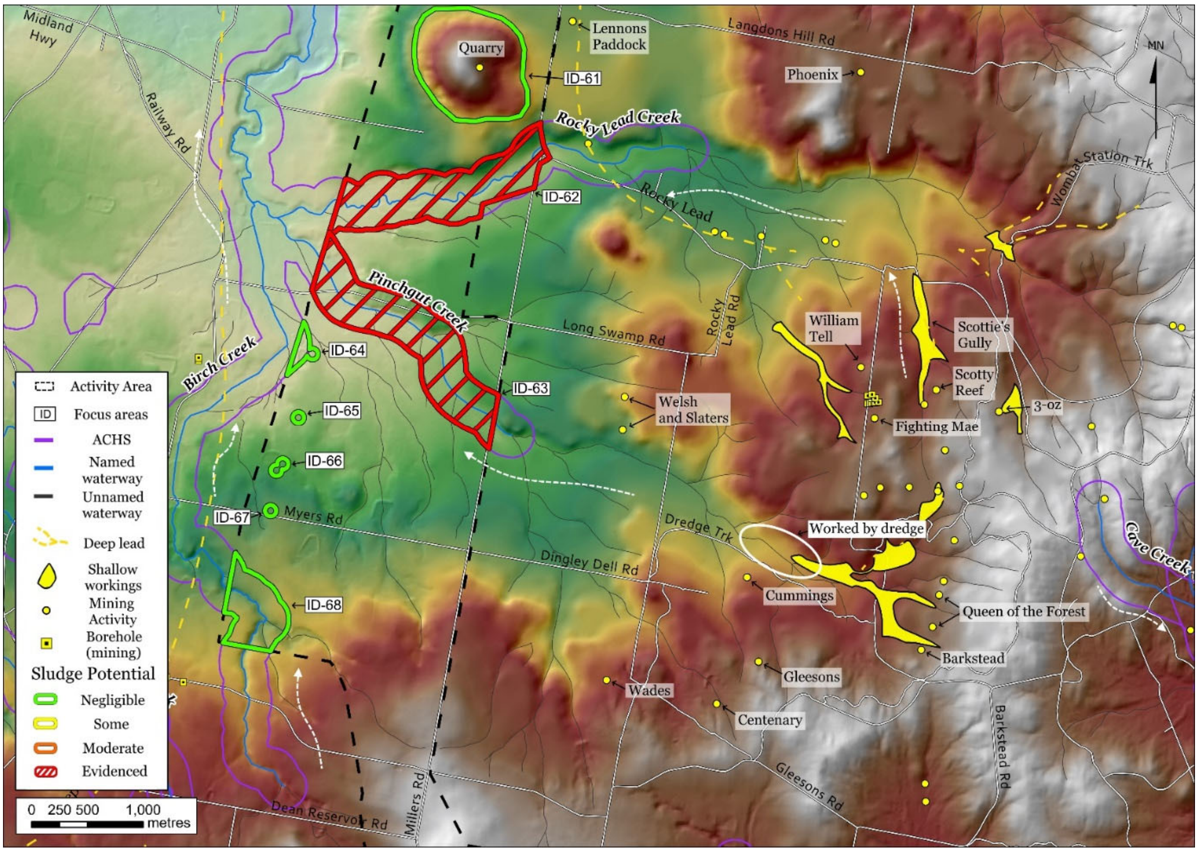

Figure 18. A 10-metre Digital Terrain Model (DTM) showing Focus Areas **ID-62** to **ID-68** associated with Rocky Lead Creek, Pinchgut Creek, Birch Creek, and Aboriginal Cultural Heritage Places. Focus Area **ID-62** is associated with Rocky Lead Creek, which had both shallow and deep lead mining activities from the 1860s to 1870s and again from around 1895. Witness testimony from the 1886 Royal Commission into sludge indicates Rocky Lead Creek carried significant volumes of sludge during the 1860s. A witness stated that the sludge entering Birch Creek from Rocky Lead Creek was so thick 'you could almost write your name upon the creek.' Pinchgut Creek (**ID-63**) is also known to have carried significant volumes of sludge during the nineteenth century. A dredge worked sections of the creek from 1906 to 1907 and was caught discharging large amounts of sludge after complaints were made by those living downstream in Newlyn. Focus Areas (**ID-64** to **ID-68**) are not downstream of any identified mining activities and thus have negligible potential to maintain sludge deposits.

Potential for Sludge: Evidenced

- Focus Area **ID-61** is an ACHS associated with Rocky Lead Creek (**Figures 16** and **18**). This waterway is known to have carried significant volumes of sludge during the nineteenth century, and has a high probability of maintaining ground surfaces buried by mining sediment. Rocky Lead Creek had shallow and deep lead mining upstream during the 1860s till early 1870s and again from around 1895 and into the twentieth century.
- Witness testimony from the 1886 Royal Commission into sludge indicates Rocky Lead Creek carried significant volumes of sludge during the 1860s (Shakespear et al. 1887:36). Here, a witness stated that the sludge entering Birch Creek from Rocky Lead Creek was so thick 'you could almost write your name upon the creek.'
- In 1907, the Sludge Abatement Board, the agency responsible for regulating and enforcing Victoria's sludge prevention legislation, interviewed miners and landowners within or near Focus Area **ID-61** about local mining and sludge. Here, a landowner again confirmed mining had taken place along and upstream of the creek and those activities had discharged sludge (*The Ballarat Star* March 15th, 1907).
- An 1895 geological map identifies numerous gold workings along and upstream of Rocky Lead Creek, including shafts marked as 'old' and areas denoted as 'now being worked' and 'good for sluicing' (GSV 1895).
- Historical mining datasets include large areas of 'shallow working' upstream of the Focus Area, including Scotty Gully (referred in historical newspapers as Scottie's Gully (*The Ballarat Star* August 8th, 1902)), which extends across 11 hectares. Other areas of shallow working are marked as 'Beekmans Gully' and '3-Oz.' More information is provided about these upstream gold mining companies and their activities in (Ferguson 1909).
    - The point data for the following gold mining companies are also included in mining datasets: Phoenix, Foote, Reef Hill, Fighting Mae, and William Tell.

- A 1902 description of 'Scottie's Gully' provided in *The Ballarat Star* (August 8th, 1903) states it was 'a piece of country riddled with prospecting shafts' (see Historical Research section).
- A 1903 newspaper (*The Argus* May 20th, 1903) indicates that 'Scottie's Reef' 'cleaned up 70 tons for 36oz'— referring to the amount of wash-dirt processed on site and likely discharged into Rocky Lead Creek.
- The topography of this location is suitable for the accumulation of significant volumes of sludge—particularly the western-half of the Focus Area (**ID-60**).

Potential for Mining: Some

- Rocky Lead Creek had shallow and deep lead mining, both along the creek and within adjacent upstream gullies. However, geological maps produced of the area in 1895 and 1909 do not show any mining activities within the Focus Area (GSV 1895; Ferguson 1909). Nevertheless, there is still some potential for miners to have prospected within **ID-60**, given the intensity of mining carried out in the area during the 1860s.
- Mining surveyor reports indicate there were 190 miners working on Rocky Lead in 1864 (Secretary for Mines 1864:14). In 1866, there were 180 miners working in the area including deep lead shafts by the 'Jupiter Company', 'You Know Company,' 'Golden Emporium,' and 'Golden Gate Company' (Secretary for Mines 1867:10). By 1869, the mining population had dropped to 30, dropping again to just 20 miners by June 1872 (Secretary for Mines 1872:22).
- No other evidence for mining activity within Focus Area **ID-60** was identified either in mining datasets or the VHD.

Waterway movement

- No evidence identified

Historical research (selected passages)

- *Royal Commission: Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board.* Melbourne: Parliament of Victoria (Shakespear et al. 1887:36)

  — Witness testimony in 1886 from John Parkin – Local farmer and miner

  '1316. How many years is it since the Rocky Lead was working? It must be something near twenty years…
  …1323. In former days there was some sluicing up near Rocky Lead, was not there? Yes.
  1324. Did they deliver into Birch's Creek? Yes.
  1325. Are you aware whether that sludge water carried sludge down Birch's Creek as far as this [Allendale]? The Creek was very muddy down here.
  1326. And the creek above this point has got clearer, has it? It is clear now.
  1327. It is clear above those mines now? Yes.'

    - John Parkin's testimony acknowledges sluicing took place along the Rocky Lead during the 1860s and that sludge was discharged into the creek that ended up in Birch Creek.

  — More witness testimony from John Parkin

  '1338. Do you know what was the nature of the working upon the Rocky Lead, was it deep working or merely shallow? Both shallow and deep. In fact I was working there myself. I had a steam puddling machine there working surface ground. As well as that, at Rocky Lead, they were working in the rock. It is a long time ago I speak of; more than 20 years since, and they had a rock shaft and a puddling machine the same as now.
  1339. Have you any idea what number of puddling machines wore working at that time? I cannot tell you.
  1340. Has the creek, do you think, got clearer since that time by the mere carrying down of all this material by flood water? It is much clearer than it was then.
  1341. You did not deliver into Hepburn's Lagoon? No.
  1342. Your puddling machines delivered direct into the creek? Yes.
  1343. Have you any idea what area of ground did the, workings cover, or how many men did they employ-something to give one an idea of the size of them? It is a very hard thing to say.
  1344. The whole area of the old workings? I suppose it was a couple of miles.
  1345. A couple of miles along the lead? A couple of miles along the lead, and I may say that at present yon would not say that there had ever been mines worked above to look at the creek.
  1346. Is that creek a constant running creek in summer? Yes, as you heard me express myself when you asked me, in the summer time the creek was coming down so thick that you could almost write your name upon the creek. It was only small, but still it was running.
  1347. And now it has got clear again? Quite clear.'

    - Here John Parkin suggests there was so much sediment entering the creek in the 1860s from the Rocky Lead mines that he could have written his name across it. His previous testimony suggests he may be referring to Birch Creek in this segment, but as the sludge from the mines he describes did not lead to Hepburn Lagoon, he is referring to sludge produced and discharged into Rocky Lead Creek.

- *The Ballarat Star* (March 15th, 1907)

- ‘SLUDGE ABATEMENT BOARD – SITTING AT CRESWICK. The Sludge Abatement Board sat in the Council Chambers, Creswick, yesterday, to make investigations into the complains preferred by local residents as to the sludge being allowed to pass from certain dredging companies’ workings into the main creek [Birch Creek]… …Chas. Curnow Phillips, retired school teacher, said he was the holder of some grazing land at Rocky Lead. There had been mining on the Birch’s Creek above the junction of the Rocky Lead Creek. There had formerly been a puddling machine there, and there had been sluicing and fossicking, there being a little sluicing going on there at the present time. There had also been mining going on in the Pinchgut Creek, too, also the Rocky Leads Creek. During the 34 years he had been in the district the puddling and sluicing he had seen on the creek had discolored the water a yellowish tinge when working.’

- *The Ballarat Star* (August 8th, 1902)
  - ‘REEF HILL AND SCOTTIE’S REEF – Having inspected Reef Hill, a start was made for Scottie’s Reef, and a scramble through a piece of country riddled with prospecting shafts brought the party to the head of what is known as Scottie’s Gully. Here the syndicate which opened the ground up prior to the flotation of the company has put down several holes, averaging 12 feet deep, and off the bottom in each case very promising prospects have been got.’

Historical maps

Department of Crown Lands and Survey, 1857. *Country lands in the Parish of Bullarook on the Bullarook Creek from 5 to 9 miles North East of Creswick*, County of Talbot, Dept. of Crown Lands and Survey, Melbourne.

Ferguson, W.H., 1909. Parish of Dean geological map, showing locations of reefs, alluvial gold workings, dykes, nuggets, etc 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 593/G/2.

Geological Survey of Victoria., 1989. Castlemaine 1:100 000 deep leads map. Department of Industry Technology & Resources, Victoria.

Geological Survey of Victoria, 1895. *Parts of Parishes of Bullarook, Wombat, Bullarto and Dean]*, Geological Survey Office, Melbourne.

References

Ferguson, W.H., 1909. Report on Rocky Lead, including notes for plan 593/G/2. Geological Survey of Victoria Unpublished Report 1909/1. Department of Mines, Victoria, 81 pp.

MINING NOTES. (1903, May 20). *The Argus (Melbourne, Vic: 1848 - 1957)*, p. 8, from **http://nla.gov.au/nla.news-article9830290**

REEF HILL AND SCOTTIE’S REEF. (1902, August 8). *The Ballarat Star (Vic: 1865 - 1924)*, p. 6., from **http://nla.gov.au/nla.news-article211463976**

Secretary for Mines, 1864. Reports of the Mining Surveyors and Registrars. Quarter ending 30th September 1864. No.13.Parliament of Victoria, Melbourne.

Secretary for Mines, 1866. Reports of the Mining Surveyors and Registrars. Quarter ending 30th June 1866. No.8.Parliament of Victoria, Melbourne.

Secretary for Mines, 1869. Reports of the Mining Surveyors and Registrars. Quarter ending 30th September 1869. No.74.Parliament of Victoria, Melbourne.

Secretary for Mines, 1872. Reports of the Mining Surveyors and Registrars. Quarter ending 31st June 1872. No.23.Parliament of Victoria, Melbourne.

Shakespear, R.H., A.F. Walker and J. Rowan. 1887. *Report of the Board Appointed by His Excellency the Governor in Council to Inquire into the Sludge Question, together with the Minutes of Evidence, notes by the Board. Melbourne: Parliament of Victoria.*

SLUDGE ABATEMENT BOARD (1907, March 15). *The Ballarat Star (Vic: 1865 - 1924)*, p. 3., from**http://nla.gov.au/nla.news-article210892252**

6.12 – ID-63 – ACHS Pinchgut Creek

See **Figure 18**

Potential for Sludge: Evidenced

- Focus Area **ID-62** is an ACHS associated with Pinchgut Creek (**Figure 18**). This waterway had a significant amount of upstream mining (shallow, quartz reef, deep lead, and dredging) and is known to have carried sludge during the nineteenth and early twentieth centuries.
- During the 1886 Royal Commission, one witness (a local miner named Christopher Russell), noted that at some point previously he had been engaged in hydraulic sluicing operations at the ‘Pinchgut Lead’ near Rocky Lead and had seen sludge ‘dammed back’ along Pinchgut Creek by ‘thick growth of reeds and grass’ (Shakespear 1887:24).
- A 1909 geological map identifies numerous gold workings along and upstream of Pinchgut Creek, including an area marked as ‘worked by dredge’ 2.5 km upstream of the Focus Area (Ferguson 1909). That dredge, owned by the Ballarat Hydraulic Company, operated from 1906 till end of 1907 (*The Ballarat Star* September 3rd, 1906; November 4th 1907). By 1907, complaints by landowners downstream lead to an investigation by Victoria’s Sludge Abatement Board. One of the witnesses noted that he had seen ‘the Ballarat

Hydraulic Company's dredge working in the Pinchgut Creek, and the sluicers made no attempt to return any of the stuff they were washing down from the faces, and, as far as he could see, neither did the dredgers' (*The Ballarat Star* March 15th, 1907). These activities were found to be responsible for the significant amount of sludge that was affecting landowners downstream in Newlyn at that time. Newlyn Reservoir (constructed in 1873) would have prevented the described sludge from continuing further downstream to lower sections of Birch Creek (**ID-56**).

- Historical mining datasets indicate there was a 26-hectare area of shallow workings across the upper reaches of the sub-catchment, which is surrounded by historical mineshafts associated with deep lead mining and quartz reefs. This is likely to be the area described as being sluiced in the 1886 Royal Commission.
    - The following mining companies are also known to have operated in in the area (shown on **Figure 18**): Try Again West, Try Again, Admiral Sperry, Mullens, Welchs, Queen of the Forest, Barkstead, Cummings, Gleesons, Centenary, Wades, Welsh and Slaters, and Welsh and Slater North. More information about some of these operations can be found in Ferguson 1909.
- The topography of this location is suitable for the accumulation of significant volumes of sludge across the majority of the Focus Area—excluding areas of higher elevation along the northern side of Pinchgut Creek. It should be noted that the sludge deposits are likely to extend south beyond and outside of the Focus Area.

Potential for Mining: Some

- Pinchgut Creek (also referred to as Pinchgut Gully and Pinchgut Lead) had a mixture shallow workings, deep lead mining, and dredging, which took place both along the creek and within adjacent upstream gullies. However, no evidence was identified that placed any of these mining activities within the Focus Area specifically. As shown in **Figure 18** the section of the creek that was dredged is 2.5 km upstream of the Activity Area. Nonetheless, there is still some potential for miners to have prospected within **ID-61**, given the intensity of mining carried out in the area during the 1860s.
- Mining surveyor reports indicate there were 150 miners working on Pinchgut Creek in 1864 (Secretary for Mines 1865:14). In 1866, there were 60 miners working in the area. In 1869, the mining population was 50, dropping again to just 30 miners by June 1872 (Secretary for Mines 1872:22). More anecdotally, a geological report written in 1898 suggests 'at one time there were 2000 [Chinese people] working in [Pinchgut Creek]' (Lidgey 1898).
- No other evidence for mining activity within Focus Area **ID-61** was identified either in mining datasets or the VHD.

Waterway movement

- No evidence identified

Historical research

- *Report on Bullarook, Barkstead, and Korweinguboora* (Lidgey 1898:1)
    - 'Pinchgut Gully rises near Barkstead and trends north-westerly towards Newlyn. **At the date of my visit there were 20 men working, and I was informed that at one time there were 2000 Chinamen working in it. It has been worked for about 2 miles**, until water became too heavy to overcome with a windlass. Scotty's Gully rises at Scotty's reef and falls to the north.'
- *The Ballarat Star* (September 3rd, 1906)
    - 'GORDON. Day and party, who are erecting machinery on Pinchgut Creek for dredging purposes, were delayed on account of the bad roads, but have now landed the machinery on the mine.'
- *The Ballarat Star* (March 15th, 1907)
    - 'SLUDGE ABATEMENT BOARD – SITTING AT CRESWICK. The Sludge Abatement Board sat in the Council Chambers, Creswick, yesterday, to make investigations into the complains preferred by local residents as to the sludge being allowed to pass from certain dredging companies' workings into the main creek [Birch Creek]… The chairman, in opening the enquiry, said that the board was going to make inquiries and hear evidence on both sides in relation to complaints made against certain dredging companies permitting their sludge to pollute the creek. A complaint had been received from the Clunes Water Commission stating that their creek and reservoir were being polluted by sludge from the Ballarat Hydraulic Dredging Company's dredge on Pinchgut Creek… …Harry E. Sandow, secretary and engineer to the Clunes Water Commission, said he examined the country about where the Ballarat Hydraulic Company's dredge was working on Pinchgut Creek in January last. The dredge was working a sluicing plant in ordinary range country. He could not give the depth of the wash. **They were not piling up the tailings from the sludge**. **He did not think the company was taking the usual precautions taken by the dredges around Creswick**… … On making inquiries at Newlyn he found that the residents had to sink wells on account of the dirty surface water, a procedure that had never been known before. In the Pinchgut Creek, midway between the Clunes reservoir and the dredge, there were unmistakable traces of sludge on the tailings. The trouble, in his opinion, was caused by the heavy rains in November and December last washing the sludge down… …The dredge, to the best of his knowledge was the first ever on Pinchgut Creek... …Chas. Curnow Phillips, retired school teacher said… there had also been mining going on in the Pinchgut Creek, too, also the Rocky Leads Creek. During the 34 years he had been in the district the puddling and sluicing

he had seen on the creek had discoloured the water a yellowish tinge when working. **He had seen the Ballarat Hydraulic Company's dredge working in the Pinchgut Creek, and the sluicers made no attempt to return any of the stuff they were washing down from the faces, and, as far as he could see, neither did the dredgers** which he understood was because they were in a fresh paddock. They had an ordinary barricade to prevent the sludge running down into the creek, but the water was not settled. **The sluicers sent the whole of their sludge away, but the dredgers impounded some of theirs**.'

- This passage details the release of sludge into Pinchgut Creek by dredge operators and those engaging in hydraulic sluicing along the creek. It also indicates that the sludge discharged caused problems for landowners downstream along Birch Creek (above Newlyn Reservoir).

- *Report on Rocky Lead, including notes for plan* 593/G/2 (Ferguson 1909:16)

  — 'Pinchgut Creek: A considerable amount of work has been done along Pinchgut Creek and its branches. The work done was mostly shallow, but at the part of the creek where formerly there was a dredge working, the ground was 40 feet deep. Much of the ground was worked by Chinese, some of whom made fortunes and returned to China. When the ground was abandoned by the Chinese it was taken up by Europeans and again worked… …A few acres of ground in the creek were worked by a dredge. This work did not pay – the gold was poor, there was trouble with water, at times there was not enough, and at other times there was too much. The ground was 40 feet deep, and there was 20 feet of tough clay which had to be broken with explosives. In local opinion the dredge was started to work too low down the creek, and it would have done better if it had been started where it finished up, as the ground there was less deep, and it is said that the gold was richer.'

<u>Historical maps</u>

Department of Crown Lands and Survey, 1857. *Country lands in the Parish of Bullarook on the Bullarook Creek from 5 to 9 miles North East of Creswick*, County of Talbot, Dept. of Crown Lands and Survey, Melbourne.

Ferguson, W.H., 1909. *Parish of Dean geological map, showing locations of reefs, alluvial gold workings, dykes, nuggets, etc*. 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 593/G/2.

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Geological Survey of Victoria, 1989. Castlemaine 1:100 000 deep leads map. Department of Industry Technology & Resources, Victoria.

Geological Survey of Victoria, 1895. *Parts of Parishes of Bullarook, Wombat, Bullarto and Dean]*, Geological Survey Office, Melbourne.

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GORDON (1906, September 3). *The Ballarat Star (Vic: 1865 - 1924)*, p. 3., from **http://nla.gov.au/nla.news-article210684229**

Lidgey, E. 1898. Report on Bullarook, Barkstead and Korweinguboora. Geological Survey of Victoria Special Report. Department of Mines and Water Supply, Victoria, 2 pp.

ROCKY LEAD. (1907, November 4). *The Ballarat Star (Vic: 1865 - 1924)*, p. 4., from http://nla.gov.au/nla.news-article211286703

Secretary for Mines, 1864. Reports of the Mining Surveyors and Registrars. Quarter ending 30th September 1864. No.13.Parliament of Victoria, Melbourne.

Secretary for Mines, 1866. Reports of the Mining Surveyors and Registrars. Quarter ending 30th June 1866. No.8.Parliament of Victoria, Melbourne.

Secretary for Mines, 1869. Reports of the Mining Surveyors and Registrars. Quarter ending 30th September 1869. No.74.Parliament of Victoria, Melbourne.

Secretary for Mines, 1872. Reports of the Mining Surveyors and Registrars. Quarter ending 31st June 1872. No.23.Parliament of Victoria, Melbourne.

SLUDGE ABATEMENT BOARD (1907, March 15). *The Ballarat Star (Vic: 1865 - 1924)*, p. 3., from **http://nla.gov.au/nla.news-article210892252**

6.13 – ID-64 to ID-68 – ACHS Birch Creek and Registered Cultural Heritage Places

See **Figure 18**

<u>Potential for Sludge:</u> Negligible

- Focus Areas **ID-64** and **ID-68** are ACHS associated with sections of Birch Creek. These Focus Areas did not have any identified evidence for historical mining across digitised mining datasets/literature or the VHD and thus have negligible potential for sludge.
- Focus Areas **ID-65** to **ID-67** are ACHS associated with registered Cultural Heritage Places that did not have any identified evidence for historical mining across digitised mining datasets/literature or the VHD and thus have negligible potential for sludge.

Potential for Mining: Negligible

- No evidence for historical mining was identified across digitised mining datasets/literature or the VHD within these Focus Areas.

Waterway movement

- No evidence for waterway movement was identified. A geological map from 1909 depicts Birch Creek unchanged from its present-day position (Ferguson 1909).

Historical research

- No historical evidence for mining within or upstream of these Focus Areas was identified

Historical maps

Ferguson, W.H., 1909. Parish of Dean geological map, showing locations of reefs, alluvial gold workings, dykes, nuggets, etc 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 593/G/2.

Geological Survey of Victoria., 1989. Castlemaine 1:100 000 deep leads map. Department of Industry Technology & Resources, Victoria.

6.14 – ID-69 to ID-71 – ACHS Musk Creek, Devils Creek, and Moorabool River West Branch

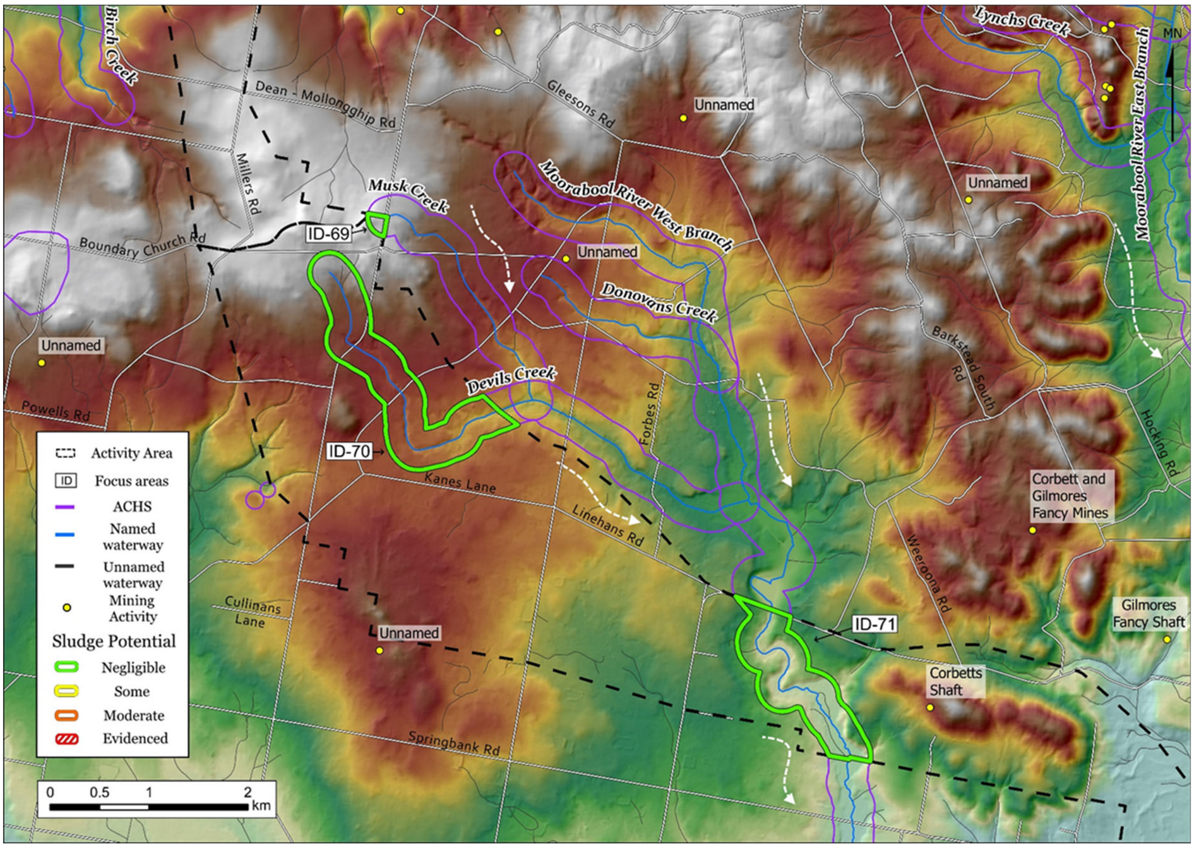

Figure 19. A 10-metre Digital Terrain Model (DTM) showing Focus Areas **ID-69** to **ID-71** associated with Musk Creek, Devils Creek, and Moorabool River West Branch. Neither Musk Creek (**ID-69**) or Devils Creek (**ID-70**) had any identified evidence of upstream mining and thus each have negligible potential to maintain sludge deposits. **ID-71** is associated with the western branch of the Moorabool River and is downstream of two unnamed mineshafts and two shafts associated with the Corbett mining company, which operated post-1930 and are thus unlikely to have discharged sludge freely into waterways. The Focus Area is more than four kilometres downstream of the unnamed mineshafts and thus has negligible potential to maintain deposits of gold mining sludge.

Potential for Sludge: Negligible

- Focus Areas **ID-69** and **ID-70** are ACHS associated with Musk Creek and Devils Creek, respectively. No evidence of historical mining was identified within or upstream of these Focus Areas across digitised mining datasets/literature or the VHD.
- Focus Area **ID-71** is an ACHS associated with the western branch of Moorabool River. Two datapoints associated unnamed mineshaftss were identified in historical mining datasets. Those features likely correspond to mineshafts that are highly unlikely to have produced enough waterborne sediment to result in meaningful volumes of sludge deposition four kilometres downstream across the Focus Area. Corbetts shaft corresponds to deep lead quartz mining from the 1930s, which is well after legislation that banned the discharging of tailings into Victoria waterways.

Potential for Mining: Negligible

- No evidence of historical mining was identified within these Focus Areas across digitised mining datasets/literature or the VHD.

Waterway movement

- No evidence identified

Historical research

- *Gold and Minerals* (Baragwanath 1946:223)
  - ‘GORDON DISTRICT; Reef mining in the vicinity of Gordon was commenced during the sixties. Later large companies operated among them being Parkers United and Kangaroo Bob. Very little information is available about the old workings and the field was comparatively idle until during the Depression of the early thirties when the discovery by Corbett Brothers of a payable reef attracted attention to the possibilities of untried reefs carrying values on the surface. It may be worth recording that Corbett's show [sic] was located on a low saddle and that on neither side was any loam gold found…
    …Corbett's mine was worked to a depth of nearly 400 feet. At the outcrop a length of 60 feet was crushed for an average value of over 2 ounces to the ton. The reef continued more or less two to three feet in width to a depth of about 150 feet when a large body of stone with at times payable values on the footwall took the place of the small reef. Below 300 feet values were difficult to locate and much prospecting was carried out at the 400 feet level in bodies of stone of low grade, and operations ceased at this depth towards the end of 1937. Shortly afterwards the plant was disposed of and portion removed to the Maxwell West at Daylesford.’

Historical maps

Ferguson, W.H., 1909. Parish of Dean geological map, showing locations of reefs, alluvial gold workings, dykes, nuggets, etc 1:31,680 (40 chains:1 inch) Unpublished Geological Parish Plan. Plan No 593/G/2.

Foster, H., 1937. Parish of Moorabool West and portion of Kerrit Bareet 1:31,680 (40 chains:1 inch) geological map. Plan No 112p. Geological Survey of Victoria.

References

Baragwanath, W. 1946. Gold and Minerals. Special report to Victoria Department of Mines.

6.15 – ID-72 – Area of Cultural Heritage Sensitivity Moorabool River East Branch

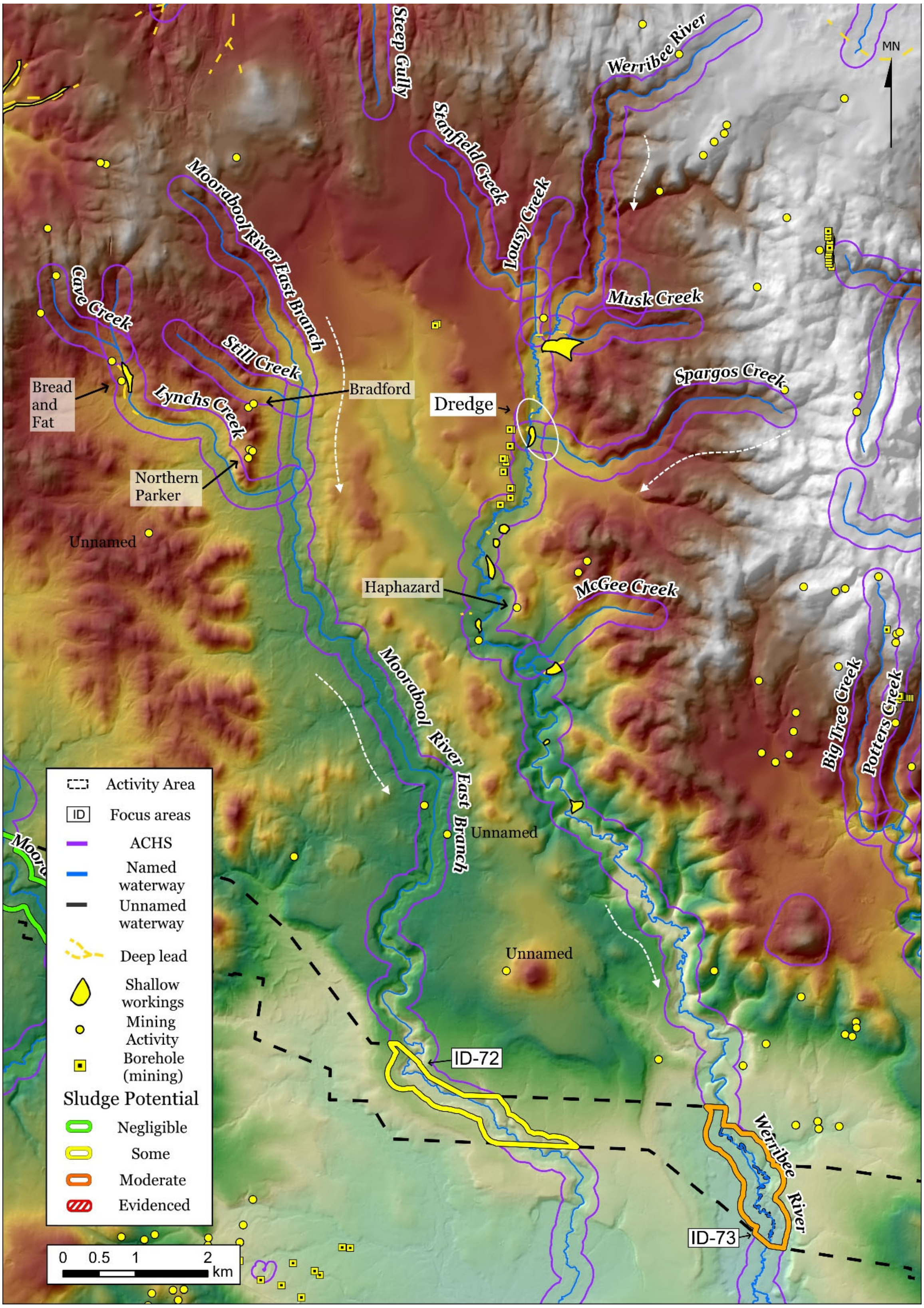

Figure 20. A 10-metre Digital Terrain Model (DTM) of Focus Areas **ID-72** and **ID-73**, ACHS associated with the Moorabool River East Branch and the Werribee River. The eastern branch of the Moorabool had shallow alluvial mining at the Bread and Fat diggings during the early stage of the rush, then, from the 1870s, had deep lead quartz reef mining at the Bradford and the Northern Parker. As **ID-72** is more than 8 km downstream of those deep lead operations, and more than 10 km from the alluvial workings, the Focus Area just has 'some' potential to maintain sludge deposits. Werribee River (**ID-73**) had intensive shallow and deep lead upstream mining activities that are likely to have produced significant quantities of waterborne sediment. In the 1870s residents of Ballan (downstream of AA) complained of 'discoloured water' from upstream mines. Additionally, the Focus Area's topography is well-suited for sludge deposition (see **Figure 13**). Overall, the Focus Area **ID-73** has 'moderate' potential to maintain sludge deposits.

<u>Potential for Sludge:</u> Some

- Focus Area **ID-72** is an ACHS associated with the eastern branch of the Moorabool River (**Figure 20**). The Focus Area had some upstream gold mining during the nineteenth and early twentieth centuries. The Bread and Fat diggings on Lynchs Creek near Barkstead was part of an early phase of the gold rush (likely during the 1850s) (*Weekly Times* 9th June 1948). The diggings are shown on a 1957 geological map, but have only a brief mention in any of the identified mining literature (presented in Historical Research section). Based on the small scale of those diggings, coupled with the ten-kilometre distance between them and **ID-72** there is only 'some potential' that any sludge produced by those activities made it down to the Focus Area in meaningful quantities.
- From around the 1880s, deep lead miners were targeting the Jones Reef at the 'Great Northern Parker' and 'Bradford' mines. The Great Northern Parker shaft was sunk to a depth of 240 ft (73 metres), but was abandoned around 1888— the Bradford was sunk to a depth of 180 ft (55 metres) and was no longer operating by 1898 (Lidgey 1898:2; *The Ballarat Star* 13th September 1900). Both mines reopened for a brief period in 1911 (*The Age* 28th January 1911). It is likely that these mining activities discharged some mining waste into the adjacent waterways (upstream of the Focus Area). However, given the eight-kilometre distance between them and the Focus Area, **ID-72** has just 'some potential' to maintain sludge deposits.

<u>Potential for Mining:</u> Negligible

- No evidence for historical mining was identified across digitised mining datasets/literature or the VHD within this Focus Area.

<u>Waterway movement</u>

- No evidence for waterway movement was identified.

<u>Historical research (selected passages)</u>

- *Weekly Times* (June 15th, 1948)
  - 'Origin of Curious Place Names – DEAR MIRANDA – The place called Barkstead mentioned in my last letter is a village in the Wombat State Forest, between Daylesford and Ballarat. In the very early days all the houses were built of sheets of bark. It is a gold-digging place. In one diggings 12 men were sitting down having lunch and only one had meat, all the others having only bread and fat. So they called it **Bread and Fat Diggings.** A young lady and myself conducted a Sunday school there for several years.'
- *Report on Bullarook, Barkstead, and Korweinguboora* (Lidgey 1898:1)
  - 'Near Barkstead, on the fall towards the Moorabool River, **Bread and Fat** and Lynch's Gullies have been worked.'
- *The Ballarat Courier* (August 16th, 1881)
  - 'MINING INTELLIGENCE – The prospectus of the Great Northern Parker's Quartz Company, near Gordon, appears in our advertising columns. The claim consists of 2600 feet on the line of reef lately worked by the State Forest Company.'
- *The Ballarat Star* (September 13th, 1900)
  - 'THE BOLWARRAH AND GORDON MINING DISTRICT -- …Here the workings on what is known as the Great Northern Parker's Reef commence, and continue without a break for a distance north of 1.5 miles. This reef is remarkably persistent and regular on the surface over the whole distance worked… …The shaft furthest north on the line was sunk down, as the ore was not rich enough to pay cartage to the nearest battery at Daylesford, about 10 miles distant. The reef was abandoned about 12 years ago, and has remained so since.'
    - More information is also provided in this reference both on the Great Northern Parker and the Bradford.
- *The Age* (January 28th, 1911)
  - 'LATE MINING NEWS – MOORABOOL. –On the banks of the Moorabool River here, two prospectors named Egan and Jones came upon a quartz reef some time ago, showing gold freely. They raised a crushing and sent it to the school of mines to be crushed. So favorably are residents here impressed with the permanency of the reef, that they have pegged off other claims. This find is on the old Great Northern Parker's reef, which proved to be rich but narrow years ago. As this claim is near Korweinguboora, the people there are greatly excited over the discovery. The Jones and Bradford claim, worked years ago, is on the same line, and this claim yielded as high as 7 oz. of gold to the ton. There is no doubt about there being payable gold in this district. All that is wanted is prospecting for it.'
- *Historic gold mining sites in the south west region of Victoria* (Bannear 1999:44)
  - 'The successes of these companies sparked a small mining boom in 1883, which led to a flurry of machinery installation. Some of this machinery was erected at two recently discovered goldfields, ie. the Great Northern Parker and Jones-Bradford companies erected steam-powered plants at Korweinguboora… …This field did not develop passed the prospecting stage.'

<u>Historical maps</u>

Geological Survey of Victoria, 1958. Korweinguboora, counties of Grant and Talbot. A. C. Brooks Govt. Printer, Melbourne.

References

Bannear, D. 1999, *Victorian goldfields project; historic gold mining sites in the south west region of Victoria.*, Department of Natural Resources and Environment, Victoria.

LATE MINING NEWS. (1911, January 28). *The Age (Melbourne, Vic:1854 - 1954)*, p. 14. from **http://nla.gov.au/nla.news-article196183043**

Lidgey, E. 1898. Report on Bullarook, Barkstead and Korweinguboora. Geological Survey of Victoria Special Report. Department of Mines and Water Supply, Victoria, 2 pp.

MINING INTELLIGENCE. (1881, August 16). *The Ballarat Courier (Vic: 1869 - 1884; 1914 - 1918)*, p. 4., from **http://nla.gov.au/nla.news-article249747019**

Origin of Curious Place Names (1948, June 9). *Weekly Times (Melbourne, Vic.: 1869 - 1954)*, p. 22., from **http://nla.gov.au/nla.news-article225973063**

THE BOLWIRRAH AND GORDON MINING, DISTRICT. (1900, September 13). *The Ballarat Star (Vic: 1865 - 1924)*, p. 3. from **http://nla.gov.au/nla.news-article206975966**

6.16 – ID-73 – Area of Cultural Heritage Sensitivity Werribee River

See also **Figure 20**

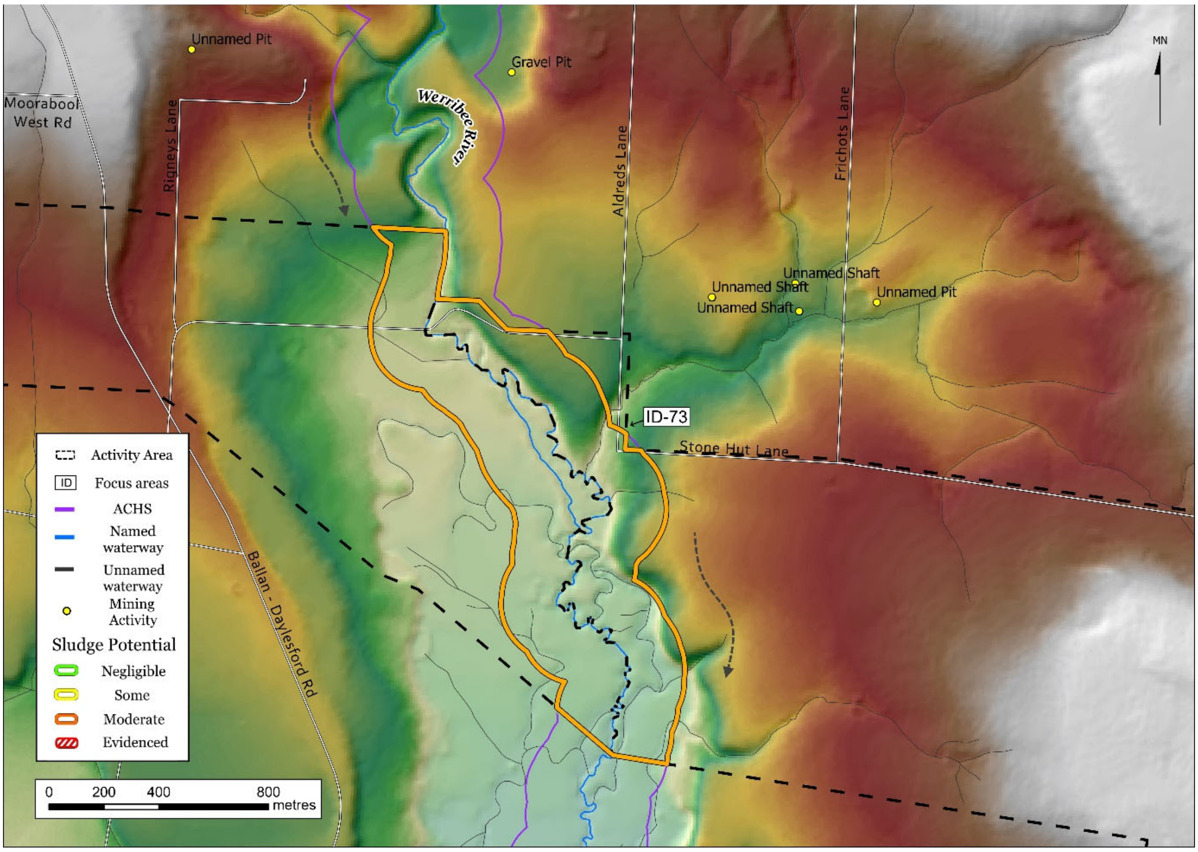

Figure 21. A 10-metre Digital Terrain Model (DTM) showing a close-up of Focus Area **ID-73** along Werribee River. This Focus Area had a large amount of upstream mining during the nineteenth century. As a flat, low-lying floodplain immediately downstream of rugged high country, the Focus Area's topography is well-suited for the accumulation of sludge deposits. Sometime in the late-nineteenth century an embankment and straight cutting were made along the western side of the river—either for irrigation purposes and/or possibly as a means of protecting local land from sludge inundation. Werribee River was reportedly 'discoloured' by mining activities 4 km downstream in Ballan, but no specific mention of sludge explicitly impacting the Focus Area was identified—resulting in a 'moderate' potential for the area to maintain sludge.

Potential for Sludge: Moderate

- Focus Area **ID-73** is an ACHS associated with the Werribee River (**Figures 20** and **21**). Numerous unnamed shallow gold workings are shown within and along the Werribee River across geological maps and the shallow gold workings dataset. Joining those workings are numerous deep lead operations along quartz reefs within the Werribee subcatchment. Haphazard, for example, had a 70 ft (21 metres) shaft and an 8-head stamper battery on site for crushing quartz (Lidgey 1898). Each of these activities are likely to have discharged mining waste sediment into Werribee River.
- There was a gold mining dredge at the intersection of Spargo Creek and the Werribee River from 1906 to 1908. However, the operators were required to prevent any sludge from entering the river (*The Ballarat Star* October 2nd, 1906). A drought, and then poor returns,

stopped the continuation of works by August 1908 (*The Argus* August 11th, 1908). An article that details the dredging operations also suggests high intensity alluvial mining took place within the Werribee nearby and during the earlier stages of the rush.

- In 1872, residents of Ballan complained in *The Bacchus Marsh Express* (October 26th, 1872) about the 'discolouration of the waters of the Werribee by mining operations.' Ballan is four kilometres downstream of **ID-73**, which suggests that the Focus Area was also being affected either by the same or worse by waterborne sediment at that time.
- As shown in **Figure 21**, there are a few unnamed mineshafts and a pit just upstream of the Focus Area along an unnamed waterway. No further information was identified for these workings. It is possible that these operations also discharged mining waste into the Focus Area.
- The numerous examples of upstream shallow gold workings along the Werribee, combined with the presence of deep lead mines, complaints from landowners in Ballan, and a topography that is well-suited to sludge deposition gives the Focus Area a 'moderate potential' to maintain sludge deposits.

Potential for Mining: Negligible

- No evidence for historical mining was identified across digitised mining datasets/literature or the VHD within this Focus Area.

Waterway movement

- An 1859 map by John Phillips suggests that the Werribee's alignment within the Focus Area has remained largely unaltered to the present—that excludes the creation of a 600 metre-long straight cutting and embankment along the western side of the river. The straight cutting and embankment are depicted on a 1937 geological map of the area (Foster 1937).

Historical research (selected passages)

- *Gold and Minerals* (Baragwanath 1946:109)
  - 'BLAKEVILLE; Alluvial gold has been worked in the vicinity of Blakeville and northerly towards the main divide in streams heading to the Werribee, e.g., Spargo Creek and Musk Creek, and south in the head of Korweinguboora Creek. Workings throughout were shallow and in no case do the alluvial deposits pass under the basalt.'
- *Report on Bullarook, Barkstead, and Korweinguboora* (Lidgey 1898:1)
  - 'On the eastern side of the Werribee River, in the parish of Moorabool East, the Haphazard reef is being worked by Macdonald Brothers. The main shaft is 70 ft deep, and a good deal of stone has been taken from the surface. The reef is a saddle reef, and work has mostly been confined to the eastern leg… …**There is an 8-head battery, with a Marshall's 10-horse-power engine on the ground, and Mr. MacDonald states that he is willing to crush for the public.'**
- *The Bacchus Marsh Express* (October 26th, 1872)
  - 'No Title – The discolouration of the waters of the Werribee by mining operations is alarming the people of Ballan, and the people of Bacchus Marsh will soon be affected by it too... …the Council should, in addition, seek out the cause of the discolouring of the Werribee and endeavour to remove that cause. We are not aware that miners are allowed to pollute a whole river all to themselves, to the serious loss of a number of inhabitants**. Of course, in the case of the Lerderderg, it is too late now to divert all the sludge from it, but surely it is not impossible to keep the Werribee pure**. We believe that the Ballan Council could easily, and without much expense, prevent the present discolouration of the Werribee by either cutting a sludge channel itself or compelling miners to do that.'
- *The Ballarat Star* (October 2nd, 1906)
  - 'DREDGING AT KOORWINGUBOORA – A PROMISING FIELD. – Korweinguboora is, of course, one of the oldest diggings in Victoria, having been worked before Ballarat. Mr Connell, the oldest resident of the district, who also claims to be the oldest Government engineer, of the State, stays that **in the very early days a great deal of tunnelling into the terrace wash off the River Werribee was done, and as much as a pound weight of gold to the set was won**. The dredging will be carried on further down the river flats… …They intend to install a hydraulic dredge and centrifugal pump capable of treating about 300 yards per day of three shifts. **The barge site will be at the foot of Spargo Creek in about a couple chains from the main river. In order to keep the latter from being polluted, it is intended to clear the main steam of snags and logs, all debris for about one and a half miles and cut a channel from the junction of Musk Creek round the workings and join the mainstream lower down**. The working water will be drain from the creek. It will not, however, be allowed to go back to it, but will, after being used, go into the settling dams… **There are some sluicing claims now working about the place, and getting very good results**… The slum would be stacked away from the river.'
- *The Argus* (August 11th, 1908)
  - 'Gordon, Saturday. --- The Werribee dredge, Spargo Creek, which, after remaining idle for several months on account of the scarcity of water, resumed work under the management of Mr. Grimbley, has now been closed down again, owing to poor returns.'

Historical maps

Foster, H., 1937. Parish of Moorabool West and portion of Kerrit Bareet 1:31,680 (40 chains:1 inch) geological map. Plan No 112p. Geological Survey of Victoria.

Geological Survey of Victoria (1956). *Moorarbool East, County of Bourke*. W. M. Houston, Govt. Printer, Melbourne.

Phillips, J. 1859. *Country Lands in the Parishes of Moorarbool East and Moorarbool West. Counties of Bourke and Grant.* Publics Lands Office, Melbourne. Held: Publics Record Office: VPRS 8168/P0002.

References

Baragwanath, W. 1946. Gold and Minerals. Special report to Victoria Department of Mines.

DREDGING AT KOORWINGUBOORA (1906, October 2). *The Ballarat Star (Vic: 1865 - 1924)*, p. 3. from **http://nla.gov.au/nla.news-article210686330**

GORDON. (1908, August 11). *The Argus (Melbourne, Vic: 1848 - 1957)*, p. 8., from **http://nla.gov.au/nla.news-article10174295**

LATE MINING NEWS. (1911, January 28). *The Age (Melbourne, Vic:1854 - 1954)*, p. 14. from **http://nla.gov.au/nla.news-article196183043**

No Title (1872, October 26). *The Bacchus Marsh Express (Vic:1866 - 1943)*, p. 2., from **http://nla.gov.au/nla.news-article93141107**

6.17 – ID-74– Area of Cultural Heritage Sensitivity – Korjamnunnip Creek

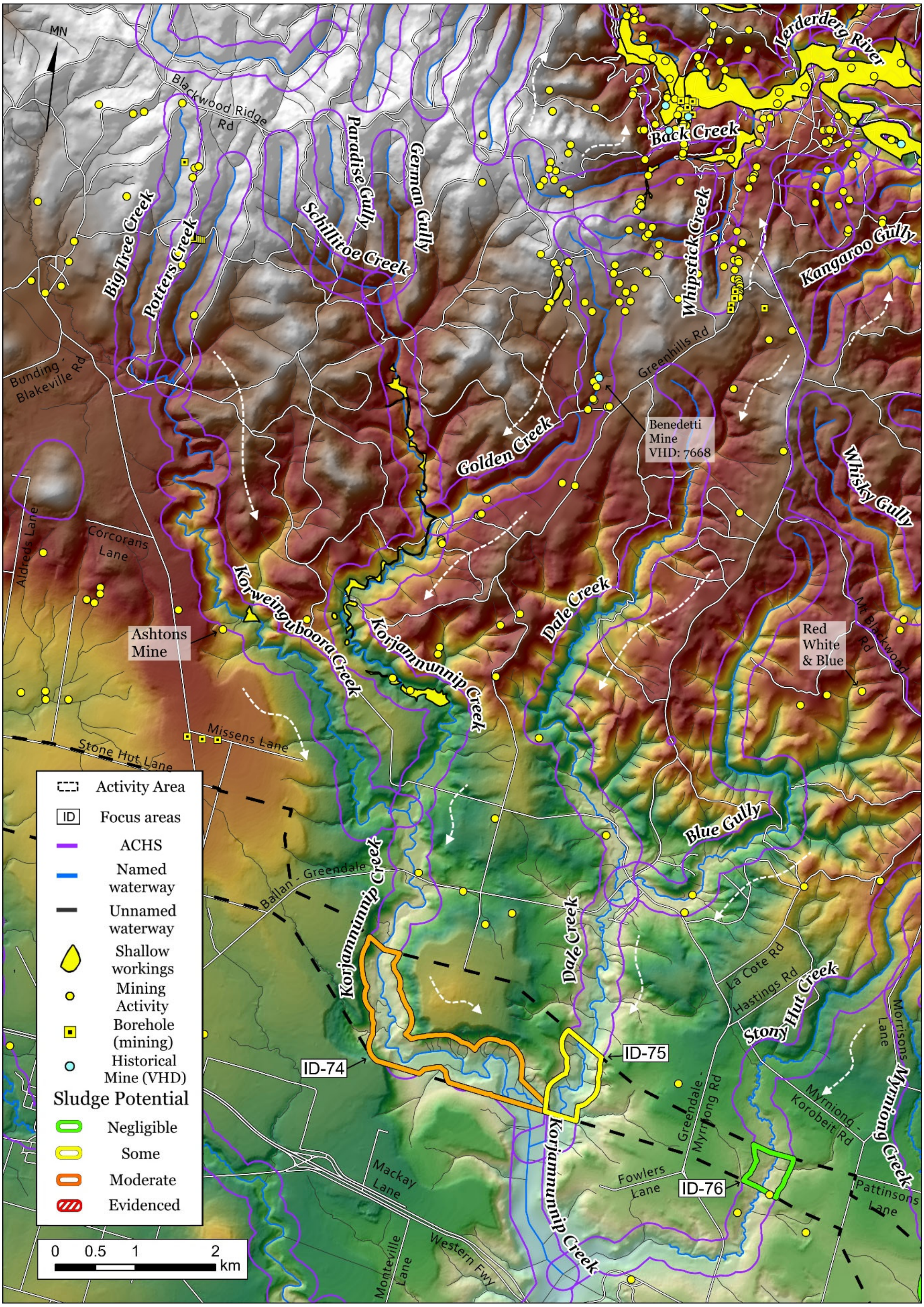

Figure 22. A 10-metre Digital Terrain Model (DTM) of Focus Areas **ID-74** and **ID-75**, ACHS associated with Korjamnunnip Creek and Dale Creek. Korjamnunnip Creek had a significant amount of alluvial mining within its creek bed upstream of the Focus Area (**ID-74**). That mining activity combined with quartz and deep lead mining activities upstream of Korweinguboora Creek and Korjamnunnip Creek gives the Focus Area a 'moderate potential' to maintain sludge deposits. Sections of Dale Creek downstream of Blue Gully were purportedly inundated by sludge discharged by the Red, White, and Blue mine in 1902. One landowner stated that 12 acres had been affected. However, that claim was later disputed. That ambiguity, coupled with otherwise limited identified evidence of mining activity gives Focus Area **ID-75** 'some potential' to maintain sludge deposits (close-up of both Focus Areas provided **Figure 23**).

<u>Potential for Sludge:</u> Moderate

- Focus Area **ID-74** is an ACHS associated with Korjamnunnip Creek (also referred to elsewhere as 'Korjaminup Creek' or 'Pykes Creek') (**Figures 23** and **23**). A 1956 geological map of the area indicates a high proportion of upstream sections of the creek were subjected to shallow alluvial gold working (denoted on **Figure 22**). Golden Creek (also referred to in historical sources as 'Green Hill Creek') feeds into Korjamnunnip Creek and was also the focus of high intensity gold mining activities (*The Argus* August 9th, 1884). Another map shows numerous mineshafts and other gold mining features along that waterway (Taylor 1885). Benedetti deep lead mine is recorded along Golden Creek on the VHD and is noted as having a puddling machine (VHD: 7668).
- Korweinguboora Creek, which feeds into Korjamnunnip Creek also had shallow alluvial mining and deep lead quartz mining. Works were carried off and on at Ashtons Reef from at least 1872 till the 1930s (*The Bacchus Marsh Express* April 6th, 1872; *The Herald* (August 17th, 1933). Upstream of Ashtons Reef, along Big Tree Creek and Potters Creek there were numerous other deep lead mines as well.
- Although no historical accounts of sludge affecting Korjamnunnip Creek or the Focus Area were identified, based on the amount of upstream mining activity and the area's topography, there is 'moderate potential' for it to maintain sludge deposits—particularly near the centre of the Focus Area (See **Figure 23**).

<u>Potential for Mining:</u> Negligible

- No evidence for historical mining was identified across digitised mining datasets/literature or the VHD within this Focus Area.

<u>Waterway movement</u>

- A map from 1856 depicts Korjamnunnip Creek largely unchanged from its present-day position within the Focus Area (excluding Pykes Creek Reservoir, which was built between 1907 and 1911) (Meikle 1856).

<u>Historical research (selected passages)</u>

- *The Argus* (August 9th, 1884)
    - 'MINING REGISTRARS' REPORTS. – The recent discovery at Green Hills, Blackwood by B. Guglielmina, a Swiss, who occupies 10 acres under the gold-mining lease regulations, is thus reported upon by Mr. Hansen, registrar for the subdivision: — "The character of the land is of volcanic and schistose formation, the surface being of rich chocolate soil, and heavily timbered. The Green Hill Creek (one of the main branches of the Korjamunip Creek) intersects the block, and in **the bed of this creek the lessee carries on mining operations by means of ground sluicing**. The course of the creek at this point is due north and south, and a tail-race of considerable length has been cut several feet deep into the schistose rocks. A dam has also been erected at the head of the claim, and a race to divert the water when not used has been cut. The volcanic formation is in close proximity to the easter bank of the creek, where several shafts have been sunk: one, 90 ft in depth, is about 70 ft deeper than the bed of the creek, and the strong influx of water has hitherto prevented bottoming with the appliances to hand. **The shallow alluviums in the bed of the creek have been worked for a good many years, and Mr. Guglielmina's brother some six or seven years ago worked the very spot where the going is being found at present**, but this gold is not from alluviums, but from a quartz reef that traverses the area… …A prospect from the richest part, at a depth of between 3 ft to 4 ft (the top having been already removed), was broken out and washed in my presence, with a result of about 1 oz. to 1.5 oz. loose gold and gold in specimens.'
- *The Bacchus Marsh Express* (April 6th, 1872)
    - 'NO TITLE – There has been great excitement about a new reef reported to have been fabulously rich, but on further investigation it has been reduced to very modest pretensions. It appears that a reef has been found on Mr. Ashton's farm, adjoining the road from Ballan to Blakeville.'

<u>Historical maps</u>

Geological Survey of Victoria. 1956. *Moorarbool East, County of Bourke*. W. M. Houston, Govt. Printer, Melbourne.

Meikle, R. 1856. *Country Lands on the Roads Leading from Blackwood to Ballan. The County of Bourke.* Surveyor General's Office, Melbourne.

Taylor, N. 1885. *Plan showing Course of Lead Green Hill near Blackwood*. Geological Survey of Victoria.

<u>References</u>

COMPANY NEWS (1933, August 17). *The Herald (Melbourne, Vic: 1861 - 1954)*, p. 38., from **http://nla.gov.au/nla.news-article243419543**

MINING REGISTRARS' REPORTS. (1884, August 9). *The Argus (Melbourne, Vic: 1848 - 1957)*, p. 7., from **http://nla.gov.au/nla.news-article6054997**

NO TITLE (1872, April 6). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 2., from **http://nla.gov.au/nla.news-article93141571**

6.18 – ID-75 – Area of Cultural Heritage Sensitivity – Dale Creek

See also **Figure 22**

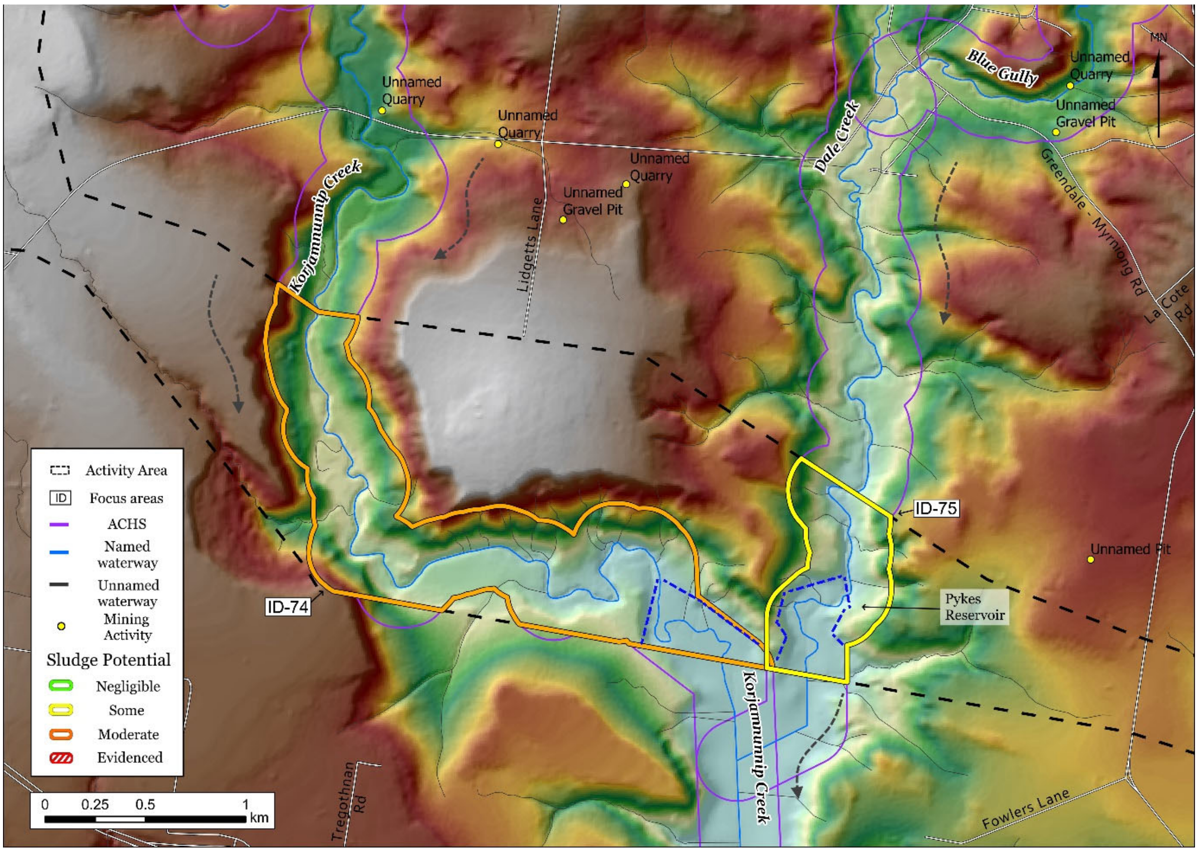

Figure 23. A 10-metre Digital Terrain Model (DTM) showing a close-up of Focus Areas **ID-74** and **ID-75** along Korjamnunnip Creek and Dale Creek, respectively. **ID-74** had intensive gold mining activities that are likely to have discharged mining sediment. The area's topography is reasonably well-suited to the accumulation of sludge deposits, particularly around its halfway point. **ID-75** had fairly limited upstream mining, but historical research identified complaints that sludge from mining was impacting the watercourse in late-1902. However, the source/presence of that sludge was later disputed in subsequent articles. **ID-75** thus has 'some' potential to maintain limited amounts of sludge.

<u>Potential for Sludge:</u> Some

- Focus Area **ID-75** is an ACHS associated with Dale Creek (**Figures 22** and **23**). This waterway had a limited number of upstream deep lead mines including the 'Red, White, and Blue' and 'Struck Oil' to its immediate west (**Figure 22**). Both mines are shown on a map from 1922, but the Red, White and Blue operated from at least 1902 (*The Bacchus Marsh Express* November 8th, 1902; Foster 1922). In 1902, The Red, White and Blue was accused of discharging sludge into Dale Creek by landowners downstream. The matter was referred to a local constable, who found no fault and suggests that the Red, White, and Blue were stacking their waste sands. The 1922 map of the Red, White, and Blue's operations shows a 'slum dam' situated on an unnamed waterway that eventually leads to Dale Creek. More information is given about these two mines can be found in historical mining literature (Murray 1895)
- Besides a few unnamed shafts and quarries, no other mining activities were identified upstream of the Focus Area. Based on the conflicting historical research Focus Area **ID-75** has 'some potential' to maintain some limited amounts of sludge.

<u>Potential for Mining:</u> Negligible

- No evidence for historical mining was identified across digitised mining datasets/literature or the VHD within this Focus Area.

<u>Waterway movement</u>

- A map from 1856 depicts Dale Creek along a path that is largely unchanged from its present-day position within the Focus Area (excluding Pykes Creek Reservoir, which was built between 1907 and 1911) (Meikle 1856).

<u>Historical research (selected passages)</u>

- *The Bacchus Marsh Express* (November 8th, 1902)
  - 'BALLAN SHIRE COUNCIL. – Cr. Hamilton called attention to pollution of Dale's Creek by mining operations. He was told there was arsenic in the white scum left all along the creek margins. The water ran into the Werribee, and was highly dangerous. He was informed that the horses in Cr. Graham's paddock would not drink it. The white deposit was now showing below Pyke's creek bridge. –Cr. Graham said he had lost 12 acres of land through it. The water came from Back creek, from the Red, White, and Blue. —Cr. Walsh said it was a hard thing to interfere with mining, but drinking water must be kept from pollution.

> Was the Council's bylaw in force? – The Secretary said it would be in force as soon as gazetted. –Cr. Graham said a flood brought down most of the sludge. –Cr. Walsh suggested that the attention of Constable Shebler be called to the matter. – Agreed to.'

- *The Bacchus Marsh Express* (March 7th, 1903)
  - 'BALLAN SHIRE COUNCIL. – Constable Shebler, of Blackwood, wrote that he was of opinion that Back Creek was not polluted with sludge or poisonous matter. The Red White and Blue Co. had a lot of sand worth £600 reserved. –Cr. Hamilton said the pollution occurred when rain fell; a white scum came down. The Health Department wrote respecting taking precautions against consumption. –Cr. Walsh did not know of any cases. If any occurred the Health officer would no doubt see to disinfection.'

Historical maps

Foster, H., 1922. *Locality map for Red White and Blue and Struck Oil* Mines, Blackwood, with topography, locations of quartz reefs and mine plant; and sections along adit workings. Parish of Blackwood. Plan No 2066/B/1. Geological Survey of Victoria.

Geological Survey of Victoria, 1931. Gorong & Portions of Blackwood & Myrniong Counties of Bourke & Grant, Govt. Printer, Melbourne.

Geological Survey of Victoria, 1937. Blackwood. County of Bourke. Govt. Printer, Melbourne.

Meikle, R. 1856. *Country Lands on the Roads Leading from Blackwood to Ballan. The County of Bourke.* Surveyor General's Office, Melbourne.

Murray, R.A.F., 1895. Geological and physical geography. Geological Survey of Victoria Special Report. Mines Department, Victoria, 163 pp.

References

BALLAN SHIRE COUNCIL. (1902, November 8). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 4., from **http://nla.gov.au/nla.news-article90580717**

BALLAN SHIRE COUNCIL. (1903, March 7). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 4., from **http://nla.gov.au/nla.news-article90581580**

6.19 – ID-76 to ID-78 – ACHS – Stony Hut Creek, Myrniong Creek, and Korkuperrimul Creek

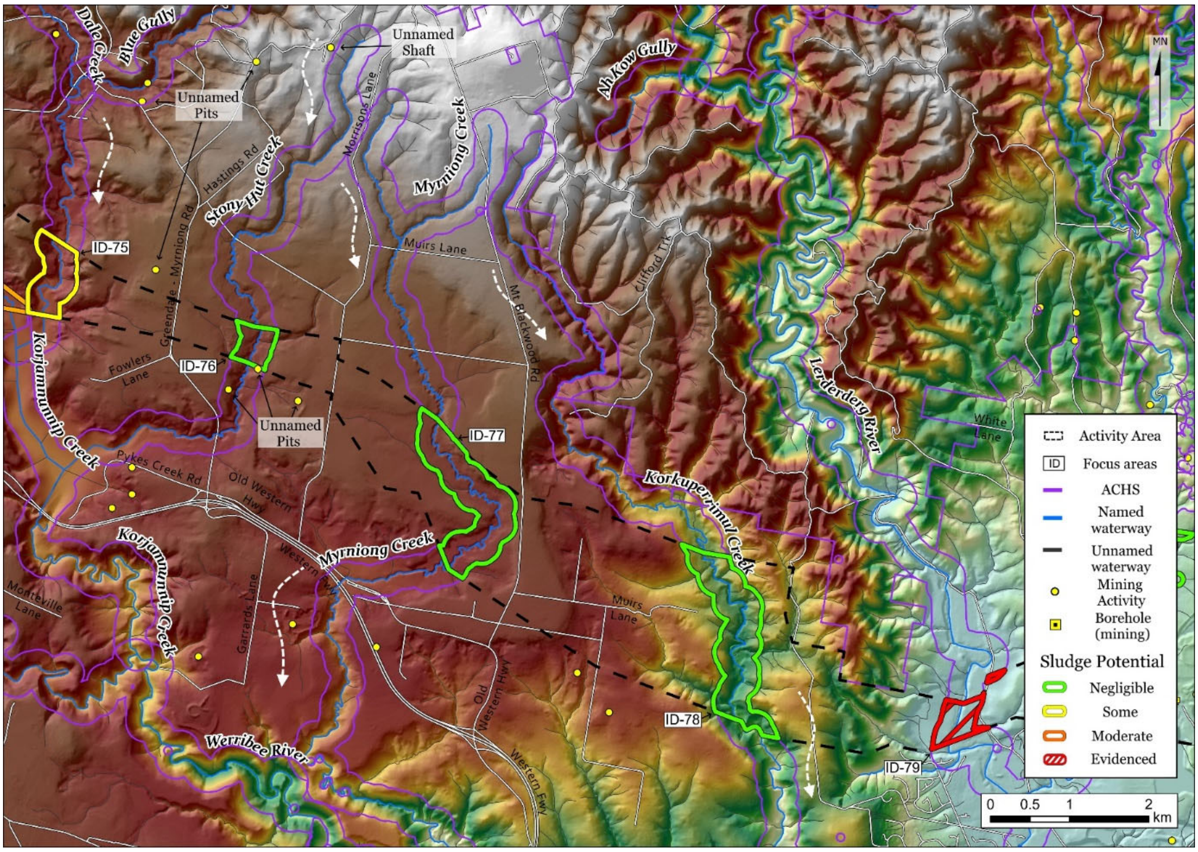

Figure 24. A 10-metre Digital Terrain Model (DTM) of Focus Areas **ID-76** to **ID-78** from Stony Hut Creek (on some maps as Korobeit Creek) to Korkuperrimul Creek. These locations have negligible potential for sludge as no significant upstream historical mining activities were identified. The topography of the three Focus Areas is not well-suited to the accumulation of waterborne mining waste. An unnamed gravel pit was identified within the southeast corner of **ID-76** (GSV 1931).

Potential for Sludge: Negligible

- Focus Area **ID-75** is an ACHS associated with Stony Hut Creek (also known as 'Korobeit Creek') (**Figure 24**). The only identified mining activities upstream of this Focus Area was an unnamed shaft and an unnamed pit. These features are a few kilometres upstream. The topography of the Focus Area is not well-suited to the accumulation of deposits of sludge.
- Focus Areas **ID-76** and **ID-77** are ACHS associated with Myrniong Creek and Korkuperrimul, respectively. No evidence for historical mining upstream of these Focus Areas were identified across digitised mining datasets/literature or the VHD.

Potential for Mining: Some (**ID-75**); Negligible (**ID-76**, **ID-77**)

- The only evidence for historical mining that was identified across digitised mining datasets/literature or the VHD within these Focus Areas was an unnamed gravel pit along the southeast corner of Focus Area **ID-75** (showing on GSV, 1931).

Waterway movement

- An 1856 map of the area does not suggest any major alterations to Stony Hut Creek between then and the present have occurred (Meikle 1856).
- No evidence for waterway movement was identified across the other Focus Areas.

Historical research

- No historical evidence for mining within or upstream of these Focus Areas was identified

Historical maps

Geological Survey of Victoria, 1931. *Gorong & Portions of Blackwood & Myrniong Counties of Bourke & Grant*, Melbourne.

Meikle, R. 1856. *Country Lands on the Roads Leading from Blackwood to Ballan. The County of Bourke.* Surveyor General's Office, Melbourne.

References

BALLAN SHIRE COUNCIL. (1902, November 8). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 4., from **http://nla.gov.au/nla.news-article90580717**

6.20 – ID-79 to ID-80 – Areas of Cultural Heritage Sensitivity – Lerderderg River

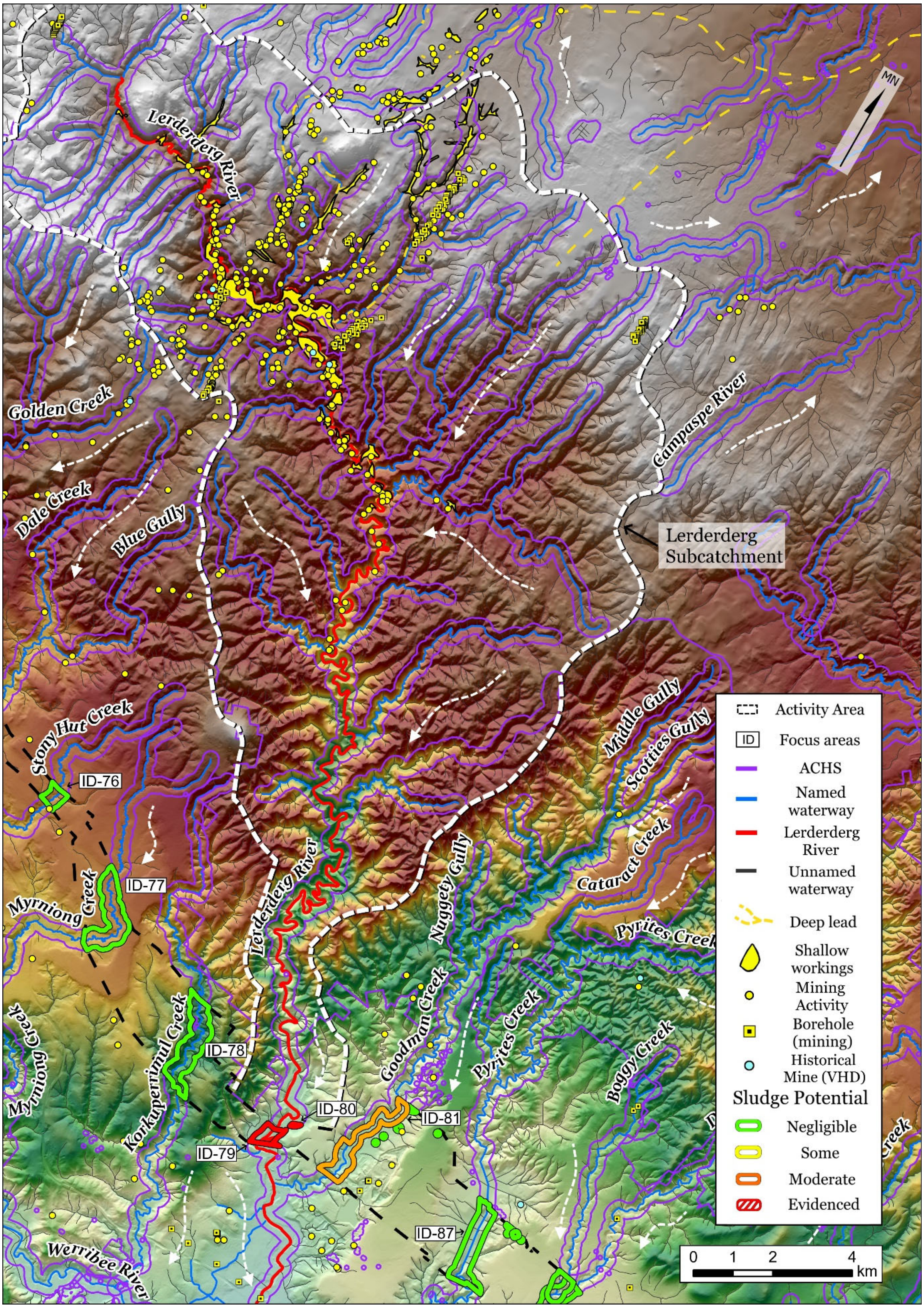

Figure 25. A 10-metre Digital Terrain Model (DTM) showing Focus Areas **ID-79** and **ID-80**, associated with the Lerderderg River. The Lerderderg River has a large subcatchment (denoted by white dashes) that had a significant amount of historical gold mining throughout the gold rush period (associated with the Blackwood goldfield) and is evidenced to have carried large volumes of sludge. The topography of the Focus Area is ideal for the deposition of significant quantities of waterborne mining sediment. **Figures 26** and **27** provide a close-up of these two Focus Areas.

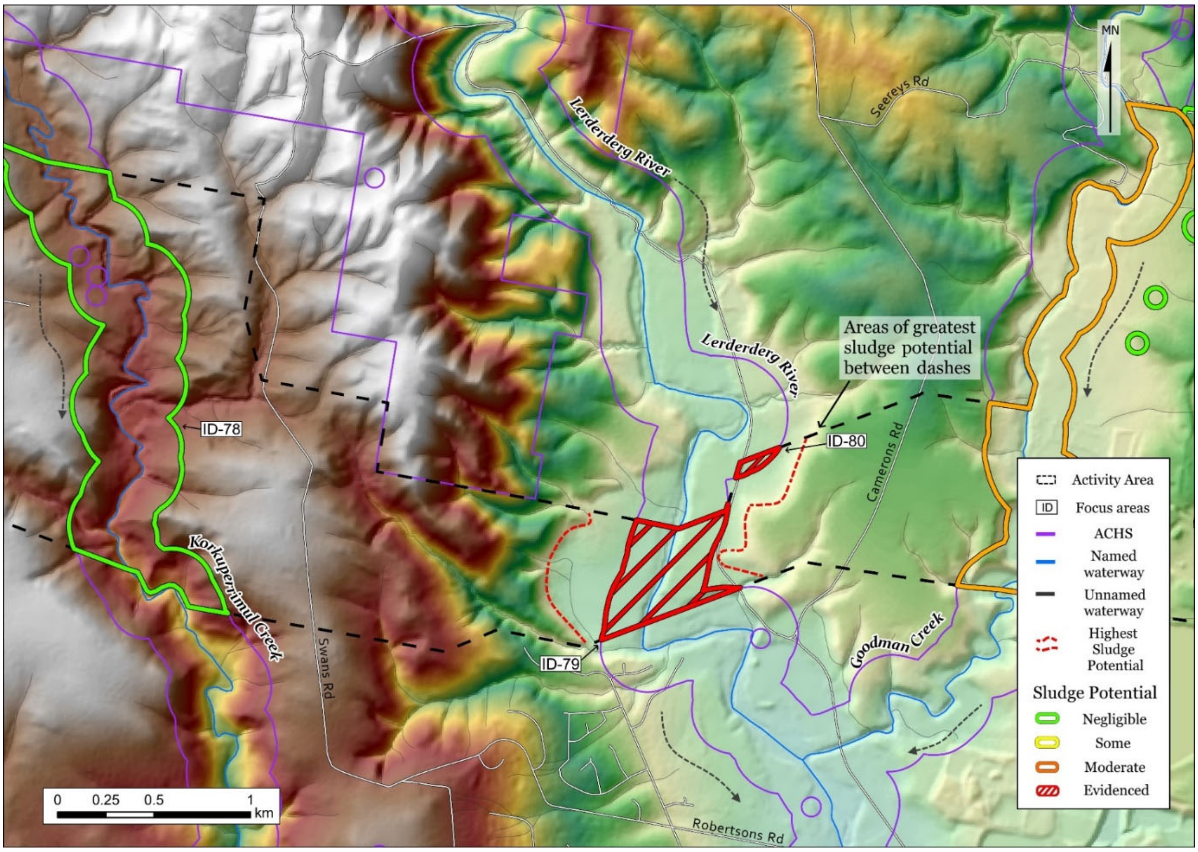

Figure 26. A 10-metre Digital Terrain Model (DTM) showing a close-up view of Focus Areas **ID-79** and **ID-80**. The area showing between the two red dashes have the greatest potential to maintain deposits of gold mining sludge. Historical maps suggest the path of the Lerderderg River is largely unchanged from its 1850s trajectory within Focus Area **ID-79.**

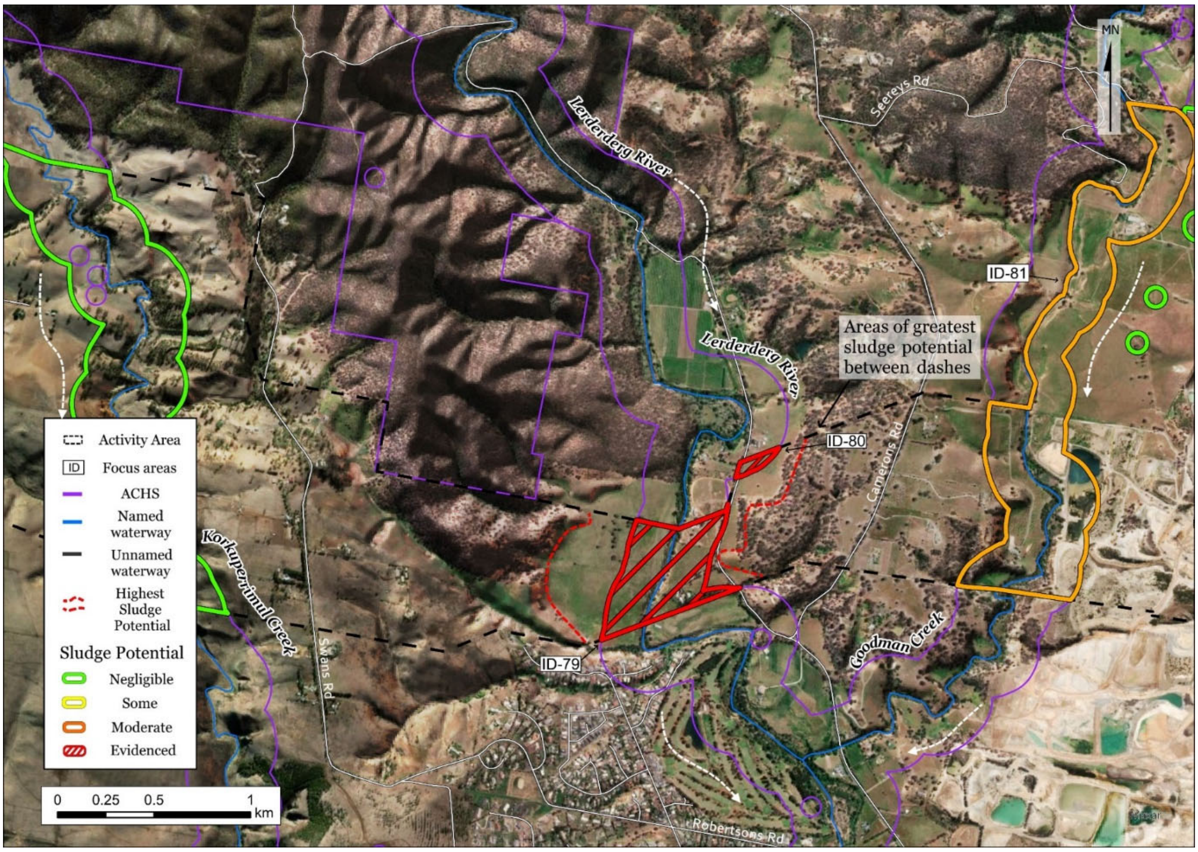

Figure 27. A recent aerial image of Lerderderg River (**ID-79** and **ID-80**) overlying a 10-metre resolution Digital Terrain Model (DTM). The area depicted is the same as in **Figure 26** and is provided as a locational aid. Focus Area **ID-81**, along Goodman Creek is also shown along the right-side of the figure.

Potential for Sludge: Evidenced

- Focus Areas **ID-79** and **ID-80** are ACHS associated with the Lerderderg River. Upstream, the Lerderderg runs through the centre of the Blackwood goldfield, which was first rushed by miners in 1854, and was the focus of high intensity mining activities till the late 1880s (with small-scale activities continuing into the early twentieth century) (Bannear 1999:36). Miners focused their efforts on the bed and banks of the river and its upstream gullies through sluicing, and targeted surrounding auriferous quartz reefs through deep mineshaftss. As shown in **Figure 25**, the Lerderderg has a large subcatchment that contains dozens of gold mining datapoints with large and widespread areas of shallow gold workings. These high intensity gold mining activities produced significant quantities of waterborne mining waste—as evidenced by landowner complaints in downstream areas (included in historical research section). From those complaints, it can be estimated that the Focus Area was likely affected by sludge from at least as early as the 1860s till the 1880s—with landowners referring the inundations of mining sediment in terms of feet and not inches.
- During the peak of the Blackwood rush there were as many as 13,000 diggers working within the subcatchment, including works at Golden Point, Nuggetty Gully, Long Gully, Yankee Gully, Frenchman's Gully and Dead Horse Gully (Bannear 1999:34). More information about these mining operations across the Blackwood goldfield is presented at length elsewhere (Murray 1895).
- The topography of these Focus Areas (floodplains immediately downstream of rugged high country) is well-suited to the accumulation of thick deposits of mining sludge (**Figures 26** and **27**).

Potential for Mining: Negligible

- No evidence for historical mining was identified across digitised mining datasets/literature or the VHD within these Focus Areas.

Waterway movement

- Two historical maps of the area (one undated, but LODDON60 in the same style and from the same series at PROV is from 1847) do not suggest that any major alterations to the course of the Lerderderg River through these Focus Areas during the late-nineteenth and twentieth centuries (Anon, 1856; Anon undated).

Historical research (selected passages)

The following are selected passages from historical sources on the Lerderderg River and the Blackwood diggings, and provide examples of sludge affecting downstream areas—including Bacchus Marsh, which is downstream of the Focus Area.

- *The gold fields and mineral districts of Victoria* (Smyth 1869:81)
  - 'The Blackwood goldfields are situate on the upper tributaries of the River Lerderderg which have cut deeply into the schists, exposing in some places high cliffs. The formation of the Blackwood goldfields is peculiarly favorable for alluvial miners with limited capital, inasmuch as there is no deep sinking required, nor machinery for lifting water, as there is ample fall for drainage in every part; so that, in fact, the only outlay necessary is for sluicing-boxes and mining tools. Thus equipped, a party with a small capital, and a fair share of skill, patience, and perseverance, may realize a competency in a few years.
    The most important gullies are named Nuggety, Yankee, Long, and Frenchman's. In Nuggety Gully the depth of the alluvium varies from two to thirty-five feet… …**The strata lying in the bed of the Lerderderg, for a great distance, are auriferous, and yield sufficient in most parts to repay the skilful sluicer**.'
- *Historic gold mining sites in the south west region of Victoria* (Bannear 1999:34)
  - 'In June 1855, the news of gold discoveries by Edward Hill as a spot called Red Hill saw a large rush set in along the course of the Lerderderg River and its tributaries. When the Blackwood Rush peaked in September 1855, there were some 13,000 diggers along the river and its tributaries. By this time, mining was focussed on six localities around Blackwood: Golden Point, Nuggetty Gully, Long Gully, Yankee Gully, Frenchman's Gully and Dead Horse Gully. The last named gully was noted for the discovery of the district's largest nuggest, 29lbs in weight. During this time, two main mining villages were established: one at Red Hill, the other at Golden Point. The latter settlement was surveyed and laid out as Blackwood.

    By the end of 1856, the bulk of Blackwood's mining population had left for the Fiery Creek (Beaufort) Diggings. For those that remained, less than one tenth of the old population, profitable alluvial mining proved to be a struggle. Very little new ground was opened, the exception was the Blue Mountain Diggings in 1862. **Most of the alluvial miners focussed their attention on the bed of the Lerderderg River, which was worked time and time again using sluice boxes, pumps and water wheels**.'
- *The Age* (August 22, 1866)
  - 'THE WORKING OF THE LAND ACT. – …The water of the Lerderderg is also very much deteriorated by the sludge from the gold workings at Mount Blackwood… …the quality of the water which is seriously damaged by sludge… …the quality of the water would perhaps improve the land, but the annual deposit of sediment would ultimately render the soil worthless. If any proof of this were wanting, it may be seen along the banks of the Loddon, where nothing will grow, a deposit of half-an-inch of sludge every year most effectually choking vegetation. Any reservoir would also in time become filled up with this sludge.'
    - This passage comes from newspaper article that considers possible locations for a new reservoir in the region—with a potential location at the Lerderderg discounted due to the sludge affecting it from upstream mining.

- *'The Bacchus Marsh Express* (October 13th, 1866)
  - — NO TITLE – 'In the Lerderderg, the flood was very heavy. The waters rose steadily until Saturday, and covered the lowlands lying between the river and the main road with a turbid sheet of thick yellow fluid – it can scarcely be called water. The grass on the lands belonging to Mr. Crook, Mr. Ryan, and Mr. James, suffered very much—in fact, the crop has been rendered almost worthless wherever touched by the water. This was owing, not merely to the force of the flood, but to the character of the water itself. At all times bad for the land, it was doubly so when the action of the flood added mud and gravel **to the sludge brought down from the Blackwood diggings, and left a deposit on the land which no springing grass couple force itself through**. We consider the question as to the possibility of successful irrigation from the waters of the Lerderderg to be fully decided by the flood of last week. A dam and sluice would for but an imperfect filtering medium for the sludgy waters; and even though they were filtered to a certain extent, the dam would require such an amount of "clearing out" as would render the work most expensive—perhaps impracticable. **A fair same of the stuff brought down the river might have been seen on Monday last, at Ryan's Ford, where the Lerderderg forms the boundary between the township and the parish of Merrimu. The ford was rendered quite impassable by a deposit of silt on either bank ranging from five to six feet in depth, and extending up the road for some yards.**'
- *The Bacchus Marsh Express* (November 18th, 1871)
  - — 'NO TITLE – The frequent floods in the Lerderderg and Werribee rivers, in Bacchus Marsh, render it desirable that some remediable measures of some kind be tried. The Shire Council is concerned because the main road is considerably damaged by these overflows, and the landowners are more affected because **the flood waters not only do damage to fences and any crops that may be risked, but also deposit a very objectionable silt which covers up the fertile back soil of the locality and makes valuable land quite barren**… …Votes of money for flood channels in several parts of the colony have been made by the Legislative Assembly, also for sludge channels, and as the river Lerderderg is both a natural watercourse and a sludge channel from the Blackwood goldfield, it is natural to suppose that the Government will admit its responsibility to aid in remedying the present unsatisfactory condition of that river at least, even if it declines to deal with the Werribee.'
- *The Bacchus Marsh Express* (July 27th, 1878)
  - — 'To the Editor of the Express. –Sir, –The leader in your issue on the 20th inst., referring to the late flood damages in Bacchus Marsh, must certainly be very consoling to the sufferers. I observed on Saturday, with much interest, the advance and retreat, to and from the scene of the greatest damage, of that grave deputation of the Bacchus Marsh Shire Council, and of which—if I err not—yourself, with the Engineer, formed a contingent. Now, sir, I beg leave to tell you—and I do it with all respect—I know of no better way of disguising the truth than suppressing a portion of it. Perhaps you are not aware of it, but if you are, why don't you tell the whole truth, and shame the Devil? You say, in the first place, "About twenty acres of splendid land have been covered to a depth varying from six to twenty-inches with a deposit of sand, or little better." Why don't you call it by its proper title—silt? Yes sir, the mullock from the Blackwood diggings, the Blackwood curse! that is as surely burying the fertile acreage of Bacchus Marsh as did the lava and scoria from Mt. Vesuvius the land of Italy. You say again "the river course" (I call it a sludge channel) "has also become so obstructed and filled up in places that it is difficult to say where the next flood will leave the most damage behind."'
- *The Australasian* (November 12, 1881)
  - — *'THE SLUDGE QUESTION* – Sir, I am a constant reader of The Australasian, and gladly perceive by your Ballarat letter, November 5, that you question involving the rights of landowners and others in the vicinity of mines is, at last, likely to receive some consideration from the powers that be. In fact, the damage done to private property in Bacchus Marsh and its vicinity alone, by the flow of sludge from Blackwood diggings through the channel of the Lerderderg River, besides polluting its waters and silting up its course and that of the Werribee also for miles, caused hundreds of acres of our best land, to the value of some thousands of pounds sterling—I am within the margin—to lie buried for ever beneath from two to four feet of that abominable sludge or silt, turning the place into a desert. The main road through Bacchus Marsh for over half a mile, in the vicinity of the Lerderderg River, is dangerously obstructed by an accumulation of that sludge or silt abomination during the last 12 months, as passengers can see, while out local shire council, calmly ignoring the fact, coolly proposes to irrigate our remaining lands with a further dose of objectionable product.'

Historical maps

Anon, 1856. Untitled map of the Lerderderg River. Public Records Office Victoria, VPRS 8168/P0002, FEATR190-1.

Anon, undated. Untitled map of the Lerderderg Hill and surroundings. Held: Public Records Office Victoria, VPRS 8168/P0002, LODDON61.

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NO TITLE (1871, November 18). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 2., from http://nla.gov.au/nla.news-article89701323

Smyth, R.B. 1869. *The gold fields and mineral districts of Victoria*. John Ferres, Govt. Printer, Melbourne.

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THE SLUDGE QUESTION. (1881, November 12). *The Australasian (Vic: 1864 - 1946)*, p. 5, from http://nla.gov.au/nla.news-article138072749

To the Editor of the Express. (1878, July 27). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 3, from http://nla.gov.au/nla.news-article89702150

6.21 – ID-81 to ID-86 – Areas of Cultural Heritage Sensitivity – Goodman Creek

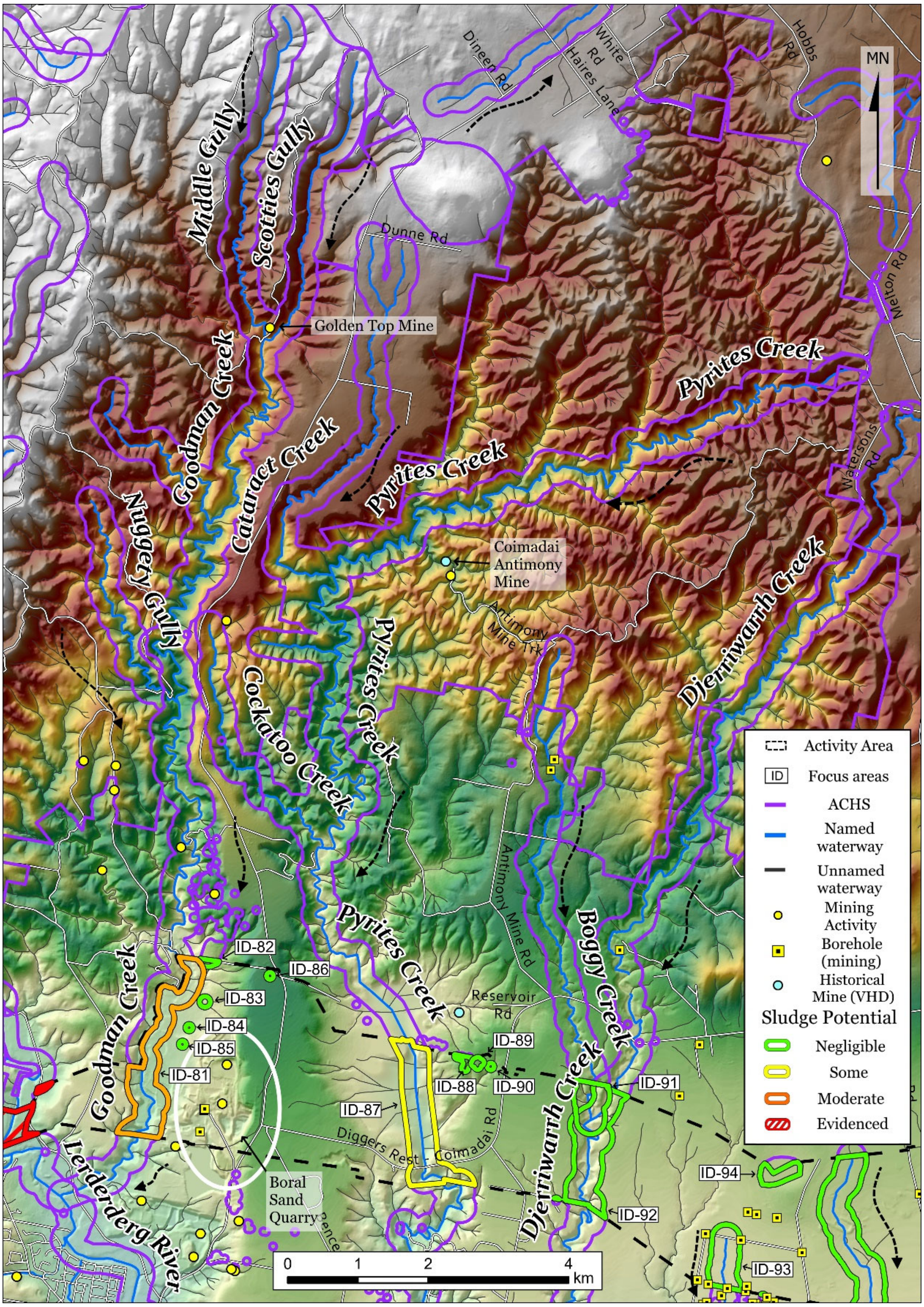

Figure 28. A 10-metre Digital Terrain Model (DTM) showing Focus Areas **ID-81** to **ID-92** from Goodman Creek to Djerriwarrh Creek. Focus Area **ID-81** is associated with Goodman Creek, which had significant amounts of upstream alluvial mining throughout the gold rush period. No explicit reference to sludge affecting the Focus Area was identified, resulting in a 'moderate' potential to maintain historical sludge deposits. **ID-82** to **ID-86** are situated well above the creek and have negligible potential for sludge. Focus Area **ID-87** is associated with Merrimu Reservoir/Pyrites Creek, which had limited upstream mining activities and have some potential for sludge. No evidence of historical mining activity was identified within or upstream Focus Areas **ID-88** to **ID-92** these thus have negligible potential for sludge. Close-ups of these Focus Areas are presented in **Figures 29** to **30**.

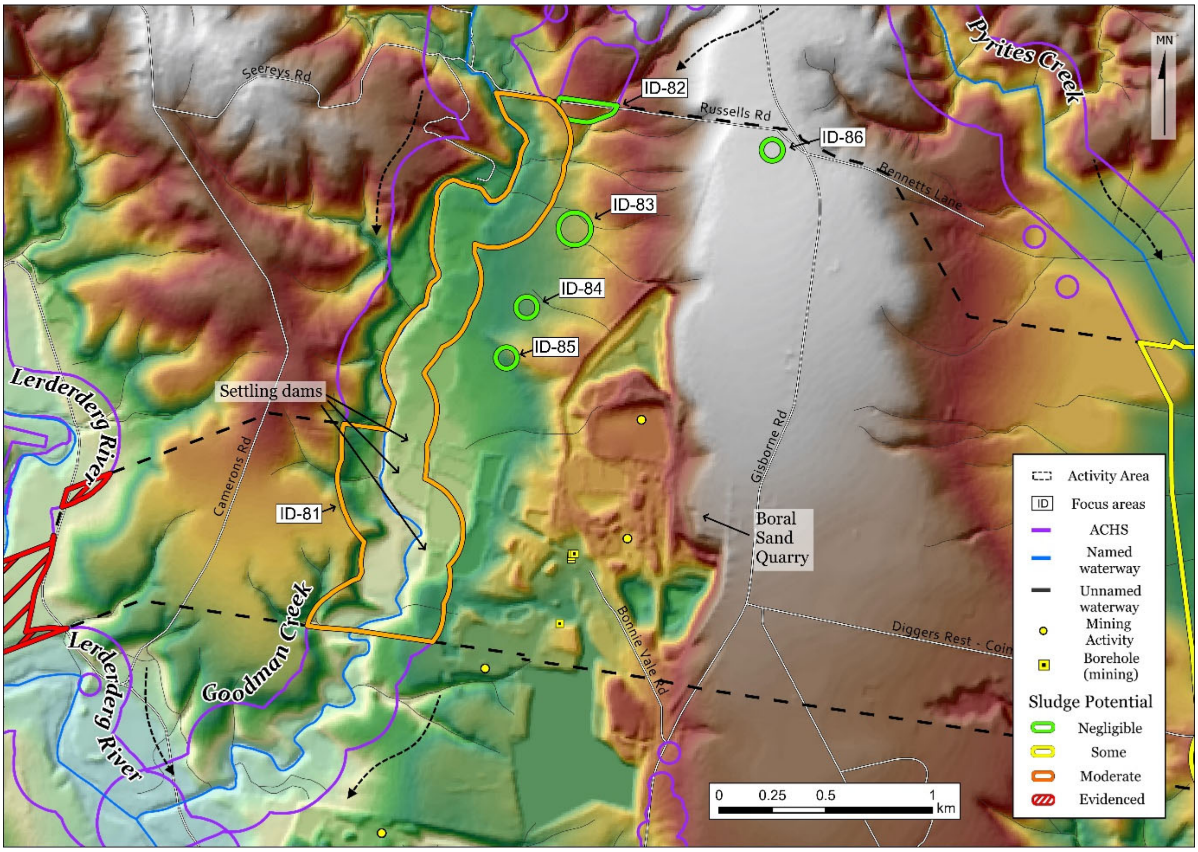

Figure 29. A 10-metre Digital Terrain Model (DTM) of Focus Areas **ID-81** to **ID-86** along Goodman Creek. Focus Area **ID-81** is immediately adjacent to Boral Sand Quarry, and includes a series of terraced settling dams near its southeast corner. Goodman Creek had upstream mining activities throughout the nineteenth century, including alluvial sluicing, which are likely to have produced significant quantities of waterborne sediment. The Focus Area's topography (a floodplain downstream of rugged high country) is well-suited to the accumulation of sediment. Focus Areas **ID-82** to **ID-86** are more than ten metres above the creek line and are situated beyond the reach of potential sludge inundation and thus have a negligible potential to maintain sludge. **ID-81** has evidenced potential for mining activity, **ID-82** to **ID-85** have some potential; **ID-86** has negligible potential. See **Figure 27** for an aerial view of these Focus Areas.

<u>Potential for Sludge:</u> Moderate

- Focus Areas **ID-81** and **ID-82** to **ID-86** are ACHS associated with Goodman Creek (also as Goodmans Creek) and registered Cultural Heritage Places, respectively. Goodman Creek was part of the Blackwood goldfield, and although mining activities along it were less intensive than those along the Lerderderg, there was still alluvial and deep lead mining upstream of the Focus Areas for decades throughout the nineteenth and early twentieth centuries. At present, there is a large sand quarry along the eastern side of Focus Area **ID-81**. The settling dams situated along the eastern bank almost certainly maintain modern sludge deposits. However, in terms of historical gold mining sludge, no evidence was identified that explicitly referred to sludge affecting either Goodman Creek or the Focus Areas. As such, whilst mining has clearly impacted ground surfaces within **ID-81** (e.g., settling dams etc.), areas upstream of that localised activity have a moderate potential to maintain sludge derived from the historical mining activities that are subsequently described in this section.
- Mining Surveyors' Reports indicate that Goodman Creek was continuously populated and worked by miners from at least 1864 till 1884—with numbers ranging from a high of 33 in 1866 to a low of ten in 1884 (Secretary for Mines 1864; 1867; 1884). Historical newspapers indicate that there were around sixty miners working the creek as early as 1855 (*The Argus* October 4th, 1855). 'Golden Top' a deep lead quartz mine at the head of the creek was still in operation—noted as treating 73 tonnes ore— in 1907 (Secretary for Mines 1908). Mining operations at Golden Top were still being described in historical newspapers as late as 1930 (*The Age* April 15th, 1930).
- No areas of shallow workings along Goodman Creek were identified within the shallow gold workings dataset. However, an undated map of the area shows 'gold workings' in two locations just upstream of Focus Area **ID-81** (Anon, undated). A Geological Survey of Victoria map produced in 1985 also shows areas of shallow gold mining near the head of the creek in areas immediately adjacent to the Golden Top mine (GSV 1985).
- The topography of these Focus Areas (floodplains immediately downstream of rugged high country) is well-suited to the accumulation of mining sludge (**Figures 27** and **28**).

<u>Potential for Mining:</u> Evidenced (**ID-81**); Negligible (**ID-82**, **ID-83**); Some (**ID-84**, **ID-85**)

- Dams associated with the Boral Sand Quarry are situated within the southeast corner of Focus Area **ID-81**. A 2021 newsletter from Bacchus Marsh Quarry indicates they have recently filled in two of their dams (Boral 2021). Given the extent of the quarry's works there is a high potential for buried and/or altered prior ground surfaces within the Focus Area. However, the full spatial extent of those works cannot be ascertained through a desktop assessment alone. No further evidence for mining within any of these Focus Areas was identified across digitised mining datasets/literature or the VHD.

- Focus Areas **ID-84** and **ID-85** have 'some' potential for mining impacts based on their close proximity to the Boral sand quarry operations.

Waterway movement

- An 1858 map of the area does not suggest that any major alterations to the course of the Goodman Creek through Focus Area **ID-81** have taken place from that date to the present (Nixon 1858).

Historical maps

Geological Survey of Victoria. 1985. *Bacchus Marsh. 1:50,000 Geological Map Series, 7722-1 Zone 55.* Department of Minerals and Energy, Victoria.

Nixon, T. 1858. *Country lots in the Parish of Merrimu and Coimadai, County of Bourke.* Public Lands Office, Melbourne.

Anon, Undated. *Country lots in the Parish of Merrimu and Coimadai, County of Bourke.* Libraries Australia ID 52320208.

Historical research (selected passages)

- *The Argus* (October 4th, 1855)
  - 'A PEDESTRIAN TOUR IN THE INTERIOR – Whilst here, I heard favorable accounts of some new diggings at Goodman's Creek about five miles from Bacchus Marsh Township, and it is said that there is every prospect of its becoming an extensive goldfield. There are at present not more than sixty persons at work there, but report says they are doing well, every dishful of earth taken from the surface containing more or less of gold.'
- *The Star* (October 15th, 1858)
  - 'THE NEW DIGGINGS AT BACCHUS MARSH – Respecting this new field of mining enterprise the Age has the following: -- "A new rush to the Lerderderg Creek, near Bacchus Marsh, has caused a little stir in certain quarters. It is well known to the inhabitants of the Marsh that gold has been found in paying quantities in and around that district for miles in extent. We need only mention Goodman's Creek, which lies to the right of the present scene of operations, as you leave the township, only a mile or two distant, where gold was discovered two years ago, and duly recorded in this journal. We have ascertained since that parties have been working in that neighborhood till very lately.'
- *The Age* (October 7th, 1867)
  - 'GOLD AT GOODMAN'S CREEK – It is very probable that the gold workings at Goodman's Creek, near Bacchus Marsh, will support a more numerous population, 'ere long, than is now engaged in the search for gold. We are informed that very good prospects have been obtained by Mr Gulliver, of the Limekilns, and if plenty of water could be got there is no doubt that sluicing operations up a large scale would pay well, as sinking is very shallow, only some four feet.'
- *The Bacchus Marsh Express* (July 4th, 1868)
  - 'BULLENGAROOK – I visited Goodman's Creek the early part of the week, and saw a beautiful sample of gold which a miner named Munro had. It would weigh about an ounce. He got it the day before my visit, and has been doing well for some time having sold some nice samples to Mr. Hussey, of Gisborne. I think he is the only man that is doing anything worth speaking of. The others I believe at making a living, but little more. They have all erected new bark huts, and seem to settle down for the winter.'
- *The Ballarat Star* (September 13th, 1872)
  - 'MINING INTELLIGENCE. —We are glad to hear that Mr Saunders and party, of Bacchus Marsh, have a good prospect of reward for their long labors in searching for gold near Goodman's Creek. About ten days ago they struct a heavy wash, in their north-east drive, about three feet high. They have driven 17 feet and it continues to improve. Two loads were washed on Saturday and yielded 1 oz 7 dwt.'
- *Leader* (August 23rd, 1873)
  - 'THE MINES. GOODMAN'S CREEK AND BALLAN. From the Pentland Hills I made a short detour of a few miles to the east to visit some gold workings at Goodman's Creek, where it was reported profitable returned had been obtained for a small outlay. The newly discovered ground is situated on the edge of a basaltic plain within six miles of Bacchus Marsh, and close to the creek mentioned. The work done up to the present time consists of two shafts, and a tunnel connecting them at a depth of 130 feet. Both are sunk into the face of hill, in a paddock, which is understood to be private property. The workings thus far are alluvial only, but indications of quartz in the neighborhood are not wanting. The only machinery employed is a common "whip" and bucket for raising the stuff, and some rude sluicing boxes at the creek of the most primitive description. The claim is worked by five men, and the average yield throughout has been from three to four pennyweights to the load, and this is said to pay well.'
- *The Bacchus Marsh Express* (September 8th, 1883)
  - 'GEOLOGICAL SURVEYOR'S REPORT – Goodman's Creek, west of Bullengarook plateau, was rich in places; one (Golden Point) having yielded a large quantity of gold. Its western tributaries (Jimmy's Creek, and Peas and Beans gully, so named from the character of its gold) were rich. East of the Bullengarook plateau a large quantity of gold was obtained from Cockatoo gully (a tributary of Coimadai Creek) while in the gravels of the lead beneath the plateau some fair patches have been obtained, though no continuous run of rich ground has been proved.'

- *The Age* (April 15th, 1930)
    - ‘MINES AND METALS. Prospecting at Bullengarook. During the last 70 years much alluvial ground has from time to time been obtained along the banks of Goodman’s Creek at Bullengarook. Three years ago a company began operations at Golden Top, and is still carrying on deep sinking. The Victory Gold Mining Syndicate, with Mr. J. McCashney, an experienced miner, in charge, has now started to reopen a mine discarded many years ago at Bullengarook.’

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Secretary for Mines, 1867. Reports of the Mining Surveyors and Registrars. Quarter ending 31st December 1866. No.22. Parliament of Victoria.

Secretary for Mines, 1884. Reports of the Mining Surveyors and Registrars. Quarter ending 31st March 1884. No.26. Parliament of Victoria.

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THE NEW DIGGINGS AT BACCHUS MARSH. (1858, October 15th). *The Star (Ballarat, Vic: 1855 - 1864)*, p. 3., from http://nla.gov.au/nla.news-article66050646

6.22 – ID-87 to ID-92 – ACHS – Pyrites Creek and Djerriwarrh Creek

See also **Figure 28**

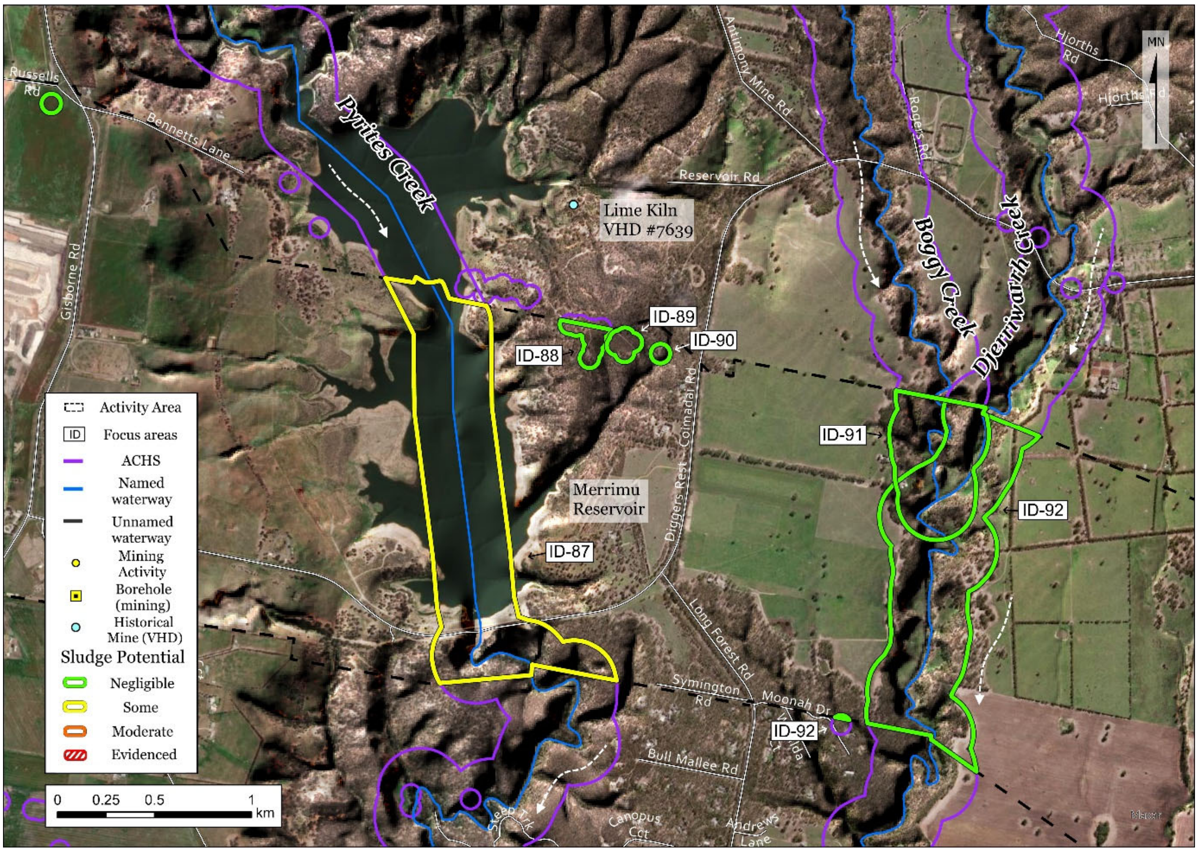

Figure 30. A recent aerial image of Merrimu Reservoir (**ID-87**) and Djerriwarrh Creek (**ID-92**) overlying a 10-metre resolution Digital Terrain Model (DTM). Pyrites Creek (also as Coimadai Creek) had a limited amount of upstream mining during the nineteenth and early twentieth centuries that may have produced sludge. Within Focus Area **ID-87** those deposits of sludge, if present, would likely be confined to areas now inundated by the reservoir. Nevertheless, there does remain ‘some potential’ for ground surfaces capped by mining sludge to be in this area (even if now underwater). Focus Areas **ID-91** and **ID-92** did not have identified examples of upstream mining across digitised mining datasets/literature or the VHD. Focus Areas **ID-88** to **ID-92** thus have negligible potential for mining impacts.

Potential for Sludge: Some (**ID-87**); Negligible (**ID-88** to **ID-92**)

- Focus Areas **ID-87** to **ID-92** are ACHS associated with Merrimu Creek (downstream of Pyrites Creek also as 'Pyrete, Creek,' 'Pyreete Creek' or 'Coimadai Creek'), Boggy Creek, Djerriwarrh Creek, and registered Cultural Heritage Places in between these waterways (**Figures 29** and **30**).
- Pyrites Creek and its tributaries, are immediately upstream of Merrimu Reservoir and had limited amounts of mining during the nineteenth and early twentieth centuries. Cockatoo Creek and Cataract Creek, in particular, were subjected to some shallow alluvial mining. However, activities along those waterways do not appear to have been intensive enough to make it onto any identified geological maps of the area—and reference to the workings were identified only within historical newspapers.
- The Coimadai Antimony Mine (**Figure 28**) is situated on an antimony reef along Pyrites Creek, which was first discovered in 1887 and was worked off and on into the mid-twentieth century (Baragwanath 1946: 342). There is evidence to suggest that Coimadai Antimony Mine stacked their ore until it could be properly processed (as antimony ore was not generally washed like alluvial gold). An article in *The Bacchus Marsh Express* indicates the mine had a 'mullock heap' that represented 600 tons of ore (*The Bacchus Marsh Express* May 8th, 1937). Historical maps of the Coimadai Antimony Mine's workings show mullock heaps, dumps, and dams that are likely to have prevented sediment from entering the creek (Undated, Department of Mines; Fisher 1958). The Coimadai Antimony Mine does not appear likely to have discharged significant volumes of mining waste into Pyrites Creek (particularly enough to result in large volumes of deposited sludge more than 6 km downstream to the Focus Area).
- Merrimu Reservoir (also as the 'Coimadai reservoir') was first constructed in 1869, but was upgraded during the late-1960s (*The Bacchus Marsh Express* April 28th, 1907). The reservoir is likely to have captured upstream waterborne sediments from that date, which may now be capping former ground surfaces (now under water).
- Overall, the ambiguity surrounding the intensity of mining activities upstream of Merrimu Reservoir, coupled with the implications of the dam itself for captured mining sediment, gives Focus Area **ID-87** 'some' potential to maintain sludge deposits.
- No evidence of historical mining activity was identified upstream of Boggy Creek or Djerriwarrh Creek across digitised mining datasets/literature or the VHD— these Focus Areas thus have a negligible potential to maintain sludge deposits.

Potential for Mining: Negligible

- No evidence for mining within any of these Focus Areas was identified across digitised mining datasets/literature or the VHD.

Waterway movement

- Besides the construction of the Merrimu Reservoir, no other evidence for historical waterway movement within these Focus Areas was identified.

Historical maps

Fisher, N.H., 1943. Coimadai Antimony Mine, No 1 (Drapers) Section, Bacchus Marsh. Plan at adit level and composite plan of sub-levels, and sections, showing geology. Plan No 275/A/2 [X size]. Bureau of Mineral Resources, Canberra.

Geological Survey of Victoria. 1985. *Bacchus Marsh. 1:50,000 Geological Map Series, 7722-1 Zone 55.* Department of Minerals and Energy, Victoria.

Department of Mines. Undated. Coimadai Antimony Mine, Bacchus Marsh. Plan No 275/P/2 [X size]. Bureau of Mineral Resources, Canberra.

Historical research

- *The Bacchus Marsh Express* (May 8th, 1937)
  - 'MINING ACTIVITY AT COIMADAI. – Antimony Attracts Investors – The antimony reefs at Coimadai, which at the end of the last century yielded thousands of tons of the metal and then were abandoned as unpayable, are about to be explored fully be modern mining methods, according to information obtained this week… ...Mr. Braden said the antimony deposit at Coimadai was first discovered in 1887 by a rabbiter named Haines, whose father-in-law, named Bondison, took out a mining lease. This "show" became known and is still referred to as Bondison's Lease. The Bondisons worked the mine for two and a half years, during which period the antimony won netted them a clear profit of £8,000 when the metal was worth only £6 a ton. Then (fortunately during a lunch-hour), in the early nineties the mine caved in, and was abandoned. Mr. Braden asserted that the Bondisons had worked to a total depth of 100 feet, and had struck water at 86 feet… …To-day the mullock heap beside Bondison's Lease represents 600 tons, on the estimate of Mr. Braden.'
- *The Bacchus Marsh Express* (February 27th, 1892)
  - 'NO TITLE …the Cockatoo gully, from which the most gold was got in surface workings some thirty years ago, takes its rise immediately below the Cataract tunnel…'
- *The Bacchus Marsh Express* (February 5th, 1870)
  - 'NO TITLE – MR. Greeves, a miner at Cockatoo Gully, near Bacchus Marsh, found on Tuesday a piece of quartz very rich with gold. We have not seen it, but a reliable correspondent in that neighbourhood informs us that the specimen is three cornered, not at all water-worn, and all the old diggers think that a quartz reef must be nearby.'

- *The Bacchus Marsh Express* (August 8th, 1891)
  - 'MR MURRAY REPORTS – I beg to report having visited the workings beneath the Bullengarook plateau northward from Bacchus Marsh. A considerable quantity of gold obtained in former years form Goodman's Creek and tributaries on the west, and from Cockatoo Gully on the east of the plateau. There is undoubtedly a lead of auriferous wash and cement under the basalt of the plateau, and this has, in many cases, been prospected, though not (so far) with payable results. The present working consist of a tunnel and branch drives therefrom put in from the Cataract Creek – a branch of Pyreete Creek—and they expose wash of varying character resting on a rather irregular bottom of Silurian bed rock.'
- *The Bacchus Marsh Express* (April 28th, 1907)
  - 'IRRIGATION PERIODS IN BACCHUS MARSH – One of the best sustained of the above periods raged from November 14th, 1868, to April 17th, 1869, and probably longer, as we have not traced it any further. On the latter date a public meeting approved the Coimadai scheme, which was to cost £73,000 but it was to irrigate all the country down to the bay. The Coimadai reservoir was reported to have 12,000 acres of watershed, and it was to hold 2,000 million gallons of water, with half the average rainfall; or a fall of 12 inches per year would fill the reservoir twice over.'

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MINING ACTIVITY AT COIMADAI. (1937, May 8). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 4., from **http://nla.gov.au/nla.news-article262571864**

MR. MURRAY'S REPORTS. (1891, August 8). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 7., from **http://nla.gov.au/nla.news-article89280440**

NO TITLE (1870, February 5). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 2., from **http://nla.gov.au/nla.news-article89701794**

NO TITLE (1892, February 27). *The Bacchus Marsh Express (Vic: 1866 - 1943)*, p. 2., from **http://nla.gov.au/nla.news-article89281161**

6.23 - ID-93 to ID-101 - ACHS - Arnolds Creek, Little Blind Creek, Toolern Creek, Ryans Creek, Kororoit Creek

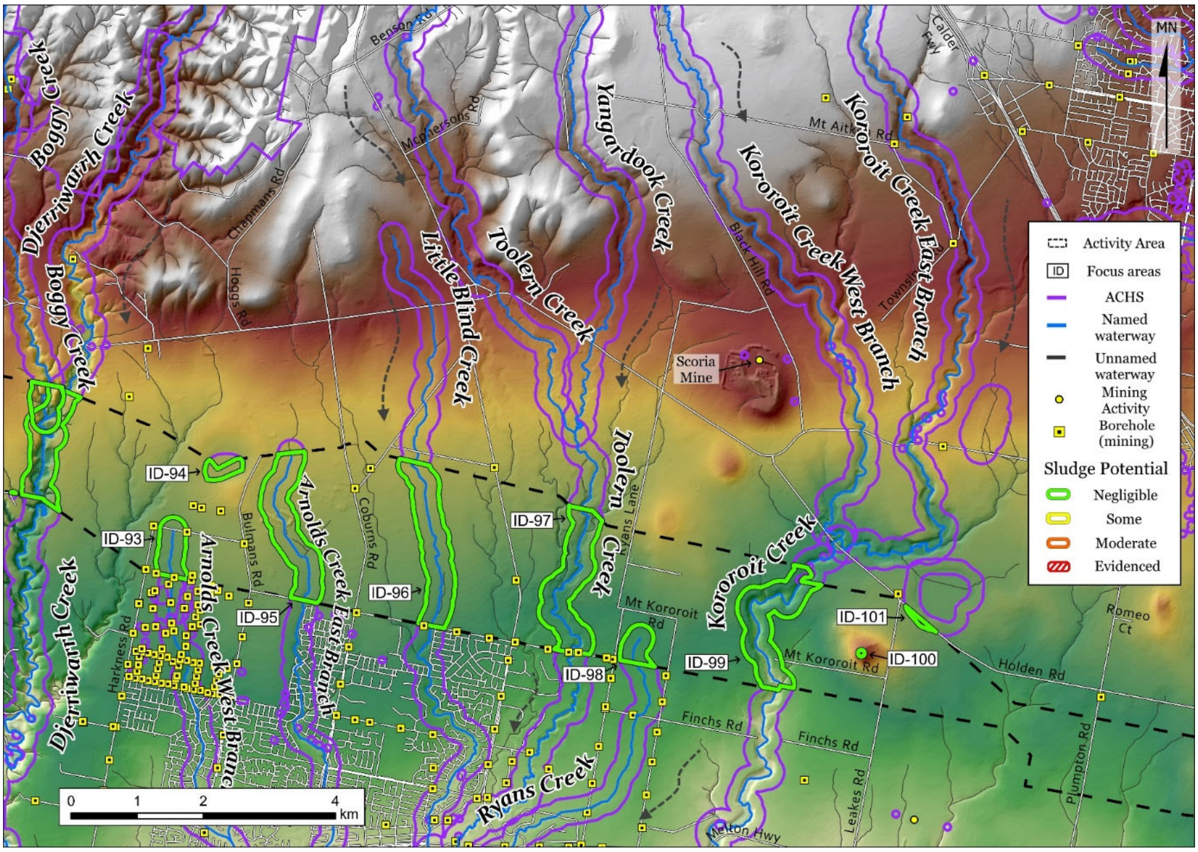

Figure 31. A 10-metre Digital Terrain Model (DTM) of Focus Areas **ID-93** to **ID-100** from Arnolds Creek to Kororoit Creek. Beyond a scoria mine (which is not likely to have discharged waterborne sediments) upstream of **ID-98** and **ID-99**, besides a limited number of prospective boreholes, no evidence of mining activities were identified upstream of these Focus Areas across digitised mining datasets/literature or the VHD. The absence of upstream historical mining activity across the Focus Areas suggests a negligible potential for sludge or mining activity. There are a number of boreholes associated with mining identified across the area and these relate to phases of resource prospection during the 1890s and the 1980s. None of the boreholes are located within the Focus Areas.

Potential for Sludge: Negligible

- Focus Areas **ID-93 to ID-101** are ACHS associated with Arnolds Creek (east and west branch), Little Blind Creek, Toolern Creek, Ryans Creek, Kororoit Creek, a registered Cultural Heritage Place, and a swamp/wetland, respectively (**Figure 31**). No evidence of historical mining was identified within or upstream of these Focus Areas across digitised mining datasets/literature or the VHD.
- There is a scoria mine upstream of Focus Areas **ID-98** and **ID-99**, but that activity is both modern and unlikely to have produced waterborne mining waste.
- There are a number of boreholes associated with mining identified across the area and these relate to phases of resource prospection during the 1890s and the 1980s. None of the boreholes are located within Focus Area.

Potential for Mining: Negligible

- No evidence of historical mining was identified within these Focus Areas across digitised mining datasets/literature or the VHD.

Waterway movement

- No evidence identified

Historical research

- No historical evidence for mining across these Focus Areas was identified

Historical maps

Geological Survey of Victoria, 1973. *Sunbury. 1 mile to 1 inch, geological map*. Department of Mines, Victoria.

6.24 - ID-102 to ID-107 – ACHS – Registered Cultural Heritage Places and Taylors Creek

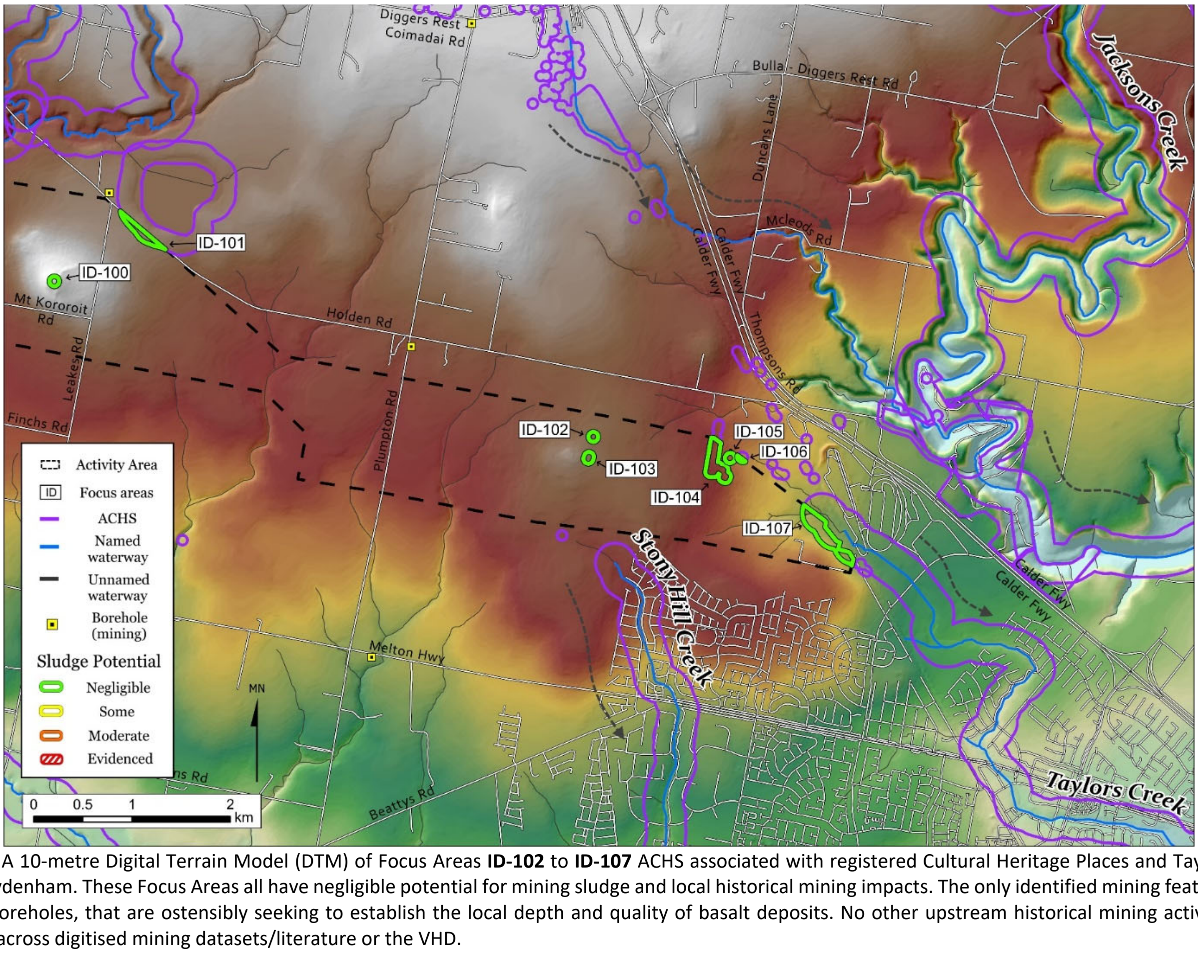

Figure 31. A 10-metre Digital Terrain Model (DTM) of Focus Areas **ID-102** to **ID-107** ACHS associated with registered Cultural Heritage Places and Taylors Creek north of Sydenham. These Focus Areas all have negligible potential for mining sludge and local historical mining impacts. The only identified mining features in the area are boreholes, that are ostensibly seeking to establish the local depth and quality of basalt deposits. No other upstream historical mining activities were identified across digitised mining datasets/literature or the VHD.

Potential for Sludge: Negligible

- Focus Areas **ID-102 to ID-107** are ACHS associated with registered Cultural Heritage Place, Taylors Creek (**Figure 31**). No evidence of historical mining was identified within or upstream of these Focus Areas across digitised mining datasets/literature or the VHD.
- There is a scoria mine upstream of Focus Areas **ID-98** and **ID-99**, but that activity is both modern and unlikely to have produced waterborne mining waste.

Potential for Mining: Negligible

- No evidence of historical mining was identified within these Focus Areas across digitised mining datasets/literature or the VHD.

Waterway movement

- No evidence identified

Historical research

- No historical evidence for mining across these focus areas was identified

Historical maps

Geological Survey of Victoria, 1973. *Sunbury. 1 mile to 1 inch, geological map*. Department of Mines, Victoria.

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Appendix C. Preliminary soil investigation and site walkover (Jacobs, 2021)

Memorandum

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Subject	Soil Investigation and Site Walkover	Project Name	Western Victoria Transmission Network Project
Attention	AusNet Transmission Group Pty Ltd	Project No.	IS311800
From	Arthur Teo, Jye Grogan and Ben Grasso		
Date	29 November 2021		
Copies to	Stanley Howell		

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1. Introduction

This factual memorandum has been prepared for AusNet Transmission Group Pty Ltd (AusNet) by Jacobs Group (Australia) Pty Limited (Jacobs) to document an opportunistic soil investigation and site walkover (the 'works') within the proposed Project Area (shown in Figure A.1 in Appendix A) and described in Table 2.1 and Table 3.1 below. The field works were completed between 18 and 19 August 2021.

1.1 Background

The Western Victoria Transmission Network Project (the Project) proposes a new transmission line starting at Bulgana, near Stawell in Victoria's west, and extending approximately 190km to Sydenham in Melbourne's north-west (the Project Area). The Project will enable the connection of new renewable energy generated in western Victoria into the National Electricity Market and increase the Victorian transmission capacity. The Project is being delivered by AusNet Services through its commercial division Mondo Power Pty Ltd.

On 4 August 2020, the Minister for Planning issued a decision confirming that an Environment Effects Statement (EES) is required due to the potential for significant environmental impacts associated with the Project.

Similarly, the Commonwealth Government's Department of Agriculture, Water and the Environment (DAWE, the Commonwealth) confirmed that the Project is a 'controlled action' and will require assessment and approval under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (EPBC Act). The Commonwealth has determined that it will use the bilateral assessment agreement and rely on the Victorian Government's assessment process (EES) to inform an approval decision under the EPBC Act.

This memorandum has been prepared as a supporting document for the Contaminated Land Impact Assessment (the Impact Assessment). The Impact Assessment is one of several technical documents, which will support the EES and inform the Project decision making process.

1.1.1 Desktop Review

The desktop review identified the following within the study area, which included the Project Area (shown in Figure A.1 in Appendix A) and a 500m buffer from the boundary of the Project Area:

- The most prevalent potentially contaminating activity is current and historic agricultural practices throughout the study area.
- Concentrated areas of historic gold mining activities are identified surrounding Smeaton, Lawrence, Allendale, and Creswick North.
- Industrial land uses were identified within the study area including Terminal Stations at Bulgana, Waubra, Ballarat, Sydenham, as well as rail yards near Sydenham Terminal Station and sand and gravel quarries between Coimadai and Darley.
- Industrial land uses were identified within the study area including Terminal Stations at Ararat, Crowlands, the Melton Aerodrome and a closed landfill (now motorsport complex) at Calder Park.
- One known contaminated site was identified on the EPA priority site register, a solid inert waste dump located at 627-703 Plumpton Road, Plumpton within the study area.

These potential sources of contamination have the potential to cause contamination within the study area.

In the context of the Project Area, potential sources of contamination identified include agricultural land use, historic gold mining, sand and gravel quarries, existing terminal stations and an illegal dumping site on the EPA priority site register. The Project Area at the proposed North Sydenham Terminal Station is also located within the recommended 200m buffer distance of an inert waste landfill as per Table 5.2 of the EPA publication 788.3 (EPA Victoria 2015) for placement of buildings and structures.

1.1.2 Contaminants of Potential Concern

Contaminants of potential concern (COPC) associated with the potential sources of contamination identified in Section 1.1.1 are summarised in Table 1.1.

Table 1.1: Potentially contaminating activities associated with current and historic land uses

Current or Historical Land Use	Potential Contaminating Activity and Common Contaminants
Historically importation of fill (e.g., existing terminal stations)	Various contaminants depending on source of materials. Common COPC associated with contaminated fill include metals, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, volatile organic compounds, asbestos, phenols, organophosphate pesticides, polychlorinated biphenyls, cyanide and sulfate.
Agricultural and farming	Intensive agriculture – potential contaminants include carbamates, organochlorine pesticides, organophosphate pesticides, herbicides (e.g., triazine, atrazine), nitrates, salinity, metals (aluminium, arsenic, cadmium, copper, iron, lead, magnesium, potassium), nutrients (e.g., nitrogen, phosphorus), PFAS (potentially used as an adjuvant or active ingredient in fertilisers and pesticides, firefighting foam used in the poultry industry to destroy infected flocks). Sheep and cattle dips – potential contaminants may include metals (e.g., arsenic), carbamates, organochlorine pesticides, organophosphate pesticides, herbicides, synthetic pyrethroids.

Current or Historical Land Use	Potential Contaminating Activity and Common Contaminants
Quarries and historic gold mining	Mining and extractive industries – potential contaminants include metals (aluminium, arsenic, copper, chromium, cobalt, lead, nickel, silver, selenium, zinc, iron and mercury), acids, alkalis, total dissolved solids, organic flocculants (e.g., sulfate, cyanide), total petroleum hydrocarbons, monocyclic aromatic hydrocarbons, explosives, caustic, asbestos and pesticides.
Industrial waste dumping	Importation of solid waste and fill – contaminants depend on the industry or activity of the source site of the material, but may include common contaminants metals, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, monocyclic aromatic hydrocarbons and asbestos.
Landfill	Landfill – potential contaminants are dependent on the type of landfill and wastes disposed, but may include polychlorinated biphenyls, ASS, alkanes, sulfides, metals, asbestos organic acids, nutrients (e.g., nitrogen, phosphorus), total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, monocyclic aromatic hydrocarbons, ammonia, landfill gases (e.g., methane), total dissolved solids
Rail yards	Railway yards – potential contaminants may include total petroleum hydrocarbons, monocyclic aromatic hydrocarbons (e.g., benzene, toluene, ethylbenzene and xylene), phenols, metals (e.g., arsenic, lead, zinc, cadmium, chromium, iron), asbestos, creosote, nutrients (e.g., nitrates, ammonia), carbonates, organochlorine pesticides, organophosphate pesticides, herbicides
Airports	Airports – potential contaminants may include total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, monocyclic aromatic hydrocarbons, metals (including aluminium, magnesium and chromium), solvents, PFAS.

1.2 Objectives and Scope of Works

The objective of the investigation was to gather preliminary soil data from discrete locations within the study area where the desktop study indicated a potentially increased likelihood of risk.

The scope of the ground investigation was based on the desktop contaminated land assessment summarised in Section 1.1.1 and detailed in Section 6 of the Impact Assessment report.

The aim of the investigation included:

- Collection and analysis of discrete soil samples for the presence of contamination.
- Collection and analysis of discrete soil samples for acid generation capacity and aggressivity.

Soil sampling by shallow hand auger was proposed at a total of 21 locations across the study area to provide initial indication of potential contamination targeting potential sources of contamination identified by the existing conditions assessment. The potential sources of contamination included agricultural land use, historic gold mining, quarry waste, ASS, EPA illegal dumping priority site and existing terminal station. Due to access constraints from private landowners and security concerns the total number of sampling locations was reduced to eight locations.

One sampling event was completed with data collected from eight soil boreholes at locations shown in Figure A.1 in Appendix A. Further detail on the site investigation locations is included in the sections below.

2. Methodology

2.1 Soil Sampling

Soil sampling was undertaken at borehole locations HA02, HA03, HA04, HA05, HA10, HA15, HA17 and HA19 (described in Table 2.1 below), between the 18 and 19 August 2021, by a Jacobs consultant, generally as follows:

- Samples were collected at regular intervals (0.1, 0.5, 1.0 m below ground level (m bgl)) or where contamination or significant changes in the lithology were observed.
- A total of 22 primary soil samples two sets of inter / intra-laboratory duplicate samples, two rinsate and one trip blank samples were collected from the borehole locations.
- Each sample was also screened with a photoionisation detector (PID) for indication of presence of volatile organic compounds.
- Soil samples were collected directly from a decontaminated hand auger.
- All samples were collected using single use dedicated nitrile gloves and placed directly into laboratory-supplied containers.
- Soils were logged and observations recorded at each sampling location. Observations are noted on investigation logs presented in Appendix C.
- Primary soil samples were submitted for laboratory analysis as indicated in Section 2.3. Two sets of inter/intra-laboratory duplicate samples were analysed for the same analytical suites as the primary soil samples.

All investigation locations were advanced using a hand auger to a maximum depth of 1 m bgl. Soil samples were recovered using the hand auger and submitted to laboratory for contamination and acid generation analysis. The investigation methods used to assess the environmental condition are described in the following sections.

2.1.1 Investigation Locations

A total of eight soil boreholes were advanced as part of the soil investigation conducted within the study area. A summary of rationale for the soil boreholes is provided in table below. The investigation locations are shown in Figure A.1 in Appendix A and photographs are shown in Appendix B.

Table 2.1: Rationale for Investigation Locations

Borehole Location ID	Location Description	Rationale
HA02	Off Joel Joel Road, Shays Flat	To assess potential contamination associated with agricultural land use
HA03	Off Boatmans Road	To assess potential presence of acid sulfate soil and obtain spatial coverage
HA04	Off Ballarat-Maryborough Road, Tourello	To assess potential contamination associated with historical gold mining
HA05	Off Charlesons Road, Allendale	To assess potential contamination associated with historical gold mining
HA10	Off Lone Hand Road, Allendale	To assess potential contamination associated with historical gold mining

Borehole Location ID	Location Description	Rationale
HA15	Off Long Swamp Road, Dean	To assess potential presence of acid sulfate soil and obtain spatial coverage
HA17	Off Callaghans Lane, Gordon	To obtain spatial coverage
HA19	Off Quarry Road, Coimadai	To assess potential presence of acid sulfate soil and obtain spatial coverage

2.2 Assessment Criteria

2.2.1 Contamination Assessment Methodology

During the field investigation works, soil samples were collected from discrete locations based on the desktop review summarised in Section 1.1.1. The results are considered indicative and are an initial step in understanding the likely waste classification of spoil for off-site disposal or reuse prior to commencement of construction. Sampling locations were selected to gain a high-level understanding of the potential contaminant risks and applicable environmental values of the environment associated with the construction and operation of the Project. The contamination assessment included sampling of fill / top soil and natural materials as follows:

- Fill / topsoil: samples were collected to assess risk to environmental values of the environment and waste categorisation. Soil samples were collected from the surface of the soil profile within fill soils
- Natural soils: samples were collected immediately below fill soils and at approximately 0.5 m below the top of the natural profile (where possible), to assess if potential contaminants from overlying fill soils had leached into the underlying soils and to assess waste categorisation.

2.2.2 Acid Sulfate Soil Assessment Methodology

Acid sulfate soil (ASS) have been identified in areas likely to be disturbed during excavation works. Select samples were analysed for ASS properties to understand the likely extent of potential and actual ASS and to provide advice on management and disposal options. Soil samples were placed into airtight plastic zip-lock bags, rolled to remove excess air, stored on ice in an esky and transported to the analytical laboratory within 24 hours of collection to reduce oxidation.

2.3 Analytical Program

The laboratories used for soil sample analysis were National Association of Testing Authorities (NATA) registered and hold NATA accreditation for the analyses conducted. Primary soil samples were analysed by Australian Laboratory Services (ALS). Duplicate soils samples were analysed by Eurofins.

Where required, ALS, Eurofins utilised their interstate laboratories to support their analytical capacity. The analytical program for each targeted assessment is described in the following sections.

2.3.1 Analysis of Soil Contamination

The soil investigation program included analysis of the following for assessment of the presence of contamination and waste characterisation:

- Fill / top soil and natural soils: Primary ‘Fill / top soil’ and ‘Natural’ soil samples were analysed for the broad range of analytes listed in EPA1828.2 (EPA Victoria, 2021) and COPC based on the areas of potential concern as identified in Section 1.1.2.

Soil samples were also tested for a range of other parameters including:

- PFAS (short suite).
- pH, sulfate and chloride and extended materials durability parameters on select samples.
- For the purpose of potentially defining site-specific ecological investigation criteria based on NEPM 2013, selected fill and natural samples were also tested for cation exchange capacity (CEC), clay content, organic carbon content and pH.
- Soil was also assessed for acid forming potential based on Information Bulletin No. 655.1 (EPA Victoria, 2009a).

2.3.2 Analysis of Acid Sulfate Soil

The potential presence of acid sulfate soils were initially screened using pH_F and pH_{FOX} screening methods. To determine net acidity, selected samples were then analysed using Chromium Reducible Sulfur suite (CRS).

2.4 Quality Assurance / Quality Control

A summary of sample collection, preservation, handling and decontamination procedures and an assessment of both field and laboratory-based quality assurance / quality control with comparison with adopted acceptance criteria is also presented in Appendix F. Calibration certificates for equipment used during the works are presented in Appendix G.

3. Results

The following sections provide a summary of observations during the site walkover, and soil analytical results for samples collected and analysed during the works.

Analytical summary tables are provided in Tables 1, 2 and 3 in Appendix D.

The laboratory reports for this soil investigation are included in Appendix E. These include, chain of custody forms, sample receipt notifications, laboratory analytical certificates and quality control reports. Summaries of analytical methods used by the laboratories are provided in the laboratory’s interpretive quality control reports.

3.1 Site Walkover

The spatial extent of the site walkover of the study area was limited to accessible sampling locations. Generally, the study area consisted of agricultural land uses. Table 3.1 provides a summary of observations made during the site walkover performed at the sampling locations within the study area.

Table 3.1: Observations from site walkover of the study area

Borehole Location ID	Location Description	Rationale	Observations
HA02	Off Joel Joel Road, Shays Flat	To assess potential contamination associated with agricultural land use	Located within broad acre sheep grazing paddock containing existing transmission line and towers.
HA03	Off Boatmans Road	To assess potential presence of acid sulfate soil and obtain spatial coverage	Located within roadside adjacent to Glenlofty Creek. Area sparsely vegetated aside from roadside trees and trees and shrubs adjacent to Glenlofty Creek. Adjacent land uses broad acre farming and existing transmission line and towers. Roadway along Boatmans Road unsealed.
HA04	Off Ballarat-Maryborough Road, Tourello	To assess potential contamination associated with historical gold mining	Located within broad acre sheep grazing paddock. Adjacent land uses broad acre farming. No indicators of historic mining activities were observed at HA04.
HA05	Off Charlesons Road, Allendale	To assess potential contamination associated with historical gold mining	Location at the foot of mine tailings mound, surrounded by broad acre sheep grazing paddock. Adjacent land uses broad acre sheep grazing with isolated areas of historic gold mine sites.
HA10	Off Lone Hand Road, Allendale	To assess potential contamination associated with historical gold mining	Located down gradient of gold mining spoil mounds. Adjacent land uses broad acre farming with isolated areas of historic gold mine sites.
HA15	Off Long Swamp Road, Dean	To assess potential presence of acid sulfate soil and obtain spatial coverage	Located within roadside reserve adjacent to Pinchgut Creek. Adjacent land uses broad acre farming. Area sparsely vegetated aside from roadside trees and trees and shrubs adjacent to Pinchgut Creek.
HA17	Off Callaghans Lane, Gordon	To obtain spatial coverage	Located within road reserve adjacent to broad acre grazing paddock. Adjacent land uses broad acre farming and isolated areas of dense vegetation.
HA19	Off Quarry Road, Coimadai	To assess potential presence of acid sulfate soil and obtain spatial coverage	Located off Quarry Road, an unsealed road, within grassed area used for cattle grazing. Observed cattle feces throughout the grassed areas and signs of erosion.

3.2 Preliminary screening criteria

Soil investigation results have been screened against adopted Tier 1 screening criteria for protection of human health, the environment and waste classification (approach, criteria and rational described in Appendix A of the Impact Assessment). For the purposes of this preliminary data gathering exercise, the environmental data has been compared against the adopted health and environmental screening criteria as set out in Appendix A of the Impact Assessment in the first instance to identify potential impacts to the relevant human and ecological receptors.

Soil results have also been compared to the adopted waste criteria to provide a preliminary indication of the hazard categorisation for the project-derived spoil.

Analytical summary tables are provided in Appendix D.

3.2.1 Ecological screening criteria

A summary of exceedances is provided in the table below..

Table 3.2: Summary of exceedances of adopted ecological screening criteria - soil

Analyte	Locations (samples)	Max. result (mg/kg)	95% UCL (mg/kg)	Screening Level (mg/kg)	No. Exceeding	% Exceeding
Fill / top soil						
Copper	3 (3)	61	Not calculated[#4]	40[#1]	1	33%
				50[#2]	1	33%
Natural						
Nickel	6 (16)	28	Not calculated[#4]	15[#1]	3	19%
				25[#2]	3	19%
Vanadium	6 (16)	170	Not calculated[#4]	130[#3]	1	6%

Notes:

[1] NEPM EIL (urban residential and public open space)

[2] NEPM EIL (commercial and industrial)

[3] CCME Soil Quality Guidelines (Residential/Parkland, Commercial and Industrial)

[4] Insufficient number of soil samples to enable calculation of the UCL.

A fill sample retrieved from HA10 reported an elevated concentration of copper above the adopted ecological investigation levels for both commercial/industrial and urban residential/open public space land use settings. If the fill material at this location was disturbed during Project works, or excavated and brought to the surface, the nature and extent of the contaminant may restrict potential reuse options.

The underlying natural soil generally reported soil concentrations below the adopted ecological investigation levels for both urban residential / public open space and commercial / industrial land use settings.

3.2.2 Human Health

Screening of results from soil investigations has been undertaken against adopted screening criteria for soils to identify potential impacts to human health. All results were below the adopted health investigation criteria.

3.2.3 Buildings and structures

The chloride and sulfate concentrations in fill and natural soils at all investigation locations indicate non-aggressive conditions for concrete and steel structures that may come into contact with on-site soil in accordance with AS2159-2009 Piling – Design and Installation. However, the fill sample collected from HA10 and natural soil samples from HA02, HA04 and HA17 reported pH levels corresponding to classification as moderate to mildly aggressive to concrete per AS2159-2009.

3.2.4 Consideration of aesthetics

Evidence of anthropogenic impact has not been observed at any of the investigation locations.

3.2.5 PFAS

Screening of results from soil investigations has been undertaken against adopted screening criteria for PFAS in soil defined in Appendix A of the Impact Assessment to identify potential impacts to human and ecological health. PFAS were not detected above the laboratory limit of reporting in all soil samples analysed.

3.2.6 Asbestos

Field observations of fill and natural soils have not identified the presence of asbestos. While asbestos has not been encountered at the investigation locations, it may be present within the fill in un-investigated areas and its presence should be confirmed in future investigation phases.

3.2.7 Acid sulfate soil

Exposure of potential acid sulfate soils (PASS) to air can potentially result in acidification of soils. If acidified, these effects could include mobilisation of metals (especially aluminium, iron and manganese) which could cause toxic effects to terrestrial and aquatic flora and fauna, corrosion of concrete structures and services, degradation of aquatic ecosystems and loss of soil structure.

The net acidity excluding acid neutralising capacity in alluvium soil sample from HA15 (19 mole H+/t) and colluvium sample from HA17 (24 mole H+/t) were reported at levels elevated above the guideline levels of 18 mole H+/t for >1000 tonnes of excavation. The net acidity is the sum of actual acidity and potential acidity. The results of the CRS method indicate that a significant component of the net acidity in these soil samples was due to actual acidity not potential acidity, hence there is a low potential for acid generation due to oxidation upon excavation as these soils are acidic in nature. On that basis, the potential for significant PASS/AASS to be encountered at these locations is considered to be low. Nevertheless, a Construction Environmental Management Plan (CEMP) should be prepared for the construction works. The CEMP should include, as a prudent measure, provision for management and disposal of PASS/AASS if required, including management measures during construction as required to avoid adverse environmental impacts.

3.3 Summary of preliminary findings

As the basis for the Impact Assessment, preliminary soil investigation results have been screened against adopted screening criteria relevant to human health, the environment and waste classification.

Where screening has identified concentrations of a substance or contaminant above an adopted screening criterion, and where a feasible exposure pathway to a human or ecological receptor is deemed present during the Project’s construction or operation, it is considered that an impact to an environmental value may occur and further assessment and / or management mitigation may be required. The preliminary investigation findings summarised in Table 3.3 below.

Table 3.3: Summary of preliminary findings

Environmental values	Summary of impact screening
Human and ecological receptors	
Land dependent ecosystems and species	Concentrations of copper above the adopted ecological investigation levels for commercial/industrial and urban residential/open public space land use settings were reported within the anthropogenic fill at HA10. If the fill material was disturbed during Project works, or excavated and brought to the surface, the nature and extent of the contaminants may restrict potential reuse options. The underlying natural soil reported soil concentrations below the adopted ecological investigation levels for urban residential/public open space and commercial / industrial land use settings.
Human health	No exceedances have been reported above the human health screening criteria in anthropogenic fill or natural soils within the study area.
Buildings and structures	The fill sample collected from HA10 and natural soil samples from HA02, HA04 and HA17 reported pH levels corresponding to classification as moderate to mildly aggressive to concrete per AS2159-2009.
Aesthetics	No evidence of anthropogenic impact was observed in fill soil at all investigation locations.
Acid sulfate soils	The results indicated the alluvium and colluvium are classified as low acid sulfate soil (ASS) potential.
Construction spoil	
General spoil	Fill / top soil: Results generally align with classification as 'Fill Material'. Underlying natural soil: Results generally align with classification as 'Fill Material'.
Waste acid sulfate soils (WASS)	Results of chemical testing undertaken on samples collected from the alluvium and colluvium sediments indicate that potential for WASS to be generated during construction or operation of the Project is likely to be low.

4. Assumptions and Limitations

4.1 Uncertainties

The study area covers a vast spatial area and variety of land-use types, as well as environmental and geological settings. The land within the study area has been subject to a range of potential current and historic contaminating activities and while contaminated land investigation and risk assessment aims to account for these variables to inform decision making, a level of inherent uncertainty exists with all assessments.

Uncertainty can arise due to limited availability of information, or limits in the quality and reliability of the information available. Traditionally, uncertainty is balanced through the application of conservative assumptions. In contaminated land risk assessment, the level of uncertainty plays a critical role in determining initial risk rankings, with more uncertainty usually resulting in a higher risk ranking or a more conservative definition of potential impacts. In general, the most effective way to reduce risk rankings in the first instance is to obtain more information through further investigation.

A summary assessment of uncertainty as it relates to this assessment and investigation works undertaken to date is provided in Table 4.1.

Table 4.1: Summary Assessment of Elements of Uncertainty

Element	Discussion on uncertainty
Data sources and completeness	Data from a number of sources have been used in undertaking this assessment, including generic, publicly available information collected during the desktop phase and data obtained through site-specific intrusive investigations conducted as part of the Project. Where available, all relevant data has been considered. As with all contaminated land assessments, uncertainty exists for areas where limited data is available and conditions at these points cannot be known definitively. Where data gaps exist — that is, where insufficient investigation has been undertaken to sufficiently manage uncertainty — conservative assumptions are made. This would typically then require further investigations to be planned and completed. This means that potential impacts have been evaluated with consideration of uncertainty and the potential for contamination to be present in areas where insufficient investigation has occurred to date. As is typical of large infrastructure projects, assessment of issues pertaining to contaminated land would continue throughout the life of the Project. As more information becomes available through ongoing investigation, the conceptual site model and understanding of potential impacts associated with contaminated land would be updated and refreshed.
Sampling density	The sampling density is not considered sufficient to characterise the contamination status of the study area. Gaps in sampling densities have been identified resulting interpretive limitations, as such, further investigations are recommended. In addition, the sampling density required to classify waste soils in accordance with requirements under the Environment Protection Regulations 2021 has not yet been achieved. An indicative classification has been made on the basis of available soil data. However, further sampling is required to inform reuse, management and off-site disposal requirements. As a general indicator, a minimum one sample is required for each 250 m^3 of spoil requiring disposal in accordance with EPA Victoria (2009b) Publication IWRG 702.
Data quality	Assessment of the quality and usability of data collected as part of Project investigation is contained within Appendix F. This includes the following aspects of the work completed to date: Completeness of planned field work Investigation coverage and sample density Field work and sampling processes Laboratory analysis. Overall, the quality of data collected to date is of sufficient quality for the purposes of this assessment.
Conclusions	A preliminary soil investigation was conducted as part of the impact assessment. The scope and coverage of investigation, including sampling density conducted are not considered sufficient for the management of uncertainty associated with this assessment. Where relevant, data gaps should be used to inform investigation scopes for subsequent phases so as to reduce uncertainty in a targeted manner. As investigations progress and more data becomes available, the conceptual site model will be refined and uncertainty will be reduced, as will the need for conservative assumptions. Regarding spoil classification and management, the most effective means of reducing uncertainty is the classification of spoil in accordance with volumetric frequency requirements defined in the Environment Protection Regulations. However, prior to this requirement being met, confidence in indicative classifications will increase as more data becomes available. In summary, data gaps have been identified and are not fully understood. This has been considered in the assessment of potential impacts and the identification of appropriate mitigation measures.

4.2 Assumptions

Assumptions made during the completion of contaminated land assessment are:

- This assessment considers land quality from the perspective of land contamination. It excludes soils quality from an agricultural perspective
- The potential exists for significant interaction between the impact assessments for contaminated land, ground water and surface water quality. Wider issues of groundwater and surface water resources are provided in:
  - Groundwater Impact Assessment Report
  - Surface Water Impact Assessment Report.
- Land contamination has the potential to affect ecological resources, construction materials' durability, and is a component of a broad health impact assessment
- The report is limited to consideration of the study area and described in Table 2.1 and Table 3.1 If the study area changed significantly, there is potential for different ground conditions to be encountered and so the findings might need to be re-visited.
- Where site walkovers were conducted, this was only completed within the bounds of public property or where consent to access to private land was granted. Some areas within the study area were not accessible.
- Only the publicly available EPA information (such as environmental audits, GQRUZ, landfill sites etc) within the study area were reviewed. It should also be noted that given the extent of the Project, it is likely that new EPA information may become available after the completion date of this report.

4.3 Limitations

The following limitations apply to the information provided in this report:

- The interpretation of sub-surface conditions and the nature and extent of contamination in this report is based on field observations and chemical analytical data from widely spaced sampling locations. It is possible that contamination exists in areas that were not investigated, sampled or analysed.
- This impact assessment is based on conditions that existed at the time the assessment was completed. Its findings and conclusions may be affected by the passage of time, by man-made events such as construction on or adjacent to the study area and by new releases of hazardous substances.
- The interpretation of sub-surface conditions is based on field observations and chemical analytical data from the sample design applied to this work. Site investigations identify sub-surface conditions only at those points where sub-surface tests were conducted or samples were taken.

5. Discussion

5.1 General spoil

The preliminary soil investigations undertaken reported soil concentrations below the EPA Victoria (2021) Publication 1828.2 'Fill Material' thresholds. However, further investigation is required to better understand the nature and extent of chemical compounds in soils and to satisfy regulatory requirements for classification of spoil, including sampling density. Indicative waste classifications based on available soil data are summarised in the table below.

Table 5.1: Summary of Indicative Waste Classification

Domain	EPA 1828.2	PFAS	Waste inclusions and asbestos	Indicative classification
Fill / top soil - general	Soil concentrations were below the 'Fill Material' thresholds.	PFAS concentrations were below the laboratory LOR.	No waste inclusions or asbestos reported	Results align with a classification as 'Fill Material'
Natural soil	Soil concentrations were below the 'Fill Material' thresholds.	PFAS concentrations were below the laboratory LOR.	No waste inclusions or asbestos reported	Results align with a classification as 'Fill Material'

5.2 Waste acid sulfate soil

Results of chemical testing undertaken on samples collected from the alluvium and colluvium sediments indicate that potential for WASS to be generated during construction of the Project is likely to be low. However, given the potential for PASS to be present in these geological units, further assessment of localised conditions is required to manage uncertainty regarding potential for WASS to be generated during Project activities.

5.3 Spoil management, reuse and recycling options

As mentioned above, excavated spoil comprising soil and rock will require management in accordance with Victorian regulatory requirements. Management may include on- or off-site reuse, or disposal to an appropriately licensed facility.

Preliminary assessment of discrete locations within the study area suggests that the spoil is unlikely to pose a significant risk to human or ecological values. Re-use of Project's spoil may be possible, pending the chemical and physical characteristics of the spoil material. However, further investigation is required to better understand the nature and extent of chemical compounds in soils and to satisfy regulatory requirements for classification of spoil or reuse.

A summary of indicative classifications and available management options is provided in the table below.

Table 5.2: Summary of indicative waste classification / re-use suitability

Domain	Indicative classification[1]	On-site reuse	Off-site reuse	Off-site disposal[2]	Pre-treatment requirement
Fill / top soil	Potential 'Fill Material – further assessment required	Yes – further assessment required	Yes – further assessment required	Yes	No
Natural soil	Potential 'Fill Material – further assessment required	Yes – further assessment required	Yes – further assessment required	Yes	No

Note 1: Soil investigations to date have been limited to areas with access permission and further assessment is required to classify soils as per regulatory requirements. On this basis, classifications are indicative and subject to a certain level of uncertainty.

Note 2: Off-site disposal must occur to an appropriately facility licensed to accept the waste category in question. Where priority waste is being removed off-site, documentation and transportation protocols must meet regulatory requirements.

5.4 Uncertainty assessment

Investigations conducted to date comprise a desktop review of available public information and an opportunistic intrusive soil investigation. These investigations are preliminary and ongoing, and continued investigation of potential risks will continue throughout the life of the Project.

Intrusive soil sampling and analysis have been undertaken in selected areas where access was permitted. Although results of the soil sampling program, together with an assessment of current and historical activities at the study area, do not indicate a high potential for significant contamination to be present, the available data is not sufficient to characterise the environmental condition of the study area and confirm categorisation of the soils for disposal. Further assessment is also required in potentially contaminated areas, particularly those with high potential for contamination to meet the recommended sample density outlined in IWRG702 for the volume of spoil generated, in order to confirm hazard categorization for off-site disposal according to EPA Victoria Publication 1828.2.

5.5 Summary

Generally, soil sampling results from discrete investigation locations within the study area were reported below adopted Tier 1 assessment criteria. Based on the soil data collected to date, the project derived spoil may be suitable for reuse or disposed of as "Fill Material" due to low level of soil concentrations. The identified data gaps have been evaluated in the impact assessment to assist with the identification of any mitigation (or performance) measures that may be warranted for any unacceptable impact that may not have been identified, due to the preliminary nature of the investigation conducted. Further detail of the impact assessment can be found in Sections 7, 8 and 9 of the Impact Assessment.

6. Conclusions

Soil samples were collected from eight boreholes at discrete locations within the study area as a preliminary data gathering exercise to inform potential land contamination, soil aggressivity, and presence of ASS. Based on the results of this preliminary investigation the following conclusions were made:

- A site walkover of the study area was undertaken as part of the works and was limited to the sampling locations where access was permitted. Generally, the investigation locations consisted of agricultural land uses, with some areas of historic gold mining and alluvial sediments.
- The soil investigated is likely to be moderate to mildly aggressive to concrete and non-aggressive to steel, however this assessment is based on data from select borehole locations.
- The net acidity excluding acid neutralising capacity in alluvium soil sample from HA15 (19 mole H+/t) and colluvium sample from HA17 (24 mole H+/t) were reported at levels elevated above the guideline levels of 18 mole H+/t for >1000 tonnes of excavation. This suggests that ASS is present within alluvium sediments within the study area.
- The soil investigated indicated that copper, nickel and vanadium were detected above the ecological screening criteria. Exceedance for copper was detected in an anthropogenic fill sample from HA10, whereas the exceedance for nickel and vanadium were detected in samples from natural soils from HA03, HA04 and HA15. Further investigation would be required to confirm whether these metals are naturally elevated.
- Soil samples analysed by this soil investigation did not report any exceedances of the upper limit for ‘Fill Material’ published in Table 3 of EPA publication 1828.2. However, the available data is not sufficient to confirm categorization of the soils for off-site disposal. Additional samples are required to confirm classification of soil per EPA Victoria publication IWRG 702, Soil Sampling (IWRG 702 2009).
- Excavated material will require classification and management in accordance with Victorian regulatory requirements and the GED. This includes assessment to understand the source areas, volumes and condition of spoil, definition and implementation of controls for the protection of the environment during excavation, temporary storage and transport of spoil, and identification of appropriate management options including all relevant permits and approvals.

7. References

EPA Victoria. 2015. Siting, design, operation and rehabilitation of landfills. Publication 788.3.

EPA Victoria. 2021. Waste Disposal Categories - Characteristics and Thresholds Publication 1828.2.

EPA Victoria. 2009a. Acid Sulfate Soil and Rock. Publication 655.1.

EPA Victoria. 2009b. Soil Sampling - IWRG Publication 702: Industrial Waste Resource Guidelines.

Standards Australia. 2009. Piling-design and installation (AS2159-2009).

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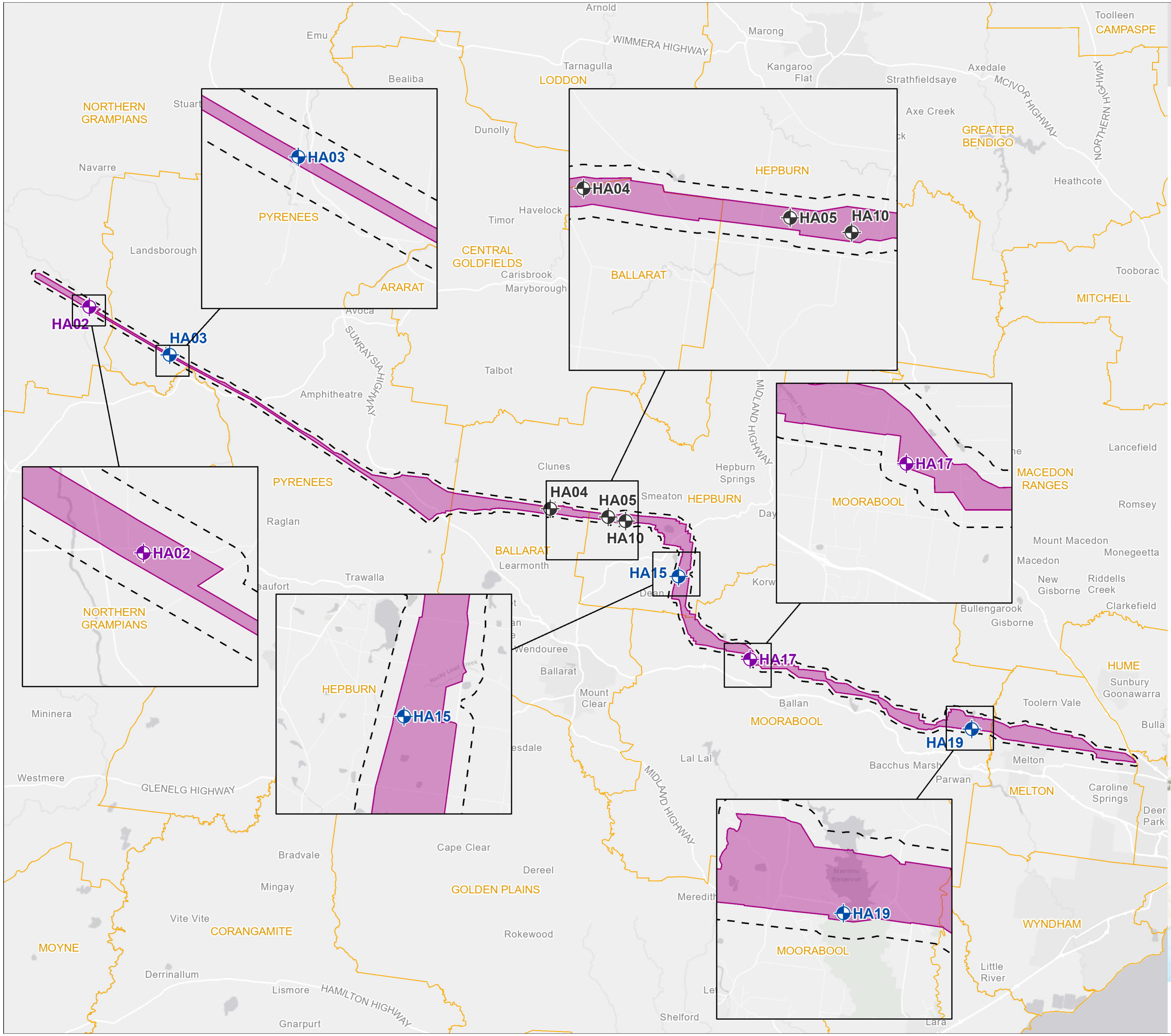
Appendix A. Figures

Figure A.1 - Soil Sampling Locations (18 and 19 August 2021)

WVTNP



▨ Project corridor

⌗ 500m Buffer

☐ Local Government Area

⊕ Hand auger soil sampling location – gold mining

⊕ Hand auger soil sampling location – potential acid sulfate soil

⊕ Hand auger soil sampling location – spatial coverage

IS311800

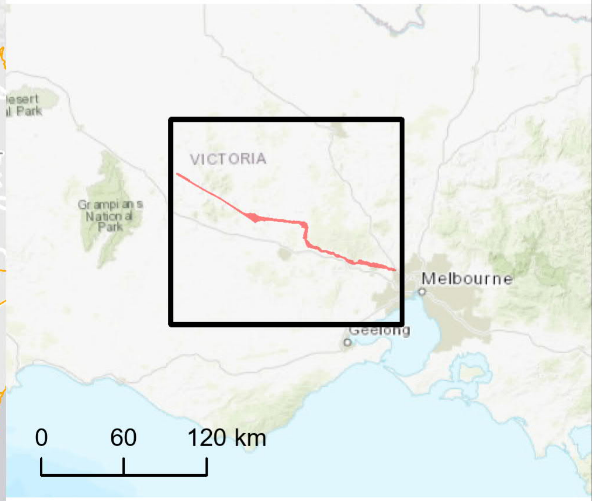
WVTNP_WR436_CL8_SoilSamplingLocations
Created 19 October 2021 by HERNANPD

N

0 10 20
Kilometres

GDA2020 Vicgrid

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) Geodata Topo 250k Series 3; Vicmap Data © State of Victoria; Jacobs.
Esri, HERE, Garmin, USGS, Vicmap, Esri, HERE, Garmin, USGS, Esri, HERE, Garmin, FAO, NOAA, USGS



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Appendix B. Photo Log

ORIENTATION South-east	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
CONTENT JG/BG	DATE 19 August 2021	PLATE NUMBER Plate 1
CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA02 located at Joel Joel Road, Shays Flat. Broad acre sheep grazing paddock, existing transmission line towers visible in background of image (left) and typical silty sand with trace clay observed during hand augering (right).

ORIENTATION South	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
CONTENT JG/BG	DATE 19 August 2021	PLATE NUMBER Plate 2
CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA03 at Boatmans Road, Glenlofty. Roadside adjacent to Glenlofty Creek (left) and typical clay observed during hand augering (right).

Jacobs	ORIENTATION North-east	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
	CONTENT JG/BG	DATE 19 August 2021	PLATE NUMBER Plate 3
	CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA04 at Ballarat-Maryborough Road, Tourello. Broad acre sheep grazing paddock (left) and typical clay observed at different depths from surface during hand augerung (right)

Jacobs	ORIENTATION South	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
	CONTENT JG/BG	DATE 18 August 2021	PLATE NUMBER Plate 4
	CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA05 at Charlesons Road, Allendale. Mine tailings mound (background) and broad acre sheep grazing paddock (foreground) (left) and typical silt observed during hand augering (right).

ORIENTATION North	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
CONTENT JG/BG	DATE 18 August 2021	PLATE NUMBER Plate 5
CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA10 at Lone Hand Road, Allendale. Gold mining spoil mounds and quartz cobbles (left) and typical gravelly sand observed during hand augering (right).

ORIENTATION West & south	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
CONTENT JG/BG	DATE 18 August 2021	PLATE NUMBER Plate 6
CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA15 at Long Swamp Road, Dean. Long Swamp Road and broad acre grazing paddock (left) and nearby Pinchgut Creek (right).

Jacobs	ORIENTATION North-west	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
	CONTENT JG/BG	DATE 18 August 2021	PLATE NUMBER Plate 7
	CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA17 at Callaghans Lane, Gordon. Roadside along Callaghans Lane and broad acre grazing paddock (left). Typical clay observed during hand augering (right).

Jacobs	ORIENTATION South-west	PROJECT CODE IS311800	PROJECT NAME Western Victoria Transmission Network Project
	CONTENT JG/BG	DATE 18 August 2021	PLATE NUMBER Plate 8
	CHECKED JG	CLIENT AusNet Services	DESCRIPTION HA19 at Quarry Road, Coimadai. Site setting along Quarry Road, Merrimu (left) and typical silty clay observed during hand augering prior to refusal in clay and gravel (right).

Appendix C. Hand Auger Logs

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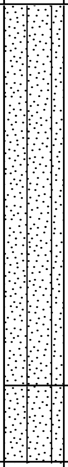
BOREHOLE ID HA02

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	683437.909, 5895121.582
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	19 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger		
CHECKED BY		**TOTAL DEPTH (m)**	0.6		
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	Sample ID	PID	Water	Well Installation Details	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
		0.0				Silty SAND, brown, fine grained, poorly graded, subrounded, trace clay	M	L	No staining, No odour
0.1	HA02_0.1 QC01_2021081								
0.2									
0.3									
0.4		0.0							Decrease in moisture
0.5	HA02_0.5					Clayey silty SAND, orange brown, fine grained, poorly graded, subrounded	D	MD	No staining, No odour
0.6						Termination Depth at: 0.6 m. Auger refusal			
0.7									
0.8									
0.9									
1									
1.1									
1.2									
1.3									
1.4									

FIELD DATA ABBREVIATIONS

PID	Photo Ionisation Detector (ppm)
QA/QC	Quality Assurance/Quality Control

GROUNDWATER SYMBOLS

▼	Water level (static)
▽	Water level (drilling)

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
SM	Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10-20
MD	(medium dense)	20-30
D	(dense)	30-50
VD	(very dense)	>50
CO	(compact)	50/150mm

CONSISTENCY (Su)

VS	(very soft)	<12 kPa
S	(soft)	12-25
F	(firm)	25-50
St	(stiff)	50-100
VSt	(very stiff)	100-200
H	(hard)	>200 kPa

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BOREHOLE ID HA03

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	694704.971, 5887755.969
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	19 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger		
CHECKED BY		**TOTAL DEPTH (m)**	1.1		
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	Sample ID	PID	Water	Well Installation Details	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
0.0		0.0			▨	CLAY, dark brown, low plasticity, with fine sand, trace fine gravel, Alluvium	SM	S	No staining, No odour, Subrounded quartz gravels
0.1	HA03_0.1				▨	CLAY, orange brown, low plasticity, with fine sand, Alluvium	D	F	No staining, No odour
0.2					▨				
0.3					▨				
0.4		0.0			▨				
0.5					▨	CLAY, dark orange brown, medium plasticity, with fine sand, Alluvium	M	F	No staining, No odour
0.6					▨				
0.7					▨	CLAY, pale brown, medium plasticity, trace fine sand, trace coarse sand, Alluvium	M	St	No staining, No odour
0.8					▨				
0.9		0.0			▨				
1	HA03_1.0		▽		▨				
1.1						Termination Depth at: 1.1 m. Target depth			
1.2									
1.3									
1.4									

FIELD DATA ABBREVIATIONS

PID	Photo Ionisation Detector (ppm)
QA/QC	Quality Assurance/Quality Control

GROUNDWATER SYMBOLS

▼	Water level (static)
▽	Water level (drilling)

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
SM	Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10-20
MD	(medium dense)	20-30
D	(dense)	30-50
VD	(very dense)	>50
CO	(compact)	50/150mm

CONSISTENCY (Su)

VS	(very soft)	<12 kPa
S	(soft)	12-25
F	(firm)	25-50
St	(stiff)	50-100
VSt	(very stiff)	100-200
H	(hard)	>200 kPa

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BOREHOLE ID HA04

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	748484.12, 5863323.04
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	19 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger		
CHECKED BY		**TOTAL DEPTH (m)**	0.9		
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	Sample ID	PID	Water	Well Installation Details	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
		0.0			▨	Silty CLAY, brown, low plasticity	SM	S	No staining, No odour
0.1	HA04_0.1								
					▨	CLAY, brown with red orange mottling, high plasticity	D	St	No staining, No odour
0.2									
0.3									
0.4		0.0							
0.5									
0.6					▨	CLAY, pale brown with red orange mottling, high plasticity, trace fine to medium gravel	D	VSt	No staining, No odour, Sub-rounded gravels
0.7									
0.8									
	HA04_0.88								
0.9						Termination Depth at: 0.9 m. Auger refusal			
1									
1.1									
1.2									
1.3									
1.4									

FIELD DATA ABBREVIATIONS

PID	Photo Ionisation Detector (ppm)
QA/QC	Quality Assurance/Quality Control

GROUNDWATER SYMBOLS

▼	Water level (static)
▽	Water level (drilling)

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
SM	Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10-20
MD	(medium dense)	20-30
D	(dense)	30-50
VD	(very dense)	>50
CO	(compact)	50/150mm

CONSISTENCY (Su)

VS	(very soft)	<12 kPa
S	(soft)	12-25
F	(firm)	25-50
St	(stiff)	50-100
VSt	(very stiff)	100-200
H	(hard)	>200 kPa

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BOREHOLE ID HA05

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	756770.398, 5861793.509
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	18 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger		
CHECKED BY		**TOTAL DEPTH (m)**	1.0		
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	Sample ID	PID	Water	Well Installation Details	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
0.1 0.2 0.3	HA05_0.1				▨	FILL: SILT, pale yellow, no plasticity	D	S	No staining, No odour
0.4 0.5					▨	FILL: SILT, brown with pink red mottling, no plasticity	D	S	No staining, No odour
0.6 0.7					▨	FILL: SILT, pale brown grey, no plasticity	D	S	No staining, No odour
0.8 0.9 1	HA05_1.0				▨	FILL: SILT, pale white grey, no plasticity, trace fine gravel	D	S	No staining, No odour, Red mottling from 0.75
1.1 1.2 1.3 1.4						Termination Depth at: 1.0 m. Target depth			

FIELD DATA ABBREVIATIONS

PID	Photo Ionisation Detector (ppm)
QA/QC	Quality Assurance/Quality Control

GROUNDWATER SYMBOLS

▼	Water level (static)
▽	Water level (drilling)

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
SM	Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10-20
MD	(medium dense)	20-30
D	(dense)	30-50
VD	(very dense)	>50
CO	(compact)	50/150mm

CONSISTENCY (Su)

VS	(very soft)	<12 kPa
S	(soft)	12-25
F	(firm)	25-50
St	(stiff)	50-100
VSt	(very stiff)	100-200
H	(hard)	>200 kPa

Disclaimer This log is intended for environmental not geotechnical purposes.

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BOREHOLE ID HA10

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	759220.591, 5861093.023
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	18 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger		
CHECKED BY		**TOTAL DEPTH (m)**	0.3		
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	Sample ID	PID	Water	Well Installation Details	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
0 – 0.3	HA10_0.1 (0.1)				▨	FILL: Gravelly SAND, brown, fine and coarse grained, angular	D	MD	No staining, No odour, Quartz gravels
0.3						Termination Depth at: 0.3 m. Auger refusal			
0.4									
0.5									
0.6									
0.7									
0.8									
0.9									
1									
1.1									
1.2									
1.3									
1.4									

FIELD DATA ABBREVIATIONS

PID	Photo Ionisation Detector (ppm)
QA/QC	Quality Assurance/Quality Control

GROUNDWATER SYMBOLS

▼	Water level (static)
▽	Water level (drilling)

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
SM	Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10-20
MD	(medium dense)	20-30
D	(dense)	30-50
VD	(very dense)	>50
CO	(compact)	50/150mm

CONSISTENCY (Su)

VS	(very soft)	<12 kPa
S	(soft)	12-25
F	(firm)	25-50
St	(stiff)	50-100
VSt	(very stiff)	100-200
H	(hard)	>200 kPa

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BOREHOLE ID HA15

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	766551.208, 5852803.828
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	18 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger		
CHECKED BY		**TOTAL DEPTH (m)**	1.0		
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	**Sample ID**	**PID**	**Water**	**Well Installation Details**	**Graphic Log**	**Material Description**	**Moisture**	**Consistency**	**Additional Observations**
0.1 0.2	HA15_0.1				▨	Gravelly CLAY, red brown, low plasticity	M	S	No staining, No odour, Fine rounded white gravels
0.3 0.4 0.5 0.6					▨	Gravelly CLAY, brown red with orange mottling, medium plasticity, some fine sand	SM	S	No staining, No odour, Angular sands and gravels
0.7 0.8 0.9	HA15_1.0		∇		▨	CLAY, dark grey with yellow mottling, high plasticity	SM	St	No staining, No odour, Trace black organic matter
1 1.1 1.2 1.3 1.4						Termination Depth at: 1.0 m. Target depth			

FIELD DATA ABBREVIATIONS		**MOISTURE CONDITION**		**DENSITY (N-value)**			**CONSISTENCY (Su)**		
PID	Photo Ionisation Detector (ppm)	**D**	Dry	**VL**	(very loose)	<10	**VS**	(very soft)	<12 kPa
QA/QC	Quality Assurance/Quality Control	**M**	Moist	**L**	(loose)	10-20	**S**	(soft)	12-25
		W	Wet	**MD**	(medium dense)	20-30	**F**	(firm)	25-50
GROUNDWATER SYMBOLS		**SM**	Slightly Moist	**D**	(dense)	30-50	**St**	(stiff)	50-100
▼	Water level (static)			**VD**	(very dense)	>50	**VSt**	(very stiff)	100-200
∇	Water level (drilling)			**CO**	(compact)	50/150mm	**H**	(hard)	>200 kPa

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BOREHOLE ID HA17

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	776350.020, 5840430.724
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	18 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger		
CHECKED BY		**TOTAL DEPTH (m)**	1.1		
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	Sample ID	PID	Water	Well Installation Details	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
		0.0			▨	CLAY, brown, low plasticity, trace sand	SM	S	No staining, No odour, Red brown mottling at 0.1m
0.1	HA17_0.1				▨				Quartz cobble
0.2					▨				
0.3	HA17_0.3				▨	CLAY, grey brown, high plasticity	SM	F	No staining, No odour
0.4		0.0			▨				
0.5	HA17_0.5		▽		▨	CLAY, pale brown with yellow mottling, high plasticity	W	St	No staining, No odour
0.6					▨				
0.7					▨				
0.8					▨	CLAY, brown orange, high plasticity, trace silt	M	St	Iron oxide staining, No odour
0.9		0.0			▨				
1					▨				
1.1						Termination Depth at: 1.1 m. Target depth			
1.2									
1.3									
1.4									

FIELD DATA ABBREVIATIONS

PID	Photo Ionisation Detector (ppm)
QA/QC	Quality Assurance/Quality Control

GROUNDWATER SYMBOLS

▼	Water level (static)
▽	Water level (drilling)

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
SM	Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10-20
MD	(medium dense)	20-30
D	(dense)	30-50
VD	(very dense)	>50
CO	(compact)	50/150mm

CONSISTENCY (Su)

VS	(very soft)	<12 kPa
S	(soft)	12-25
F	(firm)	25-50
St	(stiff)	50-100
VSt	(very stiff)	100-200
H	(hard)	>200 kPa

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BOREHOLE ID HA19

PROJECT NUMBER	IS311800	**DRILLING COMPANY**	N/A	**COORDINATES**	807844.489, 5829087.768
PROJECT NAME	Western Victoria Transmiss	**DRILLER**	N/A	**COORD SYS**	GDA2020_MGA_zone_54
DRILLING DATE	18 Aug 2021	**DRILL RIG**	N/A	**RL (mAHD)**	
LOGGED BY	BG	**DRILLING METHOD**	Hand Auger	**WELL ID**	
CHECKED BY		**TOTAL DEPTH (m)**	0.5	**WELL TOC (mAHD)**	
		DIAMETER (mm)	60		

COMMENTS

Depth (m)	Sample ID	PID	Water	Well Installation Details	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
		0.0			⁘	Silty gravelly SAND, pale brown to brown, fine grained, subangular	D-SM	L	No staining, No odour, Fine white angular gravels
0.1	HA19_0.1								
									Trace rounded coarse gravels
0.2									
0.3		0.0							Trace red brown clay
					▨	Silty CLAY, red brown, low plasticity, trace fine gravel, and	D	St	No staining, No odour
0.4	HA19_0.4								
0.5						Termination Depth at: 0.5 m. Refusal in clay and gravel			
0.6									
0.7									
0.8									
0.9									
1									
1.1									
1.2									
1.3									
1.4									

FIELD DATA ABBREVIATIONS

PID	Photo Ionisation Detector (ppm)
QA/QC	Quality Assurance/Quality Control

GROUNDWATER SYMBOLS

▼	Water level (static)
▽	Water level (drilling)

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
SM	Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10-20
MD	(medium dense)	20-30
D	(dense)	30-50
VD	(very dense)	>50
CO	(compact)	50/150mm

CONSISTENCY (Su)

VS	(very soft)	<12 kPa
S	(soft)	12-25
F	(firm)	25-50
St	(stiff)	50-100
VSt	(very stiff)	100-200
H	(hard)	>200 kPa

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Appendix D. Laboratory Data Tables

Data Table 1. Soil data screened against criteria (Ecological)

	Exposure Classification				Metals													
	Concrete Piles Soil Condition A	Concrete Piles Soil Condition B	Steel Piles Soil Condition A	Steel Piles Soil Condition B	Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury
	-	-	-	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					20	5	2	1	10	0.4	0.5	2	2	5	20	5	5	0.1
CCME Soil Quality Guidelines 2021 (Commercial)						40		8		22	1.4	87	300					24
CCME Soil Quality Guidelines 2021 (Industrial)						40		8		22	1.4	87	300					50
CCME Soil Quality Guidelines 2021 (Res/parkland)						20		4		10	0.4	64	50					6.6
PFAS NEMP 2020 Table 3 Ecological direct exposure																		
PFAS NEMP 2020 Table 3 Ecological indirect exposure																		
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)							100$^{\#2}$					450$^{\#11}$		40$^{\#3}$		1,100$^{\#4}$		
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)							160$^{\#2}$					750$^{\#11}$		50$^{\#3}$		1,800$^{\#4}$		
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																		
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																		

Location Code	Field ID	Depth	Date	Soil Description	Soil Origin	Geological Unit	Lab Report Number	Concrete Piles Soil Condition A	Concrete Piles Soil Condition B	Steel Piles Soil Condition A	Steel Piles Soil Condition B	Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	Natural	Sedimentary	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	3,900	<5	<5	<1	<50	<1	-	10	<2	<5	6,510	5	62	<0.1
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	Natural	Sedimentary	EM2116590	-	-	-	-	4,030	<5	<5	<1	<50	<1	-	10	<2	<5	6,860	6	93	<0.1
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	Natural	Sedimentary	818783	-	-	-	-	4,300	<10	<2	<2	<10	<0.4	-	12	<5	<5	8,400	8.0	95	<0.1
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	Natural	Sedimentary	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	14,300	<5	<5	<1	<50	<1	-	32	6	10	29,500	18	54	<0.1
HA03	HA03_0.1	0.1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	5,930	<5	<5	<1	<50	<1	-	13	16	7	11,500	12	1,080	<0.1
HA03	QA03_20210819	0.1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	-	-	-	-	6,260	<5	<5	<1	<50	<1	-	13	6	8	11,700	13	414	<0.1
HA03	QC04_20210819	0.1	19/08/2021	CLAY	Natural	Alluvium	818783	-	-	-	-	6,600	<10	2.4	<2	14	<0.4	-	14	9.1	9.8	12,000	15	510	<0.1
HA03	HA03_1.0	1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#7}$	1$^{\#8}$	10,600	<5	<5	<1	<50	<1	-	21	7	12	21,400	15	206	<0.1
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	Natural	Newer Volcanics	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	19,200	<5	6	<1	<50	<1	-	34	6	7	33,800	12	106	<0.1
HA04	HA04_0.88	0.88	18/08/2021	CLAY	Natural	Newer Volcanics	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	24,700	<5	14	3	<50	<5$^{\#9}$	-	58	26	18	68,100	34	108	<0.1
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	Mining Spoil	Newer Volcanics	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#10}$	1$^{\#7}$	1,750	7	<5	<1	<50	<1	-	10	8	9	8,560	21	71	<0.1
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	Mining Spoil	Newer Volcanics	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#10}$	1$^{\#7}$	1,980	<5	<5	<1	<50	<1	-	8	<2	<5	4,330	8	10	<0.1
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	Mining Spoil	Newer Volcanics	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	-	-	12	-	-	<1	<0.5	-	-	61	-	5	-	<0.1
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	Natural	Alluvium	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	16,700	<5	<5	<1	<50	<1	-	45	8	9	45,300	8	218	<0.1
HA15	HA15_1.0	1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	15,800	<5	<5	<1	<50	<1	-	25	9	<5	21,900	14	26	<0.1
HA17	HA17_0.1	0.1	18/08/2021	CLAY	Natural	Colluvium	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	7,150	<5	7	<1	<50	<1	-	11	<2	<5	17,200	10	81	<0.1
HA17	HA17_0.3	0.3	20/08/2021	CLAY	Natural	Colluvium	EM2116590	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	Natural	Colluvium	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	15,800	<5	<5	<1	<50	<1	-	17	<2	<5	22,300	10	13	<0.1
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	Natural	Sedimentary	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	2,700	<5	<5	<1	<50	<1	-	14	2	<5	8,230	<5	59	<0.1
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	Natural	Sedimentary	EM2116590	1$^{\#7}$	1$^{\#8}$	1$^{\#8}$	1$^{\#8}$	5,160	<5	<5	<1	<50	<1	-	12	2	<5	12,600	5	49	<0.1

Statistics

	Concrete Piles Soil Condition A	Concrete Piles Soil Condition B	Steel Piles Soil Condition A	Steel Piles Soil Condition B	Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury
Number of Results	15	15	15	15	18	18	19	18	18	19	1	18	18	19	18	19	18	19
Number of Detects	15	15	15	15	18	1	5	1	1	0	0	18	12	10	18	18	18	0
Minimum Concentration	1	1	1	1	1,750	<5	<2	<1	<10	<0.4	<0.5	8	2	<5	4,330	5	10	<0.1
Minimum Detect	1	1	1	1	1,750	7	2.4	3	14	ND	ND	8	2	7	4,330	5	10	ND
Maximum Concentration	1	1	1	1	24,700	<10	14	3	<50	<5	<0.5	58	26	61	68,100	34	1,080	<0.1
Maximum Detect	1	1	1	1	24,700	7	14	3	14	ND	ND	58	26	61	68,100	34	1,080	ND

Comments

#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%=0.651, VIC, Low Traffic, Aged
#4 Refer Table 1B(4)
#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffic, Aged
#6 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, Fe%=0.651, VIC, Low Traffic, Aged
#7 Mild
#8 Non Aggressive
#9 Reported Analyte LOR is higher than Requested Analyte LOR
#10 Moderate
#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Aged

Environmental Standards

Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Commercial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Industrial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Res/parkland)
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

Data Table 1. Soil data screened against criteria (Ecological)

												Inorganics													Resistivity (Saturated Paste)	Physiochemic		
					Molybdenum	Nickel	Selenium	Silver	Tin	Vanadium	Zinc	Nitrite + Nitrate as N (soluble)	Ammonia as N	Chloride	Cyanide Total	Electrical conductivity (lab)	Fluoride	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Phosphorus	Sulfate as SO4 2- (filtered)	Total Organic Carbon	Resistivity	Moisture Content	Moisture Content (dried @ 103°C)	pH (Lab)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	uS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	% Carbon	ohm cm	%	%	pH Units
EQL					2	2	2	2	5	5	5	0.1	20	10	1	1	40	20	0.1	0.1	20	2	10	0.5		0.1	1	0.1
CCME Soil Quality Guidelines 2021 (Commercial)					40		2.9	40	300	130					8	400,000	2,000											
CCME Soil Quality Guidelines 2021 (Industrial)					40		2.9	40	300	130					8	400,000	2,000											
CCME Soil Quality Guidelines 2021 (Res/parkland)					10		1	20	50	130					0.9	200,000	400											
PFAS NEMP 2020 Table 3 Ecological direct exposure																												
PFAS NEMP 2020 Table 3 Ecological indirect exposure																												
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)						15[#5]					100[#6]																	
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)						25[#5]					140[#6]																	
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																												
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																												
Location Code	Field ID	Depth	Date	Soil Description																								
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<2	2	<5	<2	<5	11	<5	0.5	<20	<10	-	20	-	1,140	0.5	<0.1	1,140	276	<10	1.8	50,000	12.3	-	
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<2	3	<5	<2	<5	11	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<5	<5	<2	<2	<10	14	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<2	11	<5	<2	<5	36	9	1.8	<20	260	-	146	-	300	1.8	<0.1	300	158	40	<0.5	6,850	11.0	-	
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<2	11	<5	<2	<5	12	23	0.2	<20	<10	-	30	-	1,800	0.2	<0.1	1,800	266	<10	2.5	33,300	26.9	-	6.9
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<2	9	<5	<2	<5	12	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.2	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<5	11	<2	<2	<10	13	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<2	18	<5	<2	<5	16	23	-	-	440	-	318	-	-	-	-	-	-	40	<0.5	3,140	20.5	-	7.4
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<2	7	<5	<2	<5	87	7	0.6	<20	20	-	25	-	1,900	0.6	<0.1	1,900	366	10	2.0	40,000	21.2	-	
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<2	28	<5	<2	<5	170	8	-	-	10	-	60	-	-	-	-	-	-	60	<0.5	16,700	20.1	-	6.3
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<2	6	<5	<2	<5	8	16	-	-	780	-	967	-	-	-	-	-	-	640	-	1,030	7.6	-	
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<2	<2	<5	<2	<5	8	7	-	-	860	-	725	-	-	-	-	-	-	640	-	1,380	12.8	-	
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<2	10	<5	<2	<5	-	46	-	-	<10	<1	17	170	-	-	-	-	-	20	-	58,800	5.8	-	
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<2	18	<5	<2	<5	65	25	-	-	<10	-	177	-	-	-	-	-	-	<10	-	5,650	22.6	-	6.6
HA15	HA15_1.0	1	18/08/2021	CLAY	<2	9	<5	<2	<5	34	15	-	-	<10	-	16	-	-	-	-	-	-	<10	-	62,500	22.0	-	6.6
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<2	4	<5	<2	<5	26	10	-	-	<10	-	12	-	-	-	-	-	-	<10	1.4	83,300	17.7	-	6.3
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<2	4	<5	<2	<5	50	<5	-	-	<10	-	20	-	-	-	-	-	-	<10	0.5	50,000	18.9	-	6.2
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<2	3	<5	<2	<5	27	8	-	-	<10	-	11	-	-	-	-	-	-	<10	-	90,900	1.7	-	6.7
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<2	5	<5	<2	<5	22	8	-	-	40	-	68	-	-	-	-	-	-	20	-	14,700	6.3	-	7.3

Statistics

Number of Results	19	19	19	19	19	18	19	4	4	15	1	15	1	4	4	4	4	4	15	8	15	17	2	15
Number of Detects	0	17	0	0	0	18	16	4	0	7	0	15	1	4	4	0	4	4	8	5	15	17	2	15
Minimum Concentration	<2	2	<2	<2	<5	8	<5	0.2	<20	10	<1	11	170	300	0.2	<0.1	300	158	10	0.5	1,030	1.7	13	5.2
Minimum Detect	ND	2	ND	ND	ND	8	7	0.2	ND	10	ND	11	170	300	0.2	ND	300	158	10	0.5	1,030	1.7	13	5.2
Maximum Concentration	<5	28	<5	<2	<10	170	46	1.8	<20	860	<1	967	170	1,900	1.8	<0.1	1,900	366	640	2.5	90,900	26.9	23	8.1
Maximum Detect	ND	28	ND	ND	ND	170	46	1.8	ND	860	ND	967	170	1,900	1.8	ND	1,900	366	640	2.5	90,900	26.9	23	8.1

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
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#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffi
#6 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, Fe%=0.651, VI
#7 Mild
#8 Non Aggressive
#9 Reported Analyte LOR is higher than Requested Analyte LOR
#10 Moderate
#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Commercial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Industrial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Res/parkland)
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

Data Table 1. Soil data screened against criteria (Ecological)

					al parameters			TRH - NEPM 2013 Fractions							TPH - NEPM 1999 Fractions					Polycyclic aro									
					pH (CaCl2)	Organic Matter	Density	TRH >C6 - C10	TRH >C10 - C16	TRH >C16 - C34	TRH >C34 - C40	TRH >C10 - C40 (Sum of total)	TRH >C6 - C10 less BTEX (F1)	TRH >C10 - C16 less Naphthalene (F2)	TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	TPH C10 - C36 (Sum of total)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(b+j+k)fluoranthene	Benzo(k)fluoranthene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(a) pyrene	Benzo(a)pyrene TEQ calc (Half)
					pH Units	%	g/cm3	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.1	0.5	0.01	10	50	100	100	50	10	50	10	20	50	50	50	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5
CCME Soil Quality Guidelines 2021 (Commercial)																						32	10		10				
CCME Soil Quality Guidelines 2021 (Industrial)																						32	10		10				
CCME Soil Quality Guidelines 2021 (Res/parkland)																						2.5	1		1				
PFAS NEMP 2020 Table 3 Ecological direct exposure																													
PFAS NEMP 2020 Table 3 Ecological indirect exposure																													
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)																													
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space										300	2,800		180	120														0.7	
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial										1,700	3,300		215	170														1.4	
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND		3.1	2.45	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	<20	<50	<100	<100	<100	<20	<50	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND		<0.5	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA03	HA03_0.1	0.1	18/08/2021	CLAY	6.0	4.4	2.65	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	<20	<50	<100	<100	<100	<20	<50	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA03	HA03_1.0	1	18/08/2021	CLAY	7.0	<0.5	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY		3.4	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA04	HA04_0.88	0.88	18/08/2021	CLAY		0.8	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND		-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<1.0	-	-	<0.5	<0.5	0.6
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA15	HA15_1.0	1	18/08/2021	CLAY	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA17	HA17_0.1	0.1	18/08/2021	CLAY		2.5	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY		0.9	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6
Statistics																													
Number of Results					9	8	2	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	1	18	18	19	19	19
Number of Detects					9	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
Minimum Concentration					4.3	<0.5	2.45	<10	<50	<100	<100	<50	<10	<50	<10	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.6
Minimum Detect					4.3	0.8	2.45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6
Maximum Concentration					7	4.4	2.65	<20	<50	<100	<100	<100	<20	<50	<20	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.6
Maximum Detect					7	4.4	2.65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
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#9 Reported Analyte LOR is higher than Requested Analyte LOR
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#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
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NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
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NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

Data Table 1. Soil data screened against criteria (Ecological)

					matic hydrocarbons (PAHs)											Monocyclic Aromatic Hydrocarbons (MAHs)													
					Benzo(a)pyrene TEQ calc (zero)	Benzo(a)pyrene TEQ calc(PQL)	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	PAHs (Sum of total)	PAHs (Vic EPA List)	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	tert-butylbenzene	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.2	0.1	0.3
CCME Soil Quality Guidelines 2021 (Commercial)								10	180		10	50	100																
CCME Soil Quality Guidelines 2021 (Industrial)								10	180		10	50	100																
CCME Soil Quality Guidelines 2021 (Res/parkland)								1	50		1	5	10																
PFAS NEMP 2020 Table 3 Ecological direct exposure																													
PFAS NEMP 2020 Table 3 Ecological indirect exposure																													
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)																													
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																								50	85	70			105
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																								75	135	165			180
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5

Statistics

Number of Results	19	19	19	19	19	19	19	19	19	18	1	18	18	18	16	16	16	16	16	19	19	19	19	19	19
Number of Detects	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
Minimum Detect	ND	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect	ND	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
#4 Refer Table 1B(4)
#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffi
#6 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, Fe%=0.651, VI
#7 Mild
#8 Non Aggressive
#9 Reported Analyte LOR is higher than Requested Analyte LOR
#10 Moderate
#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Commercial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Industrial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Res/parkland)
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

Data Table 1. Soil data screened against criteria (Ecological)

									Polychlorinated Biphenyls (PCBs)								Orga											
					Naphthalene	Total BTEX	Total MAH	Total MAHs (Lab Reported)	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	Organochlorine Pesticides (Lab Reported)	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
EQL					0.5	0.2	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.03	0.05	30	0.03	0.05	30	30	30	30	30	50	50
CCME Soil Quality Guidelines 2021 (Commercial)																33												12,000
CCME Soil Quality Guidelines 2021 (Industrial)																33												12,000
CCME Soil Quality Guidelines 2021 (Res/parkland)																1.3												700
PFAS NEMP 2020 Table 3 Ecological direct exposure																												
PFAS NEMP 2020 Table 3 Ecological indirect exposure																												
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)					170[#2]																							180,000[#2]
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)					370[#2]																							640,000[#2]
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																												
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																												
Location Code	Field ID	Depth	Date	Soil Description																								
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	-	<0.5	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<50	<0.05	<0.05	<50	<100	-	-	<50	<50	<50
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.5	-	-	<0.2	-	-	-	-	-	-	-	<0.1	<0.03	<0.05	<30	<0.03	-	<30	<30	<30	<30	<30	<50	<50
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200

Statistics

Number of Results	19	16	2	1	1	1	1	1	1	1	1	15	2	15	15	15	14	15	15	14	14	15	15	15
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.2	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.03	<0.05	<30	<0.03	<0.05	<30	<30	<30	<30	<30	<50	<50
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.2	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<50	<0.05	<0.05	<50	<100	<50	<50	<50	<50	<200
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
#4 Refer Table 1B(4)
#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffi
#6 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, Fe%=0.651, VI
#7 Mild
#8 Non Aggressive
#9 Reported Analyte LOR is higher than Requested Analyte LOR
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#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
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HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

Data Table 1. Soil data screened against criteria (Ecological)

					nochlorine Pesticides (OCPs)																								
					DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene	Azinophos methyl	Bolstar (Sulprofos)	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O	Demeton-S	Demeton-S-methyl
					µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					50	30	50	30	30	30	30	30	50	30	30	30	30	0.5	0.05	0.2	0.05	0.05	0.05	0.05	0.05	2	0.2	0.2	0.05
CCME Soil Quality Guidelines 2021 (Commercial)																													
CCME Soil Quality Guidelines 2021 (Industrial)																													
CCME Soil Quality Guidelines 2021 (Res/parkland)																													
PFAS NEMP 2020 Table 3 Ecological direct exposure																													
PFAS NEMP 2020 Table 3 Ecological indirect exposure																													
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)																													
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<50	<50	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.5	<0.2	<0.2	-	-	<0.2	<0.2	<0.2	<2	<0.2	<0.2	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	<30	-	<30	<30	<30	<30	<30	-	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA15	HA15_1.0	1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05

Statistics

Number of Results	14	15	13	15	15	15	15	15	14	15	15	15	15	1	14	1	13	13	14	14	14	1	1	1	13
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<50	<30	<50	<30	<30	<30	<30	<30	<50	<30	<30	<30	<30	<0.5	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<2	<0.2	<0.2	<0.05
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<0.5	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.05
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
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#7 Mild
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#9 Reported Analyte LOR is higher than Requested Analyte LOR
#10 Moderate
#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Commercial)
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NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

					Organophosphorous Pesticides (OPPs)																								
					Diazinon	Dichlorvos	Dimethoate	Disulfoton	EPN	Ethion	Ethoprop	Fenamiphos	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Naled (Dibrom)	Omethoate	Parathion	Phorate	Pirimiphos-methyl	Pirimphos-ethyl	Prothiofos	Pyrazophos	Ronnel
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.05	0.05	0.2	0.2	0.05	0.2	0.05	0.2	0.2	0.05	0.05	0.2	0.2	0.2	0.2	0.2	2	0.2	0.2	0.2	0.05	0.05	0.2	0.2
CCME Soil Quality Guidelines 2021 (Commercial)																													
CCME Soil Quality Guidelines 2021 (Industrial)																													
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NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	-	-	<0.2	<0.2
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-	<0.05	<0.05	-	-

Statistics

Number of Results	14	14	14	1	1	14	1	13	1	1	14	14	1	14	1	14	1	1	14	1	1	13	13	1	1
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.2	<0.05	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
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									Chlorinated Hydrocarbons																				
					Terbufos	Tokuthion	Trichloronate	Tetrachlorvinphos	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.2	0.2	0.2	0.2	0.01	0.01	0.02	0.04	0.5	0.01	0.5	0.5	0.02	0.5	0.5	0.5	0.5	0.5	0.5	0.01	0.5	0.5	0.02	0.5	0.01
CCME Soil Quality Guidelines 2021 (Commercial)										50	50	50	50	50			50	50						50			50		
CCME Soil Quality Guidelines 2021 (Industrial)										50	50	50	50	50			50	50						50			50		
CCME Soil Quality Guidelines 2021 (Res/parkland)										5	5	5	5	5			5	5						5			5		
PFAS NEMP 2020 Table 3 Ecological direct exposure																													
PFAS NEMP 2020 Table 3 Ecological indirect exposure																													
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)																													
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NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.2	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	<0.01	<0.01	<0.02	<0.04	-	<0.01	-	-	<0.02	-	-	-	-	-	-	<0.01	-	-	<0.02	-	<0.01
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
Statistics																													
Number of Results					1	1	1	1	19	19	19	19	18	19	18	16	19	18	18	16	2	18	18	19	18	18	19	18	19
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.2	<0.2	<0.2	<0.2	<0.01	<0.01	<0.02	<0.04	<0.5	<0.01	<0.5	<0.5	<0.02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.5	<0.5	<0.02	<0.5	<0.01
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.2	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
#4 Refer Table 1B(4)
#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffi
#6 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, Fe%=0.651, VI
#7 Mild
#8 Non Aggressive
#9 Reported Analyte LOR is higher than Requested Analyte LOR
#10 Moderate
#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Commercial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Industrial)
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Res/parkland)
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

Data Table 1. Soil data screened against criteria (Ecological)

														Volatile Organic Compounds (VOCs)					Per- and Poly-fluoroalkyl Substances (PFAS)											(n:2
					cis-1,3-dichloropropene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Dibromomethane	Dichloromethane	Hexachlorobutadiene	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Vinyl chloride	1,1-dichloropropene	cis-1,4-Dichloro-2-butene	Pentachloroethane	Styrene	trans-1,4-Dichloro-2-butene	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluoro-n-pentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Sum (PFHxS + PFOS)	Sum of PFAS (WA DER List)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.02	0.5	0.5	0.4	0.02	0.02	0.02	0.02	0.5	0.5	0.5	0.5	0.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0005
CCME Soil Quality Guidelines 2021 (Commercial)									50		0.01	0.5					50												
CCME Soil Quality Guidelines 2021 (Industrial)									50		0.01	0.6					50												
CCME Soil Quality Guidelines 2021 (Res/parkland)									5		0.01	0.2					5												
PFAS NEMP 2020 Table 3 Ecological direct exposure																			1	10									
PFAS NEMP 2020 Table 3 Ecological indirect exposure																			0.01										
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)																													
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	<0.02	-	-	<0.4	<0.02	<0.02	<0.02	<0.02	-	-	-	<0.5	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005

Statistics

Number of Results	18	19	18	18	3	17	19	19	19	16	16	16	19	16	15	15	15	15	15	15	15	15	15	15	15
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.02	<0.5	<0.5	<0.4	<0.02	<0.02	<0.02	<0.02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
#4 Refer Table 1B(4)
#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffi
#6 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, Fe%=0.651, VI
#7 Mild
#8 Non Aggressive
#9 Reported Analyte LOR is higher than Requested Analyte LOR
#10 Moderate
#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
Canadian Council of Ministers of the Environment, 2021, CCME Soil Quality Guidelines 2021 (Commercial)
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HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Comm Ind Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

Data Table 1. Soil data screened against criteria (Ecological)

					) Fluorotelomer Sulfonic Acids			Halogenated Benzenes										Halogenated Hydrocarbons											
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene	Hexachlorobenzene	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Iodomethane	Trichlorofluoromethane	2,3,5,6-Tetrachlorophenol	2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,4-dichlorophenol	2,4-dimethylphenol	2,4-dinitrophenol	2,6-dichlorophenol
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0005	0.0005	0.0005	0.5	0.01	0.02	0.5	0.02	0.5	0.5	0.5	0.02	30	0.5	0.5	0.5	0.5	0.5	0.03	0.05	0.05	0.03	1	5	0.03
CCME Soil Quality Guidelines 2021 (Commercial)								10	10	10	10	10				10	10,000								5	5			
CCME Soil Quality Guidelines 2021 (Industrial)								10	10	10	10	10				10	10,000								5	5			
CCME Soil Quality Guidelines 2021 (Res/parkland)								2	2	1	1	1				1	2,000								0.5	0.5			
PFAS NEMP 2020 Table 3 Ecological direct exposure																													
PFAS NEMP 2020 Table 3 Ecological indirect exposure																													
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)																													
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<50	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.0005	<0.0005	<0.0005	-	<0.01	<0.02	-	<0.02	-	-	-	<0.02	<30	-	-	-	-	-	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	-	-	-	-	-	-	-
Statistics																													
Number of Results					15	15	15	16	17	19	18	19	16	18	18	19	15	18	18	18	18	18	1	1	1	1	1	1	1
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.0005	<0.0005	<0.0005	<0.5	<0.01	<0.02	<0.5	<0.02	<0.5	<0.5	<0.5	<0.02	<30	<0.5	<0.5	<0.5	<0.5	<0.5	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5	<5	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
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#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffi
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#9 Reported Analyte LOR is higher than Requested Analyte LOR
#10 Moderate
#11 Site derived EIL based on lowest soil physiochemical parameters, Clay%=14, %Fe=0.651, VIC, Low Traffic, Age

Environmental Standards
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NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
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NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

					Phenols														Solvents							Acid Sulfate Soils - Acid Base Accounting		Acid Sulfate Soils - Acidity Trail	
					2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-chlorophenol	2-methylphenol	2-nitrophenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-nitrophenol	3&4-Methylphenol (m&p-cresol)	Dinoseb	Pentachlorophenol	Phenol	Phenols (non-halogenated) EPAVic	Sum of Phenols (halogenated)	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Acetone	Allyl chloride	Carbon disulfide	Vinyl acetate	Net Acidity (acidity units)	Net Acidity (sulfur units)	Titratable Actual Acidity (sulfur units)	Titratable Actual Acidity
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mole H+/t	%S	%S	mole H+/t
EQL					0.05	0.03	1	1	5	5	0.03	5	1	5	0.2	1	1	0.03	0.5	5	0.5	0.5	0.5	0.5	5	10	0.02	0.02	2
CCME Soil Quality Guidelines 2021 (Commercial)															7.6														
CCME Soil Quality Guidelines 2021 (Industrial)															7.6														
CCME Soil Quality Guidelines 2021 (Res/parkland)															7.6														
PFAS NEMP 2020 Table 3 Ecological direct exposure																													
PFAS NEMP 2020 Table 3 Ecological indirect exposure																													
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)																													
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																													
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	<10	<0.02	<0.02	<2
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1	<0.03	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	19	0.03	0.02	13
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	0.04	0.03	16
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-

Statistics

Number of Results	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18	16	18	2	2	18	16	3	3	3	3
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Minimum Concentration	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1	<0.03	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<5	<10	<0.02	0.02	<2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	19	0.03	0.02	13
Maximum Concentration	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1	<0.03	<5	<5	<5	<0.5	<0.5	<0.5	<5	24	0.04	0.03	16
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	24	0.04	0.03	16

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
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#5 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, Fe%=0.651, VIC, Low Traffi
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NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

					Acid Sulfate Soils - ANC		Acid Sulfate Soils - CRS			Acid Sulfate Soils - Liming Rate		SPOCAS
					ANC Fineness Factor	Net Acidity excluding ANC (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	pH (KCl)	Liming Rate	Liming Rate excluding ANC	a-Net Acidity without ANCE_
					-	% S	%S	mole H+/t	pH units	kg CaCO3/t	kg CaCO3/t	mole H+/t
EQL					0.5	0.02	0.005	10	0.1	1	1	10
CCME Soil Quality Guidelines 2021 (Commercial)												
CCME Soil Quality Guidelines 2021 (Industrial)												
CCME Soil Quality Guidelines 2021 (Res/parkland)												
PFAS NEMP 2020 Table 3 Ecological direct exposure												
PFAS NEMP 2020 Table 3 Ecological indirect exposure												
NEPM 2013 Table 1B(1-5) EIL Urban Residential/Public Open Space (Calculated)												
NEPM 2013 Table 1B(1-5) EIL Commercial Industrial (Calculated)												
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space												
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial												
Location Code	Field ID	Depth	Date	Soil Description								
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	-	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	-	-	-	-	-	-	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	1.5	<0.02	0.008	<10	6.3	<1	<1	<10
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	-	-	-	-	-	-	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	-	-	-	-	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	1.5	0.03	0.010	<10	4.8	1	1	19
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	1.5	0.04	0.012	<10	4.7	2	2	24
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	-	-	-	-	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	-	-	-	-	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	-	-	-	-	-	-	-

Statistics

Number of Results	3	3	3	3	3	3	3	3
Number of Detects	3	2	3	0	3	2	2	2
Minimum Concentration	1.5	<0.02	0.008	<10	4.7	1	1	<10
Minimum Detect	1.5	0.03	0.008	ND	4.7	1	1	19
Maximum Concentration	1.5	0.04	0.012	<10	6.3	2	2	24
Maximum Detect	1.5	0.04	0.012	ND	6.3	2	2	24

Comments
#1 Higher Concentrations applicable in subsoil or Coarse Soil
#2 Refer Table 1B(5)
#3 Site derived EIL based on lowest soil physiochemical parameters, CEC=3.2 cmol/kg, soil pH=4.3, OC%=0.5, Fe%
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NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Commercial/Industrial

	Exposure Classification				Metals												
	Concrete Piles Soil Condition A	Concrete Piles Soil Condition B	Steel Piles Soil Condition A	Steel Piles Soil Condition B	Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese
	-	-	-	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					20	5	2	1	10	0.4	0.5	2	2	5	20	5	5
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																	
PFAS NEMP 2020 Table 2 Public open space (HIL C)																	
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																	
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																	
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																	
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																	
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																	
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																	
NEPM 2013 Table 1A(1) HIL A Soil							$100^{\#3}$	60	4,500	20	100		100	6,000		$300^{\#4}$	3,800
NEPM 2013 Table 1A(1) HIL C Soil							$300^{\#3}$	90	20,000	90	300		300	17,000		$600^{\#4}$	19,000
NEPM 2013 Table 1A(1) HIL D Soil							$3,000^{\#3}$	500	300,000	900	3,600		4,000	240,000		$1,500^{\#4}$	60,000
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																	
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																	
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																	

Location Code	Field ID	Depth	Date	Soil Description	Soil Origin	Geological Unit	Lab Report Number	Concrete Piles Soil Condition A	Concrete Piles Soil Condition B	Steel Piles Soil Condition A	Steel Piles Soil Condition B	Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	Natural	Sedimentary	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	3,900	<5	<5	<1	<50	<1	-	10	<2	<5	6,510	5	62
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	Natural	Sedimentary	EM2116590	-	-	-	-	4,030	<5	<5	<1	<50	<1	-	10	<2	<5	6,860	6	93
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	Natural	Sedimentary	818783	-	-	-	-	4,300	<10	<2	<2	<10	<0.4	-	12	<5	<5	8,400	8.0	95
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	Natural	Sedimentary	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	14,300	<5	<5	<1	<50	<1	-	32	6	10	29,500	18	54
HA03	HA03_0.1	0.1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	5,930	<5	<5	<1	<50	<1	-	13	16	7	11,500	12	1,080
HA03	QA03_20210819		18/08/2021	CLAY	Natural	Alluvium	EM2116590	-	-	-	-	6,260	<5	<5	<1	<50	<1	-	13	6	8	11,700	13	414
HA03	QC04_20210819	0.1	19/08/2021	CLAY	Natural	Alluvium	818783	-	-	-	-	6,600	<10	2.4	<2	14	<0.4	-	14	9.1	9.8	12,000	15	510
HA03	HA03_1.0	1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#10}$	$1^{\#11}$	10,600	<5	<5	<1	<50	<1	-	21	7	12	21,400	15	206
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	Natural	Newer Volcanics	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	19,200	<5	6	<1	<50	<1	-	34	6	7	33,800	12	106
HA04	HA04_0.88	0.88	18/08/2021	CLAY	Natural	Newer Volcanics	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	24,700	<5	14	3	<50	$<5^{\#12}$	-	58	26	18	68,100	34	108
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	Mining Spoil	Newer Volcanics	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#13}$	$1^{\#10}$	1,750	7	<5	<1	<50	<1	-	10	8	9	8,560	21	71
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	Mining Spoil	Newer Volcanics	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#13}$	$1^{\#10}$	1,980	<5	<5	<1	<50	<1	-	8	<2	<5	4,330	8	10
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	Mining Spoil	Newer Volcanics	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	-	-	12	-	-	<1	<0.5	-	-	61	-	5	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	Natural	Alluvium	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	16,700	<5	<5	<1	<50	<1	-	45	8	9	45,300	8	218
HA15	HA15_1.0	1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	15,800	<5	<5	<1	<50	<1	-	25	9	<5	21,900	14	26
HA17	HA17_0.1	0.1	18/08/2021	CLAY	Natural	Colluvium	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	7,150	<5	7	<1	<50	<1	-	11	<2	<5	17,200	10	81
HA17	HA17_0.3	0.3	20/08/2021	CLAY	Natural	Colluvium	EM2116590	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	Natural	Colluvium	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	15,800	<5	<5	<1	<50	<1	-	17	<2	<5	22,300	10	13
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	Natural	Sedimentary	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	2,700	<5	<5	<1	<50	<1	-	14	2	<5	8,230	<5	59
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	Natural	Sedimentary	EM2116590	$1^{\#10}$	$1^{\#11}$	$1^{\#11}$	$1^{\#11}$	5,160	<5	<5	<1	<50	<1	-	12	2	<5	12,600	5	49

Statistics

Number of Results	15	15	15	15	18	18	19	18	18	19	1	18	18	19	18	19	18
Number of Detects	15	15	15	15	18	1	5	1	1	0	0	18	12	10	18	18	18
Minimum Concentration	1	1	1	1	1,750	<5	<2	<1	<10	<0.4	<0.5	8	2	<5	4,330	5	10
Minimum Detect	1	1	1	1	1,750	7	2.4	3	14	ND	ND	8	2	7	4,330	5	10
Maximum Concentration	1	1	1	1	24,700	<10	14	3	<50	<5	<0.5	58	26	61	68,100	34	1,080
Maximum Detect	1	1	1	1	24,700	7	14	3	14	ND	ND	58	26	61	68,100	34	1,080

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (refer Shedule B7).
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific bioavailability should be considered where appropriate.
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is present, or suspected to be present.
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (should meet BaP TEQ HIL) & napthalene (should meet relevant HSL)
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposure to all PCBs (inc dioxin like PCBs) should be undertaken
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)
HEPA, January 2020, PFAS NEMP 2020 Table 2 Public open space (HIL C)
HEPA, January 2020, PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)
CRCCARE, CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand)
CRCCARE, CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker
CRCCARE, CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential
CRCCARE, CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space
CRCCARE, CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.
NEPM, April 2013, NEPM 2013 Table 1A(1) HIL A Soil
NEPM, April 2013, NEPM 2013 Table 1A(1) HIL C Soil
NEPM, April 2013, NEPM 2013 Table 1A(1) HIL D Soil
NEPM, April 2013, NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion
NEPM, April 2013, NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion
NEPM, April 2013, NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion

													Exchangeable Cations											Particle Size Analysis		
					Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Vanadium	Zinc	Exchangeable Potassium	Calcium/Magnesium Ratio	Exchangeable Magnesium	Exchangeable Magnesium Percent	Cation exchange capacity	Magnesium/Potassium Ratio	Exchangeable Calcium Percent	Exchangeable Potassium Percent	Exchangeable Calcium	Exchangeable Sodium %	Exchangeable Sodium	Clay in soils <2um	Nitrite + Nitrate as N (soluble)	Ammonia as N
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	-	meq/100g	%	meq/100g	-	%	%	meq/100g	%	meq/100g	%	mg/kg	mg/kg
EQL					0.1	2	2	2	2	5	5	5	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.1	1	0.1	20
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																										
PFAS NEMP 2020 Table 2 Public open space (HIL C)																										
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																										
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																										
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																										
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																										
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																										
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																										
NEPM 2013 Table 1A(1) HIL A Soil					40[#5]		400	200				7,400														
NEPM 2013 Table 1A(1) HIL C Soil					80[#5]		1,200	700				30,000														
NEPM 2013 Table 1A(1) HIL D Soil					730[#5]		6,000	10,000				400,000														
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																										
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																										
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																										
Location Code	Field ID	Depth	Date	Soil Description																						
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.1	<2	2	<5	<2	<5	11	<5	0.6	-	0.3	-	3.2	-	-	-	2.1	-	0.1	14	0.5	<20
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.1	<2	3	<5	<2	<5	11	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.1	<5	<5	<2	<2	<10	14	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.1	<2	11	<5	<2	<5	36	9	0.4	-	3.0	-	5.7	-	-	-	1.6	-	0.7	-	1.8	<20
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.1	<2	11	<5	<2	<5	12	23	0.3	-	3.9	-	11.2	-	-	-	6.7	-	0.2	16	0.2	<20
HA03	QA03_20210819		18/08/2021	CLAY	<0.1	<2	9	<5	<2	<5	12	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.1	<5	11	<2	<2	<10	13	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.1	<2	18	<5	<2	<5	16	23	0.2	0.5	6.7	57.9	11.6	28.7	29.8	2.0	3.5	10.2	1.2	-	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.1	<2	7	<5	<2	<5	87	7	0.3	-	3.5	-	9.9	-	-	-	5.6	-	0.5	-	0.6	<20
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.1	<2	28	<5	<2	<5	170	8	0.3	-	9.3	-	15.5	-	-	-	3.9	-	2.0	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.1	<2	6	<5	<2	<5	8	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.1	<2	<2	<5	<2	<5	8	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.1	<2	10	<5	<2	<5	-	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.1	<2	18	<5	<2	<5	65	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.1	<2	9	<5	<2	<5	34	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.1	<2	4	<5	<2	<5	26	10	0.1	-	1.7	-	4.4	-	-	-	2.4	-	0.2	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.1	<2	4	<5	<2	<5	50	<5	0.1	-	3.6	-	5.0	-	-	-	0.8	-	0.4	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.1	<2	3	<5	<2	<5	27	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.1	<2	5	<5	<2	<5	22	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistics																										
Number of Results					19	19	19	19	19	19	18	19	8	1	8	1	8	1	1	1	8	1	8	2	4	4
Number of Detects					0	0	17	0	0	0	18	16	8	1	8	1	8	1	1	1	8	1	8	2	4	0
Minimum Concentration					<0.1	<2	2	<2	<2	<5	8	<5	0.1	0.5	0.3	57.9	3.2	28.7	29.8	2	0.8	10.2	0.1	14	0.2	<20
Minimum Detect					ND	ND	2	ND	ND	ND	8	7	0.1	0.5	0.3	57.9	3.2	28.7	29.8	2	0.8	10.2	0.1	14	0.2	ND
Maximum Concentration					<0.1	<5	28	<5	<2	<10	170	46	0.6	0.5	9.3	57.9	15.5	28.7	29.8	2	6.7	10.2	2	16	1.8	<20
Maximum Detect					ND	ND	28	ND	ND	ND	170	46	0.6	0.5	9.3	57.9	15.5	28.7	29.8	2	6.7	10.2	2	16	1.8	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sh
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Data Table 2. Soil data screened against criteria (Human Health)

					Inorganics											Resistivity (Saturated Paste)	Physiochemical parameters						TRH - NEPM 20			
					Chloride	Cyanide Total	Electrical conductivity (lab)	Fluoride	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Phosphorus	Sulfate as SO4 2- (filtered)	Total Organic Carbon	Resistivity	Moisture Content	pH (Lab)	Moisture Content (dried @ 103°C)	Organic Matter	pH (CaCl2)	Density	TRH >C6 - C10	TRH >C10 - C16	TRH >C16 - C34	TRH >C34 - C40
					mg/kg	mg/kg	uS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	% Carbon	ohm cm	%	pH Units	%	%	pH Units	g/cm3	mg/kg	mg/kg	mg/kg	mg/kg
EQL					10	1	1	40	20	0.1	0.1	20	2	10	0.5		0.1	0.1	1	0.5	0.1	0.01	10	50	100	100
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																										
PFAS NEMP 2020 Table 2 Public open space (HIL C)																										
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																										
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																							#2	#2		
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																							82,000	62,000	85,000	120,000
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																							4,400	3,300	4,500	6,300
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																							5,100	3,800	5,300	7,400
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																							26,000	20,000	27,000	38,000
NEPM 2013 Table 1A(1) HIL A Soil																										
NEPM 2013 Table 1A(1) HIL C Soil																										
NEPM 2013 Table 1A(1) HIL D Soil																										
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																										
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																										
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																										
Location Code	Field ID	Depth	Date	Soil Description																						
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<10	-	20	-	1,140	0.5	<0.1	1,140	276	<10	1.8	50,000	12.3	5.8	-	3.1	4.8	2.45	<10	<50	<100	<100
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	-	-	<10	<50	<100	<100
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	<20	<50	<100	<100
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	260	-	146	-	300	1.8	<0.1	300	158	40	<0.5	6,850	11.0	5.8	-	<0.5	5.3	-	<10	<50	<100	<100
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<10	-	30	-	1,800	0.2	<0.1	1,800	266	<10	2.5	33,300	26.9	6.9	-	4.4	6.0	2.65	<10	<50	<100	<100
HA03	QA03_20210819		18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	24.2	-	-	-	-	-	<10	<50	<100	<100
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	-	<20	<50	<100	<100
HA03	HA03_1.0	1	18/08/2021	CLAY	440	-	318	-	-	-	-	-	-	40	<0.5	3,140	20.5	7.4	-	<0.5	7.0	-	<10	<50	<100	<100
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	20	-	25	-	1,900	0.6	<0.1	1,900	366	10	2.0	40,000	21.2	5.6	-	3.4	4.4	-	<10	<50	<100	<100
HA04	HA04_0.88	0.88	18/08/2021	CLAY	10	-	60	-	-	-	-	-	-	60	<0.5	16,700	20.1	6.3	-	0.8	5.3	-	<10	<50	<100	<100
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	780	-	967	-	-	-	-	-	-	640	-	1,030	7.6	5.5	-	-	-	-	<10	<50	<100	<100
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	860	-	725	-	-	-	-	-	-	640	-	1,380	12.8	8.1	-	-	-	-	<10	<50	<100	<100
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<10	<1	17	170	-	-	-	-	-	20	-	58,800	5.8	5.2	-	-	4.5	-	<10	<50	<100	<100
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<10	-	177	-	-	-	-	-	-	<10	-	5,650	22.6	6.6	-	-	-	-	<10	<50	<100	<100
HA15	HA15_1.0	1	18/08/2021	CLAY	<10	-	16	-	-	-	-	-	-	<10	-	62,500	22.0	6.6	-	-	-	-	<10	<50	<100	<100
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<10	-	12	-	-	-	-	-	-	<10	1.4	83,300	17.7	6.3	-	2.5	4.8	-	<10	<50	<100	<100
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<10	-	20	-	-	-	-	-	-	<10	0.5	50,000	18.9	6.2	-	0.9	4.3	-	<10	<50	<100	<100
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<10	-	11	-	-	-	-	-	-	<10	-	90,900	1.7	6.7	-	-	-	-	<10	<50	<100	<100
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	40	-	68	-	-	-	-	-	-	20	-	14,700	6.3	7.3	-	-	-	-	<10	<50	<100	<100

Statistics

Number of Results					15	1	15	1	4	4	4	4	4	15	8	15	17	15	2	8	9	2	19	19	19	19
Number of Detects					7	0	15	1	4	4	0	4	4	8	5	15	17	15	2	6	9	2	0	0	0	0
Minimum Concentration					10	<1	11	170	300	0.2	<0.1	300	158	10	0.5	1,030	1.7	5.2	13	<0.5	4.3	2.45	<10	<50	<100	<100
Minimum Detect					10	ND	11	170	300	0.2	ND	300	158	10	0.5	1,030	1.7	5.2	13	0.8	4.3	2.45	ND	ND	ND	ND
Maximum Concentration					860	<1	967	170	1,900	1.8	<0.1	1,900	366	640	2.5	90,900	26.9	8.1	23	4.4	7	2.65	<20	<50	<100	<100
Maximum Detect					860	ND	967	170	1,900	1.8	ND	1,900	366	640	2.5	90,900	26.9	8.1	23	4.4	7	2.65	ND	ND	ND	ND

Comments

#1 Assumes 25% PFOS and 75% PFHxS

#2 Derived soil HSL exceeds soil saturation concentration

#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria

#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif

#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is

#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sh

#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur

#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.

#10 Mild

#11 Non Aggressive

#12 Reported Analyte LOR is higher than Requested Analyte LOR

#13 Moderate

					13 Fractions			TPH - NEPM 1999 Fractions					Polycyclic aromatic hydrocarbons (PAHs)													
					TRH >C10 - C40 (Sum of total)	TRH >C6 - C10 less BTEX (F1)	TRH >C10 - C16 less Naphthalene (F2)	TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	TPH C10 - C36 (Sum of total)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(b+j+k)fluoranthene	Benzo(k)fluoranthene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(a) pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ calc (zero)	Benzo(a)pyrene TEQ calc(PQL)	Chrysene	Dibenz(a,h)anthracene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					50	10	50	10	20	50	50	50	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																										
PFAS NEMP 2020 Table 2 Public open space (HIL C)																										
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																										
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																										
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																										
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																										
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																										
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																										
NEPM 2013 Table 1A(1) HIL A Soil																										
NEPM 2013 Table 1A(1) HIL C Soil																										
NEPM 2013 Table 1A(1) HIL D Soil																										
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)						45[#8]	110[#9]																			
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)						#2	#2																			
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)						260[#8]	#2																			
Location Code	Field ID	Depth	Date	Soil Description																						
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<100	<20	<50	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA03	QA03_20210819		18/08/2021	CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<100	<20	<50	<20	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<1.0	-	-	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<50	<10	<50	<10	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5

Statistics

Number of Results	19	19	19	19	19	19	19	19	19	19	19	19	1	18	18	19	19	19	19	19	19	19
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	19	0	0
Minimum Concentration	<50	<10	<50	<10	<20	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	1.2	ND	ND
Maximum Concentration	<100	<20	<50	<20	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	1.2	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriat
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is p
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sho
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Data Table 2. Soil data screened against criteria (Human Health)

													Monocyclic Aromatic Hydrocarbons (MAHs)													
					Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	PAHs (Sum of total)	PAHs (Vic EPA List)	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	tert-butylbenzene	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Naphthalene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.2	0.1	0.3	0.5
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																										
PFAS NEMP 2020 Table 2 Public open space (HIL C)																										
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																										
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																				77 | 160[#2]	[#2]	[#2]			[#2]	[#2]
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																				1,100	120,000	85,000			130,000	29,000
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																				100	14,000	4,500			12,000	1,400
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																				120	18,000	5,300			15,000	1,900
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																				430	99,000	27,000			81,000	11,000
NEPM 2013 Table 1A(1) HIL A Soil										300[#6]																
NEPM 2013 Table 1A(1) HIL C Soil										300[#6]																
NEPM 2013 Table 1A(1) HIL D Soil										4,000[#6]																
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																				0.5 | 0.5 | 0.5 | 0.5	160 | 220 | 310 | 540	55[#2]			40 | 60 | 95 | 170	3[#2]
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																				[#2]	[#2]	[#2]			[#2]	[#2]
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																				3 | 3 | 3 | 3	[#2]	[#2]			230[#2]	[#2]
Location Code	Field ID	Depth	Date	Soil Description																						
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	QA03_20210819		18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	-	-	-	-	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Statistics																										
Number of Results					19	19	19	19	19	18	1	18	18	18	16	16	16	16	16	19	19	19	19	19	19	19
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is p
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sh
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Data Table 2. Soil data screened against criteria (Human Health)

								Polychlorinated Biphenyls (PCBs)																		Org
					Total BTEX	Total MAH	Total MAHs (Lab Reported)	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	Organochlorine Pesticides (Lab Reported)	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
EQL					0.2	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.03	0.05	30	0.03	0.05	30	30	30	30	30	50	50
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																											
PFAS NEMP 2020 Table 2 Public open space (HIL C)																											
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																											
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																											
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																											
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																											
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																											
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																											
NEPM 2013 Table 1A(1) HIL A Soil															$1^{\#7}$					6		50,000					
NEPM 2013 Table 1A(1) HIL C Soil															$1^{\#7}$					10		70,000					
NEPM 2013 Table 1A(1) HIL D Soil															$7^{\#7}$					45		530,000					
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	<0.5	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<50	<0.05	<0.05	<50	<100	-	-	<50	<50	<50
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA03	QA03_20210819		18/08/2021	CLAY	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	<0.2	-	-	-	-	-	-	-	<0.1	<0.03	<0.05	<30	<0.03	-	<30	<30	<30	<30	<30	<50	<50
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200

Statistics

Number of Results	16	2	1	1	1	1	1	1	1	1	15	2	15	15	15	14	15	15	14	14	15	15	15
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.2	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.03	<0.05	<30	<0.03	<0.05	<30	<30	<30	<30	<30	<50	<50
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.2	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<50	<0.05	<0.05	<50	<100	<50	<50	<50	<50	<200
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
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#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
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Data Table 2. Soil data screened against criteria (Human Health)

					anochlorine Pesticides (OCPs)																						
					DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene	Azinophos methyl	Bolstar (Sulprofos)	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O
					µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					50	30	50	30	30	30	30	30	50	30	30	30	30	0.5	0.05	0.2	0.05	0.05	0.05	0.05	0.05	2	0.2
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																											
PFAS NEMP 2020 Table 2 Public open space (HIL C)																											
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CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																											
NEPM 2013 Table 1A(1) HIL A Soil					240,000		270,000				10,000				6,000		300,000	20						160			
NEPM 2013 Table 1A(1) HIL C Soil					400,000		340,000				20,000				10,000		400,000	30						250			
NEPM 2013 Table 1A(1) HIL D Soil					3,600,000		2,000,000				100,000				50,000		2,500,000	160						2,000			
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<50	<50	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.5	<0.2	<0.2	-	-	<0.2	<0.2	<0.2	<2	<0.2
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA03	QA03_20210819		18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	<30	-	<30	<30	<30	<30	<30	-	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	-	-

Statistics

Number of Results	14	15	13	15	15	15	15	15	14	15	15	15	15	1	14	1	13	13	14	14	14	1	1
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<50	<30	<50	<30	<30	<30	<30	<30	<50	<30	<30	<30	<30	<0.5	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<2	<0.2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<0.5	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2	<0.2	<2	<0.2
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
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#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

					Organophosphorous Pesticides (OPPs)																						
					Demeton-S	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Disulfoton	EPN	Ethion	Ethoprop	Fenamiphos	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Naled (Dibrom)	Omethoate	Parathion	Phorate	Pirimiphos-methyl
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.2	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.2	0.05	0.2	0.2	0.05	0.05	0.2	0.2	0.2	0.2	0.2	2	0.2	0.2	0.2
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																											
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NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA03	QA03_20210819		18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-	-	<0.2	-	-

Statistics

	Demeton-S	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Disulfoton	EPN	Ethion	Ethoprop	Fenamiphos	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Naled (Dibrom)	Omethoate	Parathion	Phorate	Pirimiphos-methyl
Number of Results	1	13	14	14	14	1	1	14	1	13	1	1	14	14	1	14	1	14	1	1	14	1	1
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.2	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.2	<0.05	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.2	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments

#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriat
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specifi
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is p
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sho
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Data Table 2. Soil data screened against criteria (Human Health)

																											Chlorinated H
					Pirimphos-ethyl	Prothiofos	Pyrazophos	Ronnel	Terbufos	Tokuthion	Trichloronate	Tetrachlorvinphos	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.05	0.2	0.2	0.2	0.2	0.2	0.2	0.01	0.01	0.02	0.04	0.5	0.01	0.5	0.5	0.02	0.5	0.5	0.5	0.5	0.5	0.5
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																											
PFAS NEMP 2020 Table 2 Public open space (HIL C)																											
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																											
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																											
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																											
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																											
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																											
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																											
NEPM 2013 Table 1A(1) HIL A Soil																											
NEPM 2013 Table 1A(1) HIL C Soil																											
NEPM 2013 Table 1A(1) HIL D Soil																											
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA03	QA03_20210819		18/08/2021	CLAY	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.02	<0.04	-	<0.01	-	-	<0.02	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5

Statistics

Number of Results					13	13	1	1	1	1	1	1	19	19	19	19	18	19	18	16	19	18	18	16	2	18	18
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01	<0.02	<0.04	<0.5	<0.01	<0.5	<0.5	<0.02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
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#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

					ydrocarbons															Volatile Organic Compounds (VOCs)							
					Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Dibromomethane	Dichloromethane	Hexachlorobutadiene	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Vinyl chloride	1,1-dichloropropene	cis-1,4-Dichloro-2-butene	Pentachloroethane	Styrene	trans-1,4-Dichloro-2-butene	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluoro-n-pentanoic acid (PFPeA)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.01	0.5	0.5	0.02	0.5	0.01	0.5	0.02	0.5	0.5	0.4	0.02	0.02	0.02	0.02	0.5	0.5	0.5	0.5	0.5	0.0002	0.0002	0.0002
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																										50	
PFAS NEMP 2020 Table 2 Public open space (HIL C)																										10	
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																										0.1	
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																											
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																											
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																											
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																											
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																											
NEPM 2013 Table 1A(1) HIL A Soil																											
NEPM 2013 Table 1A(1) HIL C Soil																											
NEPM 2013 Table 1A(1) HIL D Soil																											
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	<0.5	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA03	QA03_20210819		18/08/2021	CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	<0.5	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.01	-	-	<0.02	-	<0.01	-	<0.02	-	-	<0.4	<0.02	<0.02	<0.02	<0.02	-	-	-	<0.5	-	<0.0002	<0.0002	<0.0002
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
Statistics																											
Number of Results					19	18	18	19	18	19	18	19	18	18	3	17	19	19	19	16	16	16	19	16	15	15	15
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.01	<0.5	<0.5	<0.02	<0.5	<0.01	<0.5	<0.02	<0.5	<0.5	<0.4	<0.02	<0.02	<0.02	<0.02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sh
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Data Table 2. Soil data screened against criteria (Human Health)

					Per- and Poly-fluoroalkyl Substances (PFAS)							(n:2) Fluorotelomer Sulfonic Acids				Halogenated Benzenes										Haloge	
					Perfluorohexanoic acid (PFHxA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Sum (PFHxS + PFOS)	Sum of PFAS (WA DER List)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene	Hexachlorobenzene	1,2-dibromoethane	Bromomethane
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg
EQL					0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.5	0.01	0.02	0.5	0.02	0.5	0.5	0.5	0.02	30	0.5	0.5
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)										20																	
PFAS NEMP 2020 Table 2 Public open space (HIL C)										1																	
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)										0.007[#1]																	
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																											
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																											
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																											
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																											
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																											
NEPM 2013 Table 1A(1) HIL A Soil																									10,000		
NEPM 2013 Table 1A(1) HIL C Soil																									10,000		
NEPM 2013 Table 1A(1) HIL D Soil																									80,000		
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<50	<0.5	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA03	QA03_20210819		18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.01	<0.02	-	<0.02	-	-	-	<0.02	<30	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5

Statistics

Number of Results	15	15	15	15	15	15	15	15	15	15	15	16	17	19	18	19	16	18	18	19	15	18	18
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.01	<0.02	<0.5	<0.02	<0.5	<0.5	<0.5	<0.02	<30	<0.5	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sh
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

					nated Hydrocarbons			Phenols																			
					Dichlorodifluoromethane	Iodomethane	Trichlorofluoromethane	2,3,5,6-Tetrachlorophenol	2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,4-dichlorophenol	2,4-dimethylphenol	2,4-dinitrophenol	2,6-dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-chlorophenol	2-methylphenol	2-nitrophenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-nitrophenol	3&4-Methylphenol (m&p-cresol)	Dinoseb	Pentachlorophenol	Phenol	Phenols (non-halogenated) EPAVic
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.03	0.05	0.05	0.03	1	5	0.03	0.05	0.03	1	1	5	5	0.03	5	1	5	0.2	1	1
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																											
PFAS NEMP 2020 Table 2 Public open space (HIL C)																											
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																											
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																											
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																											
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																											
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																											
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																											
NEPM 2013 Table 1A(1) HIL A Soil																									100	3,000	
NEPM 2013 Table 1A(1) HIL C Soil																									120	40,000	
NEPM 2013 Table 1A(1) HIL D Soil																									660	240,000	
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QA03_20210819		18/08/2021	CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<5	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistics																											
Number of Results					18	18	18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.5	<0.5	<0.5	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<5	<0.5	<5	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is p
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sh
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Data Table 2. Soil data screened against criteria (Human Health)

						Solvents							Acid Sulfate Soils - Acid Base Accounting		Acid Sulfate Soils - Acidity Trail		Acid Sulfate Soils - ANC		Acid Sulfate Soils - CRS			Acid Sulfate Soils - Liming Rate		SPOCAS	EPA 621 Classification of Wastes		
					Sum of Phenols (halogenated)	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Acetone	Allyl chloride	Carbon disulfide	Vinyl acetate	Net Acidity (acidity units)	Net Acidity (sulfur units)	Titratable Actual Acidity (sulfur units)	Titratable Actual Acidity	ANC Fineness Factor	Net Acidity excluding ANC (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	pH (KCl)	Liming Rate	Liming Rate excluding ANC	a-Net Acidity without ANCE_	Other OCPs (IWRG Lab Reported)	Vic EPA IWRG 621 CHC (Total)*	Vic EPA IWRG 621 Other CHC (Total)*
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mole H+/t	%S	%S	mole H+/t	-	% S	%S	mole H+/t	pH units	kg CaCO3/t	kg CaCO3/t	mole H+/t	mg/kg	mg/kg	mg/kg
EQL					0.03	0.5	5	0.5	0.5	0.5	0.5	5	10	0.02	0.02	2	0.5	0.02	0.005	10	0.1	1	1	10	0.1	0.01	0.5
PFAS NEMP 2020 Table 2 Industrial/ commercial (HIL D)																											
PFAS NEMP 2020 Table 2 Public open space (HIL C)																											
PFAS NEMP 2020 Table 2 Residential with garden/accessible soil (HIL A)																											
CRCCARE No.10 Table 3 HSL (Vapour Intrusion) Intrusive Maintenance Worker (Sand) (0-2 m)																											
CRCCARE No.10 Table 4 HSL (direct contact) Intrusive Maintenance Worker																											
CRCCARE No.10 Table 4 HSL-A (direct contact) Low Density Residential																											
CRCCARE No.10 Table 4 HSL-C (direct contact) Recreational/ Open Space																											
CRCCARE No.10 Table 4 HSL-D (direct contact) Comm./Ind.																											
NEPM 2013 Table 1A(1) HIL A Soil																											
NEPM 2013 Table 1A(1) HIL C Soil																											
NEPM 2013 Table 1A(1) HIL D Soil																											
NEPM 2013 Table 1A(3) HSL A/B Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion (0-1 m)																											
NEPM 2013 Table 1A(3) HSL D Sand for Vapour Intrusion (0-1 m)																											
Location Code	Field ID	Depth	Date	Soil Description																							
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.5	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QA03_20210819		18/08/2021	CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	-	<5	<5	<5	-	-	<0.5	<5	<10	<0.02	<0.02	<2	1.5	<0.02	0.008	<10	6.3	<1	<1	<10	-	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	-	<5	<5	<5	-	-	<0.5	<5	19	0.03	0.02	13	1.5	0.03	0.010	<10	4.8	1	1	19	-	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	24	0.04	0.03	16	1.5	0.04	0.012	<10	4.7	2	2	24	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	<5	<5	<5	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistics

Number of Results	1	18	16	18	2	2	18	16	3	3	3	3	3	3	3	3	3	3	3	3	1	3	2
Number of Detects	0	0	0	0	0	0	0	0	2	2	2	2	3	2	3	0	3	2	2	2	0	0	0
Minimum Concentration	<0.03	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<5	<10	<0.02	0.02	<2	1.5	<0.02	0.008	<10	4.7	1	1	<10	<0.1	<0.01	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	19	0.03	0.02	13	1.5	0.03	0.008	ND	4.7	1	1	19	ND	ND	ND
Maximum Concentration	<0.03	<5	<5	<5	<0.5	<0.5	<0.5	<5	24	0.04	0.03	16	1.5	0.04	0.012	<10	6.3	2	2	24	<0.1	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	24	0.04	0.03	16	1.5	0.04	0.012	ND	6.3	2	2	24	ND	ND	ND

Comments

#1 Assumes 25% PFOS and 75% PFHxS
#2 Derived soil HSL exceeds soil saturation concentration
#3 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropria
#4 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specif
#5 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is
#6 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (sh
#7 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposur
#8 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#9 To obtain F2 subtract napthalene from the >C10 - C16 fraction.
#10 Mild
#11 Non Aggressive
#12 Reported Analyte LOR is higher than Requested Analyte LOR
#13 Moderate

Data Table 3. Soil data screened against criteria (Soil Management)

								Exposure Classification				Metals															
								Concrete Piles Soil Condition A	Concrete Piles Soil Condition B	Steel Piles Soil Condition A	Steel Piles Soil Condition B	Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel
								-	-	-	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL												20	5	2	1	10	0.4	0.5	2	2	5	20	5	5	0.1	2	2
EPA 655.1: >1,000 tonnes -All soil types																											
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																											
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																											
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																											
EPA IWRG1828.2 Category B upper limit													300	2,000	400	60,000	400	2,000			20,000		6,000		300	4,000	12,000
EPA IWRG1828.2 Category C upper limit													75	500	100	15,000	100	500			5,000		1,500		75	1,000	3,000
EPA IWRG1828.2 Category D / Industrial Waste upper limit													75	500	100	15,000	100	500			5,000		1,500		75	1,000	3,000
EPA IWRG1828.2 Fill material upper limit														20			3	1			100		300		1	40	60
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																											
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																											
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																											
EPA 1669.4: Interim position statement on PFAS																											
AS2159-2009 Buildings & Structures																											
Location Code	Field ID	Depth	Date	Soil Description	Soil Origin	Geological Unit	Lab Report Number																				
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	Natural	Sedimentary	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	3,900	<5	<5	<1	<50	<1	-	10	<2	<5	6,510	5	62	<0.1	<2	2
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	Natural	Sedimentary	EM2116590	-	-	-	-	4,030	<5	<5	<1	<50	<1	-	10	<2	<5	6,860	6	93	<0.1	<2	3
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	Natural	Sedimentary	818783	-	-	-	-	4,300	<10	<2	<2	<10	<0.4	-	12	<5	<5	8,400	8.0	95	<0.1	<5	<5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	Natural	Sedimentary	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	14,300	<5	<5	<1	<50	<1	-	32	6	10	29,500	18	54	<0.1	<2	11
HA03	HA03_0.1	0.1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	5,930	<5	<5	<1	<50	<1	-	13	16	7	11,500	12	1,080	<0.1	<2	11
HA03	QA03_20210819	0.1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	-	-	-	-	6,260	<5	<5	<1	<50	<1	-	13	6	8	11,700	13	414	<0.1	<2	9
HA03	QC04_20210819	0.1	19/08/2021	CLAY	Natural	Alluvium	818783	-	-	-	-	6,600	<10	2.4	<2	14	<0.4	-	14	9.1	9.8	12,000	15	510	<0.1	<5	11
HA03	HA03_1.0	1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	1[#6]	1[#7]	1[#6]	1[#7]	10,600	<5	<5	<1	<50	<1	-	21	7	12	21,400	15	206	<0.1	<2	18
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	Natural	Newer Volcanics	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	19,200	<5	6	<1	<50	<1	-	34	6	7	33,800	12	106	<0.1	<2	7
HA04	HA04_0.88	0.88	18/08/2021	CLAY	Natural	Newer Volcanics	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	24,700	<5	14	3	<50	<5[#8]	-	58	26	18	68,100	34	108	<0.1	<2	28
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	Mining Spoil	Newer Volcanics	EM2116590	1[#6]	1[#7]	1[#9]	1[#6]	1,750	7	<5	<1	<50	<1	-	10	8	9	8,560	21	71	<0.1	<2	6
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	Mining Spoil	Newer Volcanics	EM2116590	1[#6]	1[#7]	1[#9]	1[#6]	1,980	<5	<5	<1	<50	<1	-	8	<2	<5	4,330	8	10	<0.1	<2	<2
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	Mining Spoil	Newer Volcanics	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	-	-	12	-	-	<1	<0.5	-	-	61	-	5	-	<0.1	<2	10
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	Natural	Alluvium	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	16,700	<5	<5	<1	<50	<1	-	45	8	9	45,300	8	218	<0.1	<2	18
HA15	HA15_1.0	1	18/08/2021	CLAY	Natural	Alluvium	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	15,800	<5	<5	<1	<50	<1	-	25	9	<5	21,900	14	26	<0.1	<2	9
HA17	HA17_0.1	0.1	18/08/2021	CLAY	Natural	Colluvium	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	7,150	<5	7	<1	<50	<1	-	11	<2	<5	17,200	10	81	<0.1	<2	4
HA17	HA17_0.3	0.3	20/08/2021	CLAY	Natural	Colluvium	EM2116590	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	Natural	Colluvium	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	15,800	<5	<5	<1	<50	<1	-	17	<2	<5	22,300	10	13	<0.1	<2	4
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	Natural	Sedimentary	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	2,700	<5	<5	<1	<50	<1	-	14	2	<5	8,230	<5	59	<0.1	<2	3
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	Natural	Sedimentary	EM2116590	1[#6]	1[#7]	1[#7]	1[#7]	5,160	<5	<5	<1	<50	<1	-	12	2	<5	12,600	5	49	<0.1	<2	5
Statistics																											
Number of Results								15	15	15	15	18	18	19	18	18	19	1	18	18	19	18	19	18	19	19	19
Number of Detects								15	15	15	15	18	1	5	1	1	0	0	18	12	10	18	18	18	0	0	17
Minimum Concentration								1	1	1	1	1,750	<5	<2	<1	<10	<0.4	<0.5	8	2	<5	4,330	5	10	<0.1	<2	2
Minimum Detect								1	1	1	1	1,750	7	2.4	3	14	ND	ND	8	2	7	4,330	5	10	ND	ND	2
Maximum Concentration								1	1	1	1	24,700	<10	14	3	<50	<5	<0.5	58	26	61	68,100	34	1,080	<0.1	<5	28
Maximum Detect								1	1	1	1	24,700	7	14	3	14	ND	ND	58	26	61	68,100	34	1,080	ND	ND	28

Comments

#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

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										Exchangeable Cations											Particle Size Analysis	Inorganics							
					Selenium	Silver	Tin	Vanadium	Zinc	Exchangeable Potassium	Calcium/Magnesium Ratio	Exchangeable Magnesium	Exchangeable Magnesium Percent	Cation exchange capacity	Magnesium/Potassium Ratio	Exchangeable Calcium Percent	Exchangeable Potassium Percent	Exchangeable Calcium	Exchangeable Sodium %	Exchangeable Sodium	Clay in soils <2um	Nitrite + Nitrate as N (soluble)	Ammonia as N	Chloride	Cyanide Total	Electrical conductivity (lab)	Fluoride	Kjeldahl Nitrogen Total	Nitrate (as N)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	-	meq/100g	%	meq/100g	-	%	%	meq/100g	%	meq/100g	%	mg/kg	mg/kg	mg/kg	mg/kg	uS/cm	mg/kg	mg/kg	mg/kg
EQL					2	2	5	5	5	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.1	1	0.1	20	10	1	1	40	20	0.1
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit					40,000	720			140,000																10,000		40,000		
EPA IWRG1828.2 Category C upper limit					10,000	180			35,000																2,500		10,000		
EPA IWRG1828.2 Category D / Industrial Waste upper limit					10,000	180			35,000																2,500		10,000		
EPA IWRG1828.2 Fill material upper limit					10	10	50		200																50		450		
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																													
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AS2159-2009 Buildings & Structures																								6,000					
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<5	<2	<5	11	<5	0.6	-	0.3	-	3.2	-	-	-	2.1	-	0.1	14	0.5	<20	<10	-	20	-	1,140	0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<5	<2	<5	11	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<2	<2	<10	14	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<5	<2	<5	36	9	0.4	-	3.0	-	5.7	-	-	-	1.6	-	0.7	-	1.8	<20	260	-	146	-	300	1.8
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<5	<2	<5	12	23	0.3	-	3.9	-	11.2	-	-	-	6.7	-	0.2	16	0.2	<20	<10	-	30	-	1,800	0.2
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<5	<2	<5	12	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<2	<2	<10	13	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<5	<2	<5	16	23	0.2	0.5	6.7	57.9	11.6	28.7	29.8	2.0	3.5	10.2	1.2	-	-	-	440	-	318	-	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<5	<2	<5	87	7	0.3	-	3.5	-	9.9	-	-	-	5.6	-	0.5	-	0.6	<20	20	-	25	-	1,900	0.6
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<5	<2	<5	170	8	0.3	-	9.3	-	15.5	-	-	-	3.9	-	2.0	-	-	-	10	-	60	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<5	<2	<5	8	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	780	-	967	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<5	<2	<5	8	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	860	-	725	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<5	<2	<5	-	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	<1	17	170	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<5	<2	<5	65	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	-	177	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	<5	<2	<5	34	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	-	16	-	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<5	<2	<5	26	10	0.1	-	1.7	-	4.4	-	-	-	2.4	-	0.2	-	-	-	<10	-	12	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<5	<2	<5	50	<5	0.1	-	3.6	-	5.0	-	-	-	0.8	-	0.4	-	-	-	<10	-	20	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<5	<2	<5	27	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	-	11	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<5	<2	<5	22	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	-	68	-	-	-
Statistics																													
Number of Results					19	19	19	18	19	8	1	8	1	8	1	1	1	8	1	8	2	4	4	15	1	15	1	4	4
Number of Detects					0	0	0	18	16	8	1	8	1	8	1	1	1	8	1	8	2	4	0	7	0	15	1	4	4
Minimum Concentration					<2	<2	<5	8	<5	0.1	0.5	0.3	57.9	3.2	28.7	29.8	2	0.8	10.2	0.1	14	0.2	<20	10	<1	11	170	300	0.2
Minimum Detect					ND	ND	ND	8	7	0.1	0.5	0.3	57.9	3.2	28.7	29.8	2	0.8	10.2	0.1	14	0.2	ND	10	ND	11	170	300	0.2
Maximum Concentration					<5	<2	<10	170	46	0.6	0.5	9.3	57.9	15.5	28.7	29.8	2	6.7	10.2	2	16	1.8	<20	860	<1	967	170	1,900	1.8
Maximum Detect					ND	ND	ND	170	46	0.6	0.5	9.3	57.9	15.5	28.7	29.8	2	6.7	10.2	2	16	1.8	ND	860	ND	967	170	1,900	1.8

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
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Data Table 3. Soil data screened against criteria (Soil Management)

										Resistivity (Saturated Paste)	Physiochemical parameters						TRH - NEPM 2013 Fractions							TPH - NEPM 1999 Fractions					
					Nitrite (as N)	Nitrogen (Total)	Phosphorus	Sulfate as SO4 2- (filtered)	Total Organic Carbon	Resistivity	Moisture Content	Moisture Content (dried @ 103°C)	Organic Matter	pH (Lab)	pH (CaCl2)	Density	TRH >C6 - C10	TRH >C10 - C16	TRH >C16 - C34	TRH >C34 - C40	TRH >C10 - C40 (Sum of total)	TRH >C6 - C10 less BTEX (F1)	TRH >C10 - C16 less Naphthalene (F2)	TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	TPH C10 - C36 (Sum of total)	Acenaphthene
					mg/kg	mg/kg	mg/kg	mg/kg	% Carbon	ohm cm	%	%	%	pH Units	pH Units	g/cm3	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.1	20	2	10	0.5		0.1	1	0.5	0.1	0.1	0.01	10	50	100	100	50	10	50	10	20	50	50	50	0.5
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit														2-12.5	2-12.5									2,600				40,000	
EPA IWRG1828.2 Category C upper limit																								650				10,000	
EPA IWRG1828.2 Category D / Industrial Waste upper limit																								325				5,000	
EPA IWRG1828.2 Fill material upper limit														4-10	4-10									100				1,000	
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																													
EPA 1669.4: Interim position statement on PFAS																													
AS2159-2009 Buildings & Structures								1,000						5.5-14	5.5-14														
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.1	1,140	276	<10	1.8	50,000	12.3	-	3.1	5.8	4.8	2.45	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	11.3	-	-	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	-	-	-	-	13	-	-	-	-	<20	<50	<100	<100	<100	<20	<50	<20	<20	<50	<50	<50	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.1	300	158	40	<0.5	6,850	11.0	-	<0.5	5.8	5.3	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.1	1,800	266	<10	2.5	33,300	26.9	-	4.4	6.9	6.0	2.65	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	24.2	-	-	-	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	23	-	-	-	-	<20	<50	<100	<100	<100	<20	<50	<20	<20	<50	<50	<50	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	-	-	-	40	<0.5	3,140	20.5	-	<0.5	7.4	7.0	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.1	1,900	366	10	2.0	40,000	21.2	-	3.4	5.6	4.4	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	60	<0.5	16,700	20.1	-	0.8	6.3	5.3	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	-	-	640	-	1,030	7.6	-	-	5.5	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	640	-	1,380	12.8	-	-	8.1	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	20	-	58,800	5.8	-	-	5.2	4.5	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	-	-	<10	-	5,650	22.6	-	-	6.6	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	-	-	-	<10	-	62,500	22.0	-	-	6.6	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	-	-	<10	1.4	83,300	17.7	-	2.5	6.3	4.8	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	-	-	<10	0.5	50,000	18.9	-	0.9	6.2	4.3	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	-	-	<10	-	90,900	1.7	-	-	6.7	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	-	-	20	-	14,700	6.3	-	-	7.3	-	-	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50	<0.5

Statistics

Number of Results	4	4	4	15	8	15	17	2	8	15	9	2	19	19	19	19	19	19	19	19	19	19	19	19	19
Number of Detects	0	4	4	8	5	15	17	2	6	15	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.1	300	158	10	0.5	1,030	1.7	13	<0.5	5.2	4.3	2.45	<10	<50	<100	<100	<50	<10	<50	<10	<20	<50	<50	<50	<0.5
Minimum Detect	ND	300	158	10	0.5	1,030	1.7	13	0.8	5.2	4.3	2.45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.1	1,900	366	640	2.5	90,900	26.9	23	4.4	8.1	7	2.65	<20	<50	<100	<100	<100	<20	<50	<20	<50	<100	<100	<50	<0.5
Maximum Detect	ND	1,900	366	640	2.5	90,900	26.9	23	4.4	8.1	7	2.65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments

#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
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#8 Reported Analyte LOR is higher than Requested Analyte LOR
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Data Table 3. Soil data screened against criteria (Soil Management)

					Polycyclic aromatic hydrocarbons (PAHs)																								
					Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(b+j+k)fluoranthene	Benzo(k)fluoranthene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(a) pyrene	Benzo(a)pyrene TEQ calc (Half)	Benzo(a)pyrene TEQ calc (zero)	Benzo(a)pyrene TEQ calc(PQL)	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	PAHs (Sum of total)	PAHs (Vic EPA List)	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit												160												400					
EPA IWRG1828.2 Category C upper limit												40												100					
EPA IWRG1828.2 Category D / Industrial Waste upper limit												20												50					
EPA IWRG1828.2 Fill material upper limit												1												20					
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																													
EPA 1669.4: Interim position statement on PFAS																													
AS2159-2009 Buildings & Structures																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.5	<0.5	<0.5	<1.0	-	-	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
Statistics																													
Number of Results					19	19	19	1	18	18	19	19	19	19	19	19	19	19	19	19	19	19	18	1	18	18	18	16	16
Number of Detects					0	0	0	0	0	0	0	0	19	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards
EPA Victoria, October 2020, EPA 1669.4: Interim position statement on PFAS
EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category C upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category D / Industrial Waste upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Fill material upper limit
HEPA, January 2020, PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria
Aus Standards, November 2009, AS2159-2009 Buildings & Structures

Data Table 3. Soil data screened against criteria (Soil Management)

					Monocyclic Aromatic Hydrocarbons (MAHs)													Polychlorinated Biphenyls (PCBs)											
					p-isopropyltoluene	sec-butylbenzene	tert-butylbenzene	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Naphthalene	Total BTEX	Total MAH	Total MAHs (Lab Reported)	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	Organochlorine Pesticides (Lab Reported)	4,4-DDE	a-BHC	Aldrin
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg
EQL					0.5	0.5	0.5	0.1	0.1	0.1	0.2	0.1	0.3	0.5	0.2	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.03	0.05	30	0.03
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit								16	12,800	4,800			9,600												6				
EPA IWRG1828.2 Category C upper limit								4	3,200	1,200			2,400												50				
EPA IWRG1828.2 Category D / Industrial Waste upper limit								4	3,200	1,200			2,400												2				
EPA IWRG1828.2 Fill material upper limit								1									7								2	1			
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																													
EPA 1669.4: Interim position statement on PFAS																													
AS2159-2009 Buildings & Structures																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5	-	<0.5	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<50	<0.05
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.2	-	-	-	-	-	-	-	<0.1	<0.03	<0.05	<30	<0.03
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	-	-	-	-	-	-	-	-	-	<0.1	-	<0.05	<50	<0.05

Statistics

Number of Results	16	16	16	19	19	19	19	19	19	19	16	2	1	1	1	1	1	1	1	1	15	2	15	15	15
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.5	<0.2	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.03	<0.05	<30	<0.03
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<50	<0.05
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments

#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards

EPA Victoria, October 2020, EPA 1669.4: Interim position statement on PFAS
EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category C upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category D / Industrial Waste upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Fill material upper limit
HEPA, January 2020, PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria
Aus Standards, November 2009, AS2159-2009 Buildings & Structures

Data Table 3. Soil data screened against criteria (Soil Management)

					Organochlorine Pesticides (OCPs)																								
					Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene	Azinophos methyl	Bolstar (Sulprofos)	Bromophos-ethyl
					mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	30	30	30	30	30	50	50	50	30	50	30	30	30	30	30	50	30	30	30	30	0.5	0.05	0.2	0.05
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit					4.8		16,000						50,000										4,800						
EPA IWRG1828.2 Category C upper limit					1.2		4,000						50,000										1,200						
EPA IWRG1828.2 Category D / Industrial Waste upper limit					1.2		4,000						50,000										1,200						
EPA IWRG1828.2 Fill material upper limit																													
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																													
EPA 1669.4: Interim position statement on PFAS																													
AS2159-2009 Buildings & Structures																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.05	<50	<100	-	-	<50	<50	<50	<50	<50	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.5	<0.2	<0.2	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	<30	<30	<30	<30	<30	<50	<50	-	<30	-	<30	<30	<30	<30	<30	-	<30	<30	<30	<30	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	-	<0.05	-	<0.05

Statistics

Number of Results	14	15	15	14	14	15	15	15	14	15	13	15	15	15	15	15	14	15	15	15	15	1	14	1	13
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.05	<30	<30	<30	<30	<30	<50	<50	<50	<30	<50	<30	<30	<30	<30	<30	<50	<30	<30	<30	<30	<0.5	<0.05	<0.2	<0.05
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.05	<50	<100	<50	<50	<50	<50	<200	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<200	<0.5	<0.2	<0.2	<0.05
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards
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EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
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					Organophosphorous Pesticides (OPPs)																								
					Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O	Demeton-S	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Disulfoton	EPN	Ethion	Ethoprop	Fenamiphos	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Naled (Dibrom)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.05	0.05	0.05	2	0.2	0.2	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.2	0.05	0.2	0.2	0.05	0.05	0.2	0.2	0.2	0.2	0.2
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
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Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	<0.2	<0.2	<0.2	<2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.05	<0.05	<0.05	<0.05	-	-	-	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	-	<0.05	-	-	<0.05	<0.05	-	<0.2	-	<0.2	-
Statistics																													
Number of Results					13	14	14	14	1	1	1	13	14	14	14	1	1	14	1	13	1	1	14	14	1	14	1	14	1
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.05	<0.05	<0.05	<0.05	<2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.2	<0.05	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.05	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
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					Omethoate	Parathion	Phorate	Pirimiphos-methyl	Pirimphos-ethyl	Prothiofos	Pyrazophos	Ronnel	Terbufos	Tokuthion	Trichloronate	Tetrachlorvinphos	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					2	0.2	0.2	0.2	0.05	0.05	0.2	0.2	0.2	0.2	0.2	0.2	0.01	0.01	0.02	0.04	0.5	0.01	0.5	0.5	0.02	0.5	0.5	0.5	0.5
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit																	1,600	4,800	210	190		480			48				
EPA IWRG1828.2 Category C upper limit																	400	1,200	52	48		120			12				
EPA IWRG1828.2 Category D / Industrial Waste upper limit																	400	1,200	52	48		120			12				
EPA IWRG1828.2 Fill material upper limit																													
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EPA 1669.4: Interim position statement on PFAS																													
AS2159-2009 Buildings & Structures																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<2	<0.2	<0.2	<0.2	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.02	<0.04	-	<0.01	-	-	<0.02	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA15	HA15_1.0	1	18/08/2021	CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	<0.2	-	-	<0.05	<0.05	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
Statistics																													
Number of Results					1	14	1	1	13	13	1	1	1	1	1	1	19	19	19	19	18	19	18	16	19	18	18	16	2
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01	<0.02	<0.04	<0.5	<0.01	<0.5	<0.5	<0.02	<0.5	<0.5	<0.5	<0.5
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<2	<0.2	<0.2	<0.2	<0.05	<0.05	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards
EPA Victoria, October 2020, EPA 1669.4: Interim position statement on PFAS
EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category C upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category D / Industrial Waste upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Fill material upper limit
HEPA, January 2020, PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria
Aus Standards, November 2009, AS2159-2009 Buildings & Structures

					Chlorinated Hydrocarbons																	Volatile Organic Compounds (VOCs)							
					Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Dibromomethane	Dichloromethane	Hexachlorobutadiene	Trichloroethene (TCE)	Tetrachloroethene (PCE)	Vinyl chloride	1,1-dichloropropene	cis-1,4-Dichloro-2-butene	Pentachloroethane	Styrene	trans-1,4-Dichloro-2-butene	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluoro-n-pentanoic acid (PFPeA)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.01	0.5	0.5	0.02	0.5	0.01	0.5	0.02	0.5	0.5	0.4	0.02	0.02	0.02	0.02	0.5	0.5	0.5	0.5	0.5	0.0002	0.0002	0.0002
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit							48			960							64	11	80	800	4.8				480				
EPA IWRG1828.2 Category C upper limit							12			240							16	2.8	20	200	1.2				120				
EPA IWRG1828.2 Category D / Industrial Waste upper limit							12			240							16	2.8	20	200	1.2				120				
EPA IWRG1828.2 Fill material upper limit																													
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																												50[#4]	
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																												50[#3]	
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																												50[#1]	
EPA 1669.4: Interim position statement on PFAS																											0.002	0.001	
AS2159-2009 Buildings & Structures																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	<0.5	-	-	-	-
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	-	-	<0.5	-	-	-	-
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	<0.01	-	-	<0.02	-	<0.01	-	<0.02	-	-	<0.4	<0.02	<0.02	<0.02	<0.02	-	-	-	<0.5	-	<0.0002	<0.0002	<0.0002
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
Statistics																													
Number of Results					18	18	19	18	18	19	18	19	18	19	18	18	3	17	19	19	19	16	16	16	19	16	15	15	15
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.5	<0.5	<0.01	<0.5	<0.5	<0.02	<0.5	<0.01	<0.5	<0.02	<0.5	<0.5	<0.4	<0.02	<0.02	<0.02	<0.02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.5	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.0002	<0.0002	<0.0002
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments

#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards

EPA Victoria, October 2020, EPA 1669.4: Interim position statement on PFAS
EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category C upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category D / Industrial Waste upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Fill material upper limit
HEPA, January 2020, PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria
Aus Standards, November 2009, AS2159-2009 Buildings & Structures

Data Table 3. Soil data screened against criteria (Soil Management)

					Per- and Poly-fluoroalkyl Substances (PFAS)							(n:2) Fluorotelomer Sulfonic Acids				Halogenated Benzenes										Halogenated Hydrocarbons			
					Perfluorohexanoic acid (PFHxA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Sum (PFHxS + PFOS)	Sum of PFAS (WA DER List)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene	Hexachlorobenzene	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Iodomethane
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.5	0.01	0.02	0.5	0.02	0.5	0.5	0.5	0.02	30	0.5	0.5	0.5	0.5
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit																		24,000		640				4,800					
EPA IWRG1828.2 Category C upper limit																		6,000		160				1,200					
EPA IWRG1828.2 Category D / Industrial Waste upper limit																		6,000		160				1,200					
EPA IWRG1828.2 Fill material upper limit																													
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria										20[#5]																			
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria										50[#3]																			
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria										50[#2]																			
EPA 1669.4: Interim position statement on PFAS						0.001																							
AS2159-2009 Buildings & Structures																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<50	<0.5	<0.5	<0.5	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5	<5	<0.5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5	<5	<0.5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<5	<5	<0.5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.01	<0.02	-	<0.02	-	-	-	<0.02	<30	-	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA15	HA15_1.0	1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
Statistics																													
Number of Results					15	15	15	15	15	15	15	15	15	15	15	16	17	19	18	19	16	18	18	19	15	18	18	18	18
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.01	<0.02	<0.5	<0.02	<0.5	<0.5	<0.5	<0.02	<30	<0.5	<0.5	<0.5	<0.5
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<5	<0.5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards
EPA Victoria, October 2020, EPA 1669.4: Interim position statement on PFAS
EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category C upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category D / Industrial Waste upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Fill material upper limit
HEPA, January 2020, PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria
Aus Standards, November 2009, AS2159-2009 Buildings & Structures

Data Table 3. Soil data screened against criteria (Soil Management)

						Phenols																							
					Trichlorofluoromethane	2,3,5,6-Tetrachlorophenol	2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,4-dichlorophenol	2,4-dimethylphenol	2,4-dinitrophenol	2,6-dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-chlorophenol	2-methylphenol	2-nitrophenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-nitrophenol	3&4-Methylphenol (m&p-cresol)	Dinoseb	Pentachlorophenol	Phenol	Phenols (non-halogenated) EPAVic	Sum of Phenols (halogenated)	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.03	0.05	0.05	0.03	1	5	0.03	0.05	0.03	1	1	5	5	0.03	5	1	5	0.2	1	1	0.03	0.5	5	0.5
EPA 655.1: >1,000 tonnes -All soil types																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays																													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams																													
EPA IWRG1828.2 Category B upper limit							64,000	320	3,200					4,800											2,200		32,000		
EPA IWRG1828.2 Category C upper limit							16,000	80	800					1,200											560		8,000		
EPA IWRG1828.2 Category D / Industrial Waste upper limit							16,000	80	800					1,200											560		8,000		
EPA IWRG1828.2 Fill material upper limit																									60	1			
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																													
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																													
EPA 1669.4: Interim position statement on PFAS																													
AS2159-2009 Buildings & Structures																													
Location Code	Field ID	Depth	Date	Soil Description																									
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA03	HA03_0.1	0.1	18/08/2021	CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA03	QA03_20210819	0.1	18/08/2021	CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA04	HA04_0.88	0.88	18/08/2021	CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1	<0.03	-	-	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA15	HA15_1.0	1	18/08/2021	CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA17	HA17_0.1	0.1	18/08/2021	CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	<5	<5
Statistics																													
Number of Results					18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18	16	18
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.5	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1	<0.03	<0.5	<5	<0.5
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<5	<0.03	<0.05	<0.05	<0.03	<1	<5	<0.03	<0.05	<0.03	<1	<1	<5	<5	<0.03	<5	<1	<5	<0.2	<1	<1	<0.03	<5	<5	<5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards
EPA Victoria, October 2020, EPA 1669.4: Interim position statement on PFAS
EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category C upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category D / Industrial Waste upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Fill material upper limit
HEPA, January 2020, PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria
Aus Standards, November 2009, AS2159-2009 Buildings & Structures

Data Table 3. Soil data screened against criteria (Soil Management)

					Solvents				Acid Sulfate Soils - Acid Base Accounting		Acid Sulfate Soils - Acidity Trail		Acid Sulfate Soils - ANC		Acid Sulfate Soils - CRS			Acid Sulfate Soils - Liming Rate		SPOCAS	EPA 621 Classification of Wastes		
					Acetone	Allyl chloride	Carbon disulfide	Vinyl acetate	Net Acidity (acidity units)	Net Acidity (sulfur units)	Titratable Actual Acidity (sulfur units)	Titratable Actual Acidity	ANC Fineness Factor	Net Acidity excluding ANC (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	pH (KCl)	Liming Rate	Liming Rate excluding ANC	a-Net Acidity without ANCE_	Other OCPs (IWRG Lab Reported)	Vic EPA IWRG 621 CHC (Total)*	Vic EPA IWRG 621 Other CHC (Total)*
					mg/kg	mg/kg	mg/kg	mg/kg	mole H+/t	%S	%S	mole H+/t	-	% S	%S	mole H+/t	pH units	kg CaCO3/t	kg CaCO3/t	mole H+/t	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	5	10	0.02	0.02	2	0.5	0.02	0.005	10	0.1	1	1	10	0.1	0.01	0.5
EPA 655.1: >1,000 tonnes -All soil types									18	0.03													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Medium to heavy clays and silty clays									62	0.1													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes -Sandy loams to light clays									36	0.06													
EPA 655.1: Acid sulfate soils - 1-1,000 tonnes - Loams to sandy loams									18	0.03													
EPA IWRG1828.2 Category B upper limit																					50		
EPA IWRG1828.2 Category C upper limit																					10		
EPA IWRG1828.2 Category D / Industrial Waste upper limit																					10		
EPA IWRG1828.2 Fill material upper limit																						1	
PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria																							
PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria																							
PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria																							
EPA 1669.4: Interim position statement on PFAS																							
AS2159-2009 Buildings & Structures																							
Location Code	Field ID	Depth	Date	Soil Description																			
HA02	HA02_0.1	0.1	18/08/2021	Silty SAND	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC01_20210819	0.1	18/08/2021	Silty SAND	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02	QC02_20210819	0.1	19/08/2021	Silty SAND	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.5	<0.5
HA02	HA02_0.5	0.5	18/08/2021	Clayey silty SAND	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	HA03_0.1	0.1	18/08/2021	CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QA03_20210819	0.1	18/08/2021	CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03	QC04_20210819	0.1	19/08/2021	CLAY	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5
HA03	HA03_1.0	1	18/08/2021	CLAY	-	-	<0.5	<5	<10	<0.02	<0.02	<2	1.5	<0.02	0.008	<10	6.3	<1	<1	<10	-	-	-
HA04	HA04_0.1	0.1	18/08/2021	Silty CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA04	HA04_0.88	0.88	18/08/2021	CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_0.1	0.1	18/08/2021	FILL: SILT	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05	HA05_1.0	1	18/08/2021	FILL: SILT	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA10	HA10_0.1	0.1	18/08/2021	FILL: Gravelly SAND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
HA15	HA15_0.1	0.1	18/08/2021	Gravelly CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA15	HA15_1.0	1	18/08/2021	CLAY	-	-	<0.5	<5	19	0.03	0.02	13	1.5	0.03	0.010	<10	4.8	1	1	19	-	-	-
HA17	HA17_0.1	0.1	18/08/2021	CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA17	HA17_0.3	0.3	20/08/2021	CLAY	-	-	-	-	24	0.04	0.03	16	1.5	0.04	0.012	<10	4.7	2	2	24	-	-	-
HA17	HA17_0.5	0.5	18/08/2021	CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA19	HA19_0.1	0.1	18/08/2021	Silty gravelly SAND	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA19	HA19_0.4	0.4	18/08/2021	Silty CLAY	-	-	<0.5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistics																							
Number of Results					2	2	18	16	3	3	3	3	3	3	3	3	3	3	3	3	1	3	2
Number of Detects					0	0	0	0	2	2	2	2	3	2	3	0	3	2	2	2	0	0	0
Minimum Concentration					<0.5	<0.5	<0.5	<5	<10	<0.02	0.02	<2	1.5	<0.02	0.008	<10	4.7	1	1	<10	<0.1	<0.01	<0.5
Minimum Detect					ND	ND	ND	ND	19	0.03	0.02	13	1.5	0.03	0.008	ND	4.7	1	1	19	ND	ND	ND
Maximum Concentration					<0.5	<0.5	<0.5	<5	24	0.04	0.03	16	1.5	0.04	0.012	<10	6.3	2	2	24	<0.1	<0.5	<0.5
Maximum Detect					ND	ND	ND	ND	24	0.04	0.03	16	1.5	0.04	0.012	ND	6.3	2	2	24	ND	ND	ND

Comments
#1 Total concentration. Drinking water x10
#2 Total concentration of 50 mg/kg (low content limit). Human health/industrial x10
#3 Total concentration. Human health/industrial x100
#4 Total concentration of 50 mg/kg (low content limit). Human health/industrial x1
#5 Total concentration. Human health/industrial x1
#6 Mild
#7 Non Aggressive
#8 Reported Analyte LOR is higher than Requested Analyte LOR
#9 Moderate

Environmental Standards
EPA Victoria, October 2020, EPA 1669.4: Interim position statement on PFAS
EPA Victoria, March 2021, EPA IWRG1828.2 Category B upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category C upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Category D / Industrial Waste upper limit
EPA Victoria, March 2021, EPA IWRG1828.2 Fill material upper limit
HEPA, January 2020, PFAS NEMP 2020 Table 7 Clay/Single Composite Lined Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Double Composite Landfill Acceptance Criteria
HEPA, January 2020, PFAS NEMP 2020 Table 7 Unlined Landfill Acceptance Criteria
Aus Standards, November 2009, AS2159-2009 Buildings & Structures

Data Table 4. Relative Percentage Differences

Field ID			HA02_0.1	QC01_20210819	RPD	QC02_20210819	RPD	HA03_0.1	QA03_20210819	RPD	QC04_20210819	RPD
Date			18/08/2021	18/08/2021		19/08/2021		18/08/2021	18/08/2021		19/08/2021	
Matrix Type			Soil	Soil		Soil		Soil	Soil		Soil	
Lab Report Number			EM2116590	EM2116590		818783		EM2116590	EM2116590		818783	
	Unit	EQL										
Metals												
Aluminium	mg/kg	20	3,900	4,030	3	4,300	10	5,930	6,260	5	6,600	11
Antimony	mg/kg	5	<5	<5	0	<10	0	<5	<5	0	<10	0
Arsenic	mg/kg	2	<5	<5	0	<2	0	<5	<5	0	2.4	0
Beryllium	mg/kg	1	<1	<1	0	<2	0	<1	<1	0	<2	0
Boron	mg/kg	10	<50	<50	0	<10	0	<50	<50	0	14	0
Cadmium	mg/kg	0.4	<1	<1	0	<0.4	0	<1	<1	0	<0.4	0
Chromium (III+VI)	mg/kg	2	10	10	0	12	18	13	13	0	14	7
Cobalt	mg/kg	2	<2	<2	0	<5	0	16	6	91	9.1	55
Copper	mg/kg	5	<5	<5	0	<5	0	7	8	13	9.8	33
Iron	mg/kg	20	6,510	6,860	5	8,400	25	11,500	11,700	2	12,000	4
Lead	mg/kg	5	5	6	18	8.0	46	12	13	8	15	22
Manganese	mg/kg	5	62	93	40	95	42	1,080	414	89	510	72
Mercury	mg/kg	0.1	<0.1	<0.1	0	<0.1	0	<0.1	<0.1	0	<0.1	0
Molybdenum	mg/kg	2	<2	<2	0	<5	0	<2	<2	0	<5	0
Nickel	mg/kg	2	2	3	40	<5	0	11	9	20	11	0
Selenium	mg/kg	2	<5	<5	0	<2	0	<5	<5	0	<2	0
Silver	mg/kg	2	<2	<2	0	<2	0	<2	<2	0	<2	0
Tin	mg/kg	5	<5	<5	0	<10	0	<5	<5	0	<10	0
Vanadium	mg/kg	5	11	11	0	14	24	12	12	0	13	8
Zinc	mg/kg	5	<5	<5	0	7.6	41	23	23	0	26	12
Inorganics												
Nitrite + Nitrate as N (soluble)	mg/kg	0.1	0.5	-	-	-	-	0.2	-	-	-	-
Ammonia as N	mg/kg	20	<20	-	-	-	-	<20	-	-	-	-
Chloride	mg/kg	10	<10	-	-	-	-	<10	-	-	-	-
Electrical conductivity (lab)	uS/cm	1	20	-	-	-	-	30	-	-	-	-
Kjeldahl Nitrogen Total	mg/kg	20	1,140	-	-	-	-	1,800	-	-	-	-
Nitrate (as N)	mg/kg	0.1	0.5	-	-	-	-	0.2	-	-	-	-
Nitrite (as N)	mg/kg	0.1	<0.1	-	-	-	-	<0.1	-	-	-	-
Nitrogen (Total)	mg/kg	20	1,140	-	-	-	-	1,800	-	-	-	-
Phosphorus	mg/kg	2	276	-	-	-	-	266	-	-	-	-
Sulfate as SO4 2- (filtered)	mg/kg	10	<10	-	-	-	-	<10	-	-	-	-
Total Organic Carbon	% Carbon	0.5	1.8	-	-	-	-	2.5	-	-	-	-
Resistivity (Saturated Paste)												
Resistivity	ohm cm		50,000	-	-	-	-	33,300	-	-	-	-
Physiochemical parameters												
Moisture Content	%	0.1	12.3	11.3	8	-	-	26.9	24.2	11	-	-
pH (Lab)	pH Units	0.1	5.8	-	-	-	-	6.9	-	-	-	-
Moisture Content (dried @ 103°C)	%	1	-	-	-	13	-	-	-	-	23	-
Organic Matter	%	0.5	3.1	-	-	-	-	4.4	-	-	-	-
pH (CaCl2)	pH Units	0.1	4.8	-	-	-	-	6.0	-	-	-	-
TRH - NEPM 2013 Fractions												
TRH >C6 - C10	mg/kg	10	<10	<10	0	<20	0	<10	<10	0	<20	0
TRH >C10 - C16	mg/kg	50	<50	<50	0	<50	0	<50	<50	0	<50	0
TRH >C16 - C34	mg/kg	100	<100	<100	0	<100	0	<100	<100	0	<100	0
TRH >C34 - C40	mg/kg	100	<100	<100	0	<100	0	<100	<100	0	<100	0
TRH >C10 - C40 (Sum of total)	mg/kg	50	<50	<50	0	<100	0	<50	<50	0	<100	0
TRH >C6 - C10 less BTEX (F1)	mg/kg	10	<10	<10	0	<20	0	<10	<10	0	<20	0
TRH >C10 - C16 less Naphthalene (F2)	mg/kg	50	<50	<50	0	<50	0	<50	<50	0	<50	0
TPH - NEPM 1999 Fractions												
TPH C6 - C9	mg/kg	10	<10	<10	0	<20	0	<10	<10	0	<20	0
TPH C10 - C14	mg/kg	20	<50	<50	0	<20	0	<50	<50	0	<20	0
TPH C15 - C28	mg/kg	50	<100	<100	0	<50	0	<100	<100	0	<50	0
TPH C29-C36	mg/kg	50	<100	<100	0	<50	0	<100	<100	0	<50	0
TPH C10 - C36 (Sum of total)	mg/kg	50	<50	<50	0	<50	0	<50	<50	0	<50	0
Polycyclic aromatic hydrocarbons (PAHs)												
Acenaphthene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Anthracene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Benzo(b+j)fluoranthene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Benzo(g,h,i)perylene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Benzo(a) pyrene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	0.6	0.6	0	0.6	0	0.6	0.6	0	0.6	0
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	1.2	1.2	0	1.2	0	1.2	1.2	0	1.2	0
Chrysene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Dibenz(a,h)anthracene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Fluoranthene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Fluorene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Phenanthrene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Pyrene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
PAHs (Sum of total)	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Monocyclic Aromatic Hydrocarbons (MAHs)												
1,2,4-trimethylbenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,3,5-trimethylbenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Isopropylbenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
n-butylbenzene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
n-propylbenzene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
p-isopropyltoluene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
sec-butylbenzene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
tert-butylbenzene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
Benzene	mg/kg	0.1	<0.2	<0.2	0	<0.1	0	<0.2	<0.2	0	<0.1	0
Toluene	mg/kg	0.1	<0.5	<0.5	0	<0.1	0	<0.5	<0.5	0	<0.1	0
Ethylbenzene	mg/kg	0.1	<0.5	<0.5	0	<0.1	0	<0.5	<0.5	0	<0.1	0
Xylene (m & p)	mg/kg	0.2	<0.5	<0.5	0	<0.2	0	<0.5	<0.5	0	<0.2	0
Xylene (o)	mg/kg	0.1	<0.5	<0.5	0	<0.1	0	<0.5	<0.5	0	<0.1	0
Xylene Total	mg/kg	0.3	<0.5	<0.5	0	<0.3	0	<0.5	<0.5	0	<0.3	0
Naphthalene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Total BTEX	mg/kg	0.2	<0.2	<0.2	0	-	-	<0.2	<0.2	0	-	-
Total MAH	mg/kg	0.5	-	-	-	<0.5	-	-	-	-	<0.5	-
Chlorinated Hydrocarbons												
1,1,1,2-tetrachloroethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,1,1-trichloroethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,1,2,2-tetrachloroethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,1,2-trichloroethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0

Field ID			HA02_0.1	QC01_20210819	RPD	QC02_20210819	RPD	HA03_0.1	QA03_20210819	RPD	QC04_20210819	RPD
Date			18/08/2021	18/08/2021		19/08/2021		18/08/2021	18/08/2021		19/08/2021	
Matrix Type			Soil	Soil		Soil		Soil	Soil		Soil	
Lab Report Number			EM2116590	EM2116590		818783		EM2116590	EM2116590		818783	
	Unit	EQL										
1,1-dichloroethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,1-dichloroethene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,2,3-trichloropropane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,2-dibromo-3-chloropropane	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
1,2-dichloroethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,2-dichloropropane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,3-dichloropropane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
2,2-dichloropropane	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
Bromochloromethane	mg/kg	0.5	-	-	-	<0.5	-	-	-	-	<0.5	-
Bromodichloromethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Bromoform	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Carbon tetrachloride	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Chlorodibromomethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Chloroethane	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
Chloroform	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Chloromethane	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
cis-1,2-dichloroethene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
cis-1,3-dichloropropene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
trans-1,2-dichloroethene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
trans-1,3-dichloropropene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Dibromomethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Dichloromethane	mg/kg	0.5	-	-	-	<0.5	-	-	-	-	<0.5	-
Hexachlorobutadiene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
Trichloroethene (TCE)	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Tetrachloroethene (PCE)	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Vinyl chloride	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
Halogenated Benzenes												
1,2,3-trichlorobenzene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
1,2,4-trichlorobenzene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
1,2-dichlorobenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,3-dichlorobenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
1,4-dichlorobenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
2-chlorotoluene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
4-chlorotoluene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Bromobenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Chlorobenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Hexachlorobenzene	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Halogenated Hydrocarbons												
1,2-dibromoethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Bromomethane	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
Dichlorodifluoromethane	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
Iodomethane	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Trichlorofluoromethane	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
Solvents												
Methyl Ethyl Ketone	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
2-hexanone (MBK)	mg/kg	5	<5	<5	0	-	-	<5	<5	0	-	-
4-Methyl-2-pentanone	mg/kg	0.5	<5	<5	0	<0.5	0	<5	<5	0	<0.5	0
Acetone	mg/kg	0.5	-	-	-	<0.5	-	-	-	-	<0.5	-
Allyl chloride	mg/kg	0.5	-	-	-	<0.5	-	-	-	-	<0.5	-
Carbon disulfide	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
Vinyl acetate	mg/kg	5	<5	<5	0	-	-	<5	<5	0	-	-
Volatile Organic Compounds (VOCs)												
1,1-dichloropropene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
cis-1,4-Dichloro-2-butene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
Pentachloroethane	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
Styrene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0	<0.5	<0.5	0	<0.5	0
trans-1,4-Dichloro-2-butene	mg/kg	0.5	<0.5	<0.5	0	-	-	<0.5	<0.5	0	-	-
Organochlorine Pesticides (OCPs)												
Organochlorine Pesticides (Lab Reported)	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
4,4-DDE	mg/kg	0.05	<0.05	<0.05	0	<0.05	0	<0.05	-	-	-	-
a-BHC	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Aldrin	mg/kg	0.05	<0.05	<0.05	0	<0.05	0	<0.05	-	-	-	-
Aldrin + Dieldrin	mg/kg	0.05	<0.05	<0.05	0	<0.05	0	<0.05	-	-	-	-
b-BHC	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Chlordane	µg/kg	50	<50	<50	0	<100	0	<50	-	-	-	-
Chlordane (cis)	µg/kg	50	<50	<50	0	-	-	<50	-	-	-	-
Chlordane (trans)	µg/kg	50	<50	<50	0	-	-	<50	-	-	-	-
d-BHC	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
DDD	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
DDT	µg/kg	50	<200	<200	0	<50	0	<200	-	-	-	-
DDT+DDE+DDD	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Dieldrin	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Endosulfan	µg/kg	50	<50	<50	0	-	-	<50	-	-	-	-
Endosulfan I	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Endosulfan II	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Endosulfan sulfate	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Endrin	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Endrin aldehyde	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Endrin ketone	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
g-BHC (Lindane)	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Heptachlor	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Heptachlor epoxide	µg/kg	50	<50	<50	0	<50	0	<50	-	-	-	-
Methoxychlor	µg/kg	50	<200	<200	0	<50	0	<200	-	-	-	-
Toxaphene	mg/kg	0.5	-	-	-	<0.5	-	-	-	-	-	-
Organophosphorous Pesticides (OPPs)												
Azinophos methyl	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Bolstar (Sulprofos)	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Bromophos-ethyl	mg/kg	0.05	<0.05	<0.05	0	-	-	<0.05	-	-	-	-
Carbophenothion	mg/kg	0.05	<0.05	<0.05	0	-	-	<0.05	-	-	-	-
Chlorfenvinphos	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Chlorpyrifos	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Chlorpyrifos-methyl	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Coumaphos	mg/kg	2	-	-	-	<2	-	-	-	-	-	-
Demeton-O	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Demeton-S	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Demeton-S-methyl	mg/kg	0.05	<0.05	<0.05	0	-	-	<0.05	-	-	-	-
Diazinon	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Dichlorvos	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Dimethoate	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Disulfoton	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
EPN	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Ethion	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Ethoprop	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-

Data Table 4. Relative Percentage Differences

Field ID			HA02_0.1	QC01_20210819	RPD	QC02_20210819	RPD	HA03_0.1	QA03_20210819	RPD	QC04_20210819	RPD
Date			18/08/2021	18/08/2021		19/08/2021		18/08/2021	18/08/2021		19/08/2021	
Matrix Type			Soil	Soil		Soil		Soil	Soil		Soil	
Lab Report Number			EM2116590	EM2116590		818783		EM2116590	EM2116590		818783	
	Unit	EQL										
Fenamiphos	mg/kg	0.05	<0.05	<0.05	0	-	-	<0.05	-	-	-	-
Fenitrothion	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Fensulfothion	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Fenthion	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Malathion	mg/kg	0.05	<0.05	<0.05	0	<0.2	0	<0.05	-	-	-	-
Merphos	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Methyl parathion	mg/kg	0.2	<0.2	<0.2	0	<0.2	0	<0.2	-	-	-	-
Mevinphos (Phosdrin)	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Monocrotophos	mg/kg	0.2	<0.2	<0.2	0	<2	0	<0.2	-	-	-	-
Naled (Dibrom)	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Omethoate	mg/kg	2	-	-	-	<2	-	-	-	-	-	-
Parathion	mg/kg	0.2	<0.2	<0.2	0	<0.2	0	<0.2	-	-	-	-
Phorate	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Pirimiphos-methyl	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Pirimphos-ethyl	mg/kg	0.05	<0.05	<0.05	0	-	-	<0.05	-	-	-	-
Prothiofos	mg/kg	0.05	<0.05	<0.05	0	-	-	<0.05	-	-	-	-
Pyrazophos	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Ronnel	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Terbufos	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Tokuthion	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Trichloronate	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Tetrachlorvinphos	mg/kg	0.2	-	-	-	<0.2	-	-	-	-	-	-
Polychlorinated Biphenyls (PCBs)												
Arochlor 1016	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
Arochlor 1221	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
Arochlor 1232	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
Arochlor 1242	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
Arochlor 1248	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
Arochlor 1254	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
Arochlor 1260	mg/kg	0.1	-	-	-	<0.1	-	-	-	-	-	-
PCBs (Sum of total)	mg/kg	0.1	<0.1	<0.1	0	<0.1	0	<0.1	-	-	-	-

Comments
#1 Mild
#2 Non Aggressive

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 80 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Data Table 5. Rinsate Blank Sample Results

Sample Type			Rinsate Blank	Rinsate Blank
Field ID			RN_20210818	RN_20210819
Date			20/08/2021	20/08/2021
Lab Report Number			EM2116590	EM2116590
	Unit	EQL		
Metals				
Aluminium	µg/L	10	<10	10
Antimony	µg/L	1	<1	<1
Arsenic	µg/L	1	<1	<1
Beryllium	µg/L	1	<1	<1
Boron	µg/L	50	<50	<50
Cadmium	µg/L	0.1	<0.1	<0.1
Chromium (III+VI)	µg/L	1	<1	<1
Cobalt	µg/L	1	<1	<1
Copper	µg/L	1	<1	<1
Iron	µg/L	50	<50	210
Lead	µg/L	1	<1	<1
Manganese	µg/L	1	<1	2
Mercury	µg/L	0.1	<0.1	<0.1
Molybdenum	µg/L	1	<1	<1
Nickel	µg/L	1	<1	<1
Selenium	µg/L	10	<10	<10
Silver	µg/L	1	<1	<1
Tin	µg/L	1	<1	<1
Vanadium	µg/L	10	<10	<10
Zinc	µg/L	5	<5	<5
Inorganics				
Ammonia as N	mg/L	0.01	<0.01	<0.01
Kjeldahl Nitrogen Total	mg/L	0.1	<0.2[#6]	<0.2[#6]
Nitrate & Nitrite (as N)	mg/L	0.01	<0.01	0.01
Nitrate (as N)	mg/L	0.01	<0.01	0.01
Nitrite (as N)	mg/L	0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	0.1	<0.2[#6]	<0.2[#6]
Phosphorus	mg/L	0.01	<0.01	<0.01
TRH - NEPM 2013 Fractions				
TRH >C6 - C10	mg/L	0.02	<0.02	<0.02
TRH >C10 - C16	µg/L	100	<100	<100
TRH >C16 - C34	µg/L	100	<100	<100
TRH >C34 - C40	µg/L	100	<100	<100
TRH >C10 - C40 (Sum of total)	µg/L	100	<100	<100
TRH >C6 - C10 less BTEX (F1)	µg/L	20	<20	<20
TRH >C10 - C16 less Naphthalene (F2)	µg/L	100	<100	<100
TPH - NEPM 1999 Fractions				
TPH C6 - C9	mg/L	0.02	<0.02	<0.02
TPH C10 - C14	µg/L	50	<50	<50
TPH C15 - C28	µg/L	100	<100	<100
TPH C29-C36	µg/L	50	<50	<50
TPH C10 - C36 (Sum of total)	µg/L	50	<50	<50
Polycyclic aromatic hydrocarbons (PAHs)				
Acenaphthene	µg/L	1	<1.0	<1.0
Acenaphthylene	µg/L	1	<1.0	<1.0
Anthracene	µg/L	1	<1.0	<1.0
Benz(a)anthracene	µg/L	1	<1.0	<1.0
Benzo(k)fluoranthene	µg/L	1	<1.0	<1.0
Benzo(b+j)fluoranthene	µg/L	1	<1.0	<1.0
Benzo(g,h,i)perylene	µg/L	1	<1.0	<1.0
Benzo(a) pyrene	µg/L	0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/L	0.0005	<0.0005	<0.0005
Chrysene	µg/L	1	<1.0	<1.0
Dibenz(a,h)anthracene	µg/L	1	<1.0	<1.0
Fluoranthene	µg/L	1	<1.0	<1.0
Fluorene	µg/L	1	<1.0	<1.0
Indeno(1,2,3-c,d)pyrene	µg/L	1	<1.0	<1.0
Phenanthrene	µg/L	1	<1.0	<1.0
Pyrene	µg/L	1	<1.0	<1.0
PAHs (Sum of total)	µg/L	0.5	<0.5	<0.5
Monocyclic Aromatic Hydrocarbons (MAHs)				
Benzene	µg/L	1	<1	<1
Toluene	µg/L	2	<2	<2
Ethylbenzene	mg/L	0.002	<0.002	<0.002
Xylene (m & p)	mg/L	0.002	<0.002	<0.002
Xylene (o)	µg/L	2	<2	<2
Xylene Total	µg/L	2	<2	<2
Naphthalene	mg/L	0.001	<0.0010	<0.0010
Total BTEX	µg/L	1	<1	<1
Halogenated Benzenes				
Hexachlorobenzene	µg/L	0.5	<0.5	<0.5
Per- and Poly-fluoroalkyl Substances (PFAS)				
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01
Perfluoro-n-pentanoic acid (PFPeA)	µg/L	0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	µg/L	0.02	<0.02	<0.02
Perfluorohexanesulfonic acid (PFHxS)	µg/L	0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	<0.02	<0.02
Perfluorobutanesulfonic acid (PFBS)	µg/L	0.02	<0.02	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	<0.1
Sum (PFHxS + PFOS)	µg/L	0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	<0.01
(n:2) Fluorotelomer Sulfonic Acids				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.05	<0.05	<0.05
Organochlorine Pesticides (OCPs)				
4,4-DDE	µg/L	0.5	<0.5	<0.5
a-BHC	µg/L	0.5	<0.5	<0.5
Aldrin	µg/L	0.5	<0.5	<0.5
Aldrin + Dieldrin	µg/L	0.5	<0.5	<0.5
b-BHC	µg/L	0.5	<0.5	<0.5
Chlordane	µg/L	0.5	<0.5	<0.5
Chlordane (cis)	µg/L	0.5	<0.5	<0.5
Chlordane (trans)	µg/L	0.5	<0.5	<0.5
d-BHC	µg/L	0.5	<0.5	<0.5
DDD	µg/L	0.5	<0.5	<0.5
DDT	µg/L	2	<2.0	<2.0
DDT+DDE+DDD	µg/L	0.5	<0.5	<0.5
Dieldrin	µg/L	0.5	<0.5	<0.5
Endosulfan I	µg/L	0.5	<0.5	<0.5
Endosulfan II	µg/L	0.5	<0.5	<0.5
Endosulfan sulfate	µg/L	0.5	<0.5	<0.5
Endrin	µg/L	0.5	<0.5	<0.5
Endrin aldehyde	µg/L	0.5	<0.5	<0.5
Endrin ketone	µg/L	0.5	<0.5	<0.5
g-BHC (Lindane)	µg/L	0.5	<0.5	<0.5
Heptachlor	µg/L	0.5	<0.5	<0.5
Heptachlor epoxide	µg/L	0.5	<0.5	<0.5
Methoxychlor	µg/L	2	<2.0	<2.0
Organophosphorous Pesticides (OPPs)				
Azinophos methyl	µg/L	0.5	<0.5	<0.5
Bromophos-ethyl	µg/L	0.5	<0.5	<0.5
Carbophenothion	µg/L	0.5	<0.5	<0.5
Chlorfenvinphos	µg/L	0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.5	<0.5	<0.5
Demeton-S-methyl	µg/L	0.5	<0.5	<0.5
Diazinon	µg/L	0.5	<0.5	<0.5
Dichlorvos	µg/L	0.5	<0.5	<0.5
Dimethoate	µg/L	0.5	<0.5	<0.5
Ethion	µg/L	0.5	<0.5	<0.5
Fenamiphos	µg/L	0.5	<0.5	<0.5
Fenthion	µg/L	0.5	<0.5	<0.5
Malathion	µg/L	0.5	<0.5	<0.5
Methyl parathion	µg/L	2	<2.0	<2.0
Monocrotophos	µg/L	2	<2.0	<2.0
Parathion	µg/L	2	<2.0	<2.0
Pirimphos-ethyl	µg/L	0.5	<0.5	<0.5
Prothiofos	µg/L	0.5	<0.5	<0.5
Polychlorinated Biphenyls (PCBs)				
PCBs (Sum of total)	µg/L	1	<1	<1

Comments
#1 Converted from Nitrate as NO3 (50 mg/L)
#2 Converted from Nitrite as NO2 (3 mg/L)
#3 Insufficient data to set a guideline value based on health considerations.
#4 Values calculated using hardness of 30 mg/L CaCO3. Refer ANZECC & ARMCANZ (2000) for site specific hardness guidance
#5 Trigget value for cattle adopted
#6 Reported Analyte LOR is higher than Requested Analyte LOR

Data Table 6. Trip Blank Sample Results

Sample Type			Trip Blank
Field ID			TB_20210818
Date			20/08/2021
Lab Report Number			EM2116590
	Unit	EQL	
TRH - NEPM 2013 Fractions			
TRH >C6 - C10	mg/L	0.02	<0.02
TRH >C6 - C10 less BTEX (F1)	µg/L	20	<20
TPH - NEPM 1999 Fractions			
TPH C6 - C9	mg/L	0.02	<0.02
Monocyclic Aromatic Hydrocarbons (MAHs)			
Benzene	µg/L	1	<1
Toluene	µg/L	2	<2
Ethylbenzene	mg/L	0.002	<0.002
Xylene (m & p)	mg/L	0.002	<0.002
Xylene (o)	µg/L	2	<2
Xylene Total	µg/L	2	<2
Naphthalene	mg/L	0.001	<0.005
Total BTEX	µg/L	1	<1

Comments
#1 Converted from Nitrate as NO3 (50 mg/L)
#2 Converted from Nitrite as NO2 (3 mg/L)
#3 Insufficient data to set a guideline value based on health considerations.
#4 Values calculated using hardness of 30 mg/L CaCO3. Refer ANZECC & ARMCANZ (2000) for site specific hardness guidance
#5 Trigget value for cattle adopted
#6 Reported Analyte LOR is higher than Requested Analyte LOR

Inputs
Select contaminant from list below
Cr_III
Below needed to calculate fresh and aged ACLs
Enter % clay (values from 0 to 100%)
14
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
0.651
or for aged ABCs only
Enter State (or closest State)
VIC
Enter traffic volume (high or low)
low

Outputs		
Land use	Cr III soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	70	150
Urban residential and open public spaces	190	450
Commercial and industrial	310	750

Inputs
Select contaminant from list below
Cu
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
3.2
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.3
Enter organic carbon content (%OC) (values from 0 to 50%)
0.5
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
0.651
or for aged ABCs only
Enter State (or closest State)
VIC
Enter traffic volume (high or low)
low

Outputs		
Land use	Cu soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	10	20
Urban residential and open public spaces	20	40
Commercial and industrial	25	50

Inputs
Select contaminant from list below
Ni
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
3.2
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
0.651
or for aged ABCs only
Enter State (or closest State)
VIC
Enter traffic volume (high or low)
low

Outputs		
Land use	Ni soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	6	7
Urban residential and open public spaces	9	15
Commercial and industrial	10	25

Inputs
Select contaminant from list below
Zn
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
3.2
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.3
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
0.651
or for aged ABCs only
Enter State (or closest State)
VIC
Enter traffic volume (high or low)
low

Outputs		
Land use	Zn soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	15	55
Urban residential and open public spaces	30	100
Commercial and industrial	45	140

Appendix E. Laboratory Certificates of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **EM2116590**
Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : JYE GROGAN
Address : PO BOX 312 FLINDERS LANE
MELBOURNE VIC AUSTRALIA 8009
Telephone : ----
Project : IS311800
Order number : IS311800
C-O-C number : ----
Sampler : BG, JG
Site :
Quote number : MEBQ/003/18 - Vic Only - Primary Work Only
No. of samples received : 27
No. of samples analysed : 21

Page : 1 of 50
Laboratory : Environmental Division Melbourne
Contact : Peter Ravlic
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +6138549 9645
Date Samples Received : 20-Aug-2021 15:00
Date Analysis Commenced : 21-Aug-2021
Issue Date : 27-Aug-2021 16:10

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP074-UT: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP074: Where reported, Total Trihalomethanes is the sum of the reported concentrations of all Trihalomethanes at or above the LOR.
- EP074: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP074: Where reported, Sum of chlorinated hydrocarbons includes carbon tetrachloride, chlorobenzene, chloroform, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichlorothene, trans-1,2-dichlorothene, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, vinyl chloride, hexachlorobutadiene and methylene chloride.
- EP074: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EP074-WF: Where reported, Sum of trichlorobenzenes is the sum of the reported concentrations of 1,2,3-Trichlorobenzene and 1,2,4-Trichlorobenzene, and 1,3,5-Trichlorobenzene at or above the LOR.
- EA167 (Corrosion Assessment for Concrete and Steel piles in Soil): Exposure Classification ratings for concrete and steel piles in soil are as per the Australian Standard (AS2159-2009). ALS is not NATA accredited for Corrosion Assessment.
- EA167: Soil Condition A – High permeability soils (e.g. sands and gravels) which are in groundwater
- EA167: Soil Condition B – Low permeability soils (e.g. silts and clays) or all soils above groundwater
- ED045G: The presence of Thiocyante, Thiosulfate and Sulfite can positively contribute to the Chloride result, thereby may bias higher than expected. Results should be scrutinised accordingly.

- EG020-T : EM2116590 #17 results for total metal have been confirmed by re-digestion and re-analysis.
- EG005T: EM2116590 #27 has been diluted prior to cadmium analysis due to sample matrix. LOR value has been raised accordingly.
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	----	----	**4.8**	----	**4.3**
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**6.7**	**7.3**	**6.3**	----	**6.2**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**11**	**68**	**12**	----	**20**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	**4.7**	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	**16**	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	----	**0.03**	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	----	**0.012**	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	----	<10	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	----	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	----	**0.04**	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	----	**24**	----
Liming Rate	----	1	kg CaCO3/t	----	----	----	**2**	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	----	**0.04**	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	----	**24**	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	----	**2**	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**1.7**	**6.3**	**17.7**	----	**18.9**
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**90900**	**14700**	**83300**	----	**50000**
EA167: Corrosion Classification (per AS2159-2009)								
ø **Exposure Classification - Concrete Piles Soil Condition A**	----	-	-	**Mild**	**Mild**	**Mild**	----	**Mild**
ø **Exposure Classification - Concrete Piles Soil Condition B**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	----	**Non Aggressive**
ø **Exposure Classification - Steel Piles Soil Condition A**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	----	**Non Aggressive**
ø **Exposure Classification - Steel Piles Soil Condition B**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	----	**Non Aggressive**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	**2.4**	----	**0.8**
Exchangeable Magnesium	----	0.1	meq/100g	----	----	**1.7**	----	**3.6**
Exchangeable Potassium	----	0.1	meq/100g	----	----	**0.1**	----	**0.1**
Exchangeable Sodium	----	0.1	meq/100g	----	----	**0.2**	----	**0.4**
Cation Exchange Capacity	----	0.1	meq/100g	----	----	**4.4**	----	**5.0**
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	**20**	<10	----	<10
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<10	**40**	<10	----	<10
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**2700**	**5160**	**7150**	----	**15800**
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	----	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	**7**	----	<5
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	----	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	<1
Chromium	7440-47-3	2	mg/kg	**14**	**12**	**11**	----	**17**
Cobalt	7440-48-4	2	mg/kg	**2**	**2**	<2	----	<2
Copper	7440-50-8	5	mg/kg	<5	<5	<5	----	<5
Iron	7439-89-6	0.005	%	----	----	**1.72**	----	**2.23**
Iron	7439-89-6	50	mg/kg	**8230**	**12600**	----	----	----
Lead	7439-92-1	5	mg/kg	<5	**5**	**10**	----	**10**
Manganese	7439-96-5	5	mg/kg	**59**	**49**	**81**	----	**13**
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	----	<2
Nickel	7440-02-0	2	mg/kg	**3**	**5**	**4**	----	**4**
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	<5
Silver	7440-22-4	2	mg/kg	<2	<2	<2	----	<2
Tin	7440-31-5	5	mg/kg	<5	<5	<5	----	<5
Vanadium	7440-62-2	5	mg/kg	**27**	**22**	**26**	----	**50**
Zinc	7440-66-6	5	mg/kg	**8**	**8**	**10**	----	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	<0.1
EP004: Organic Matter								
Organic Matter	----	0.5	%	----	----	**2.5**	----	**0.9**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EP004: Organic Matter - Continued								
Total Organic Carbon	----	0.5	%	**----**	**----**	**1.4**	**----**	**0.5**
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	<5	----	<5
2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	<5	----	<5
4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	<5	----	<5
2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	<5	----	<5
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
EP074D: Fumigants								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EP074D: Fumigants - Continued								
2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	<5	----	<5
Chloromethane	74-87-3	5	mg/kg	<5	<5	<5	----	<5
Vinyl chloride	75-01-4	5	mg/kg	<5	<5	<5	----	<5
Bromomethane	74-83-9	5	mg/kg	<5	<5	<5	----	<5
Chloroethane	75-00-3	5	mg/kg	<5	<5	<5	----	<5
Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	<5	----	<5
1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
EP074G: Trihalomethanes								
Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	----	**0.6**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	----	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	<0.001

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	<0.0005
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	<0.0002
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**100**	**87.9**	**84.8**	----	**93.4**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**96.2**	**100**	**109**	----	**101**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**97.1**	**101**	**123**	----	**96.5**
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.5	%	**84.8**	**97.0**	**88.5**	----	**90.6**
Toluene-D8	2037-26-5	0.5	%	**79.9**	**85.6**	**76.2**	----	**80.6**
4-Bromofluorobenzene	460-00-4	0.5	%	**85.7**	**89.9**	**81.8**	----	**86.4**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**83.9**	**88.2**	**88.6**	----	**85.0**
Anthracene-d10	1719-06-8	0.5	%	**121**	**108**	**104**	----	**102**
4-Terphenyl-d14	1718-51-0	0.5	%	**83.7**	**91.2**	**83.1**	----	**76.3**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**82.6**	**91.4**	**83.9**	----	**96.2**
Toluene-D8	2037-26-5	0.2	%	**86.7**	**92.2**	**82.4**	----	**84.1**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**HA19_0.1**	**HA19_0.4**	**HA17_0.1**	**HA17_0.3**	**HA17_0.5**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	20-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-001**	**EM2116590-002**	**EM2116590-003**	**EM2116590-004**	**EM2116590-005**
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued								
4-Bromofluorobenzene	460-00-4	0.2	%	**89.2**	**95.5**	**85.8**	**----**	**79.2**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**102**	**104**	**107**	**----**	**93.4**
13C8-PFOA	----	0.0002	%	**108**	**114**	**106**	**----**	**101**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	**----**	**----**	**4.5**	**----**	**----**
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**6.6**	**6.6**	**5.2**	**5.5**	**8.1**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**177**	**16**	**17**	**967**	**725**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**----**	**4.8**	**----**	**----**	**----**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**----**	**13**	**----**	**----**	**----**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**----**	**0.02**	**----**	**----**	**----**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	**----**	**0.010**	**----**	**----**	**----**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**----**	<10	**----**	**----**	**----**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**----**	**1.5**	**----**	**----**	**----**
Net Acidity (sulfur units)	----	0.02	% S	**----**	**0.03**	**----**	**----**	**----**
Net Acidity (acidity units)	----	10	mole H+ / t	**----**	**19**	**----**	**----**	**----**
Liming Rate	----	1	kg CaCO3/t	**----**	**1**	**----**	**----**	**----**
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**----**	**0.03**	**----**	**----**	**----**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**----**	**19**	**----**	**----**	**----**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**----**	**1**	**----**	**----**	**----**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**22.6**	**22.0**	**5.8**	**7.6**	**12.8**
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**5650**	**62500**	**58800**	**1030**	**1380**
EA167: Corrosion Classification (per AS2159-2009)								
ø **Exposure Classification - Concrete Piles Soil Condition A**	----	-	-	**Mild**	**Mild**	**Mild**	**Mild**	**Mild**
ø **Exposure Classification - Concrete Piles Soil Condition B**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**
ø **Exposure Classification - Steel Piles Soil Condition A**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	**Moderate**	**Moderate**
ø **Exposure Classification - Steel Piles Soil Condition B**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	**Mild**	**Mild**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	<10	**20**	**640**	**640**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<10	<10	<10	**780**	**860**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**16700**	**15800**	----	**1750**	**1980**
Antimony	7440-36-0	5	mg/kg	<5	<5	----	**7**	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	**12**	<5	<5
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	----	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**45**	**25**	----	**10**	**8**
Cobalt	7440-48-4	2	mg/kg	**8**	**9**	----	**8**	<2
Copper	7440-50-8	5	mg/kg	**9**	<5	**61**	**9**	<5
Iron	7439-89-6	50	mg/kg	**45300**	**21900**	----	**8560**	**4330**
Lead	7439-92-1	5	mg/kg	**8**	**14**	**5**	**21**	**8**
Manganese	7439-96-5	5	mg/kg	**218**	**26**	----	**71**	**10**
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	<2	<2
Nickel	7440-02-0	2	mg/kg	**18**	**9**	**10**	**6**	<2
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Silver	7440-22-4	2	mg/kg	<2	<2	<2	<2	<2
Tin	7440-31-5	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	**65**	**34**	----	**8**	**8**
Zinc	7440-66-6	5	mg/kg	**25**	**15**	**46**	**16**	**7**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	----	<0.5	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	<1	----	----
EK040T: Fluoride Total								
Fluoride	16984-48-8	40	mg/kg	----	----	**170**	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	<0.1	----	----
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	<0.1	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	----	<0.05	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	----	<0.05	----
EP074A: Monocyclic Aromatic Hydrocarbons								
Benzene	71-43-2	0.2	mg/kg	----	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	----	----	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	<0.5	----	----
Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Styrene	100-42-5	0.5	mg/kg	----	----	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	<0.5	----	----
Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
^ **Sum of monocyclic aromatic hydrocarbons**	----	0.2	mg/kg	----	----	<0.2	----	----
n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
^ **Total Xylenes**	----	0.5	mg/kg	----	----	<0.5	----	----
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	----	<5	<5
2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	----	<5	<5
4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	----	<5	<5
2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	----	<5	<5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP074B: Oxygenated Compounds - Continued								
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	----	<5	<5
Chloromethane	74-87-3	5	mg/kg	<5	<5	----	<5	<5
Vinyl chloride	75-01-4	5	mg/kg	<5	<5	----	<5	<5
Bromomethane	74-83-9	5	mg/kg	<5	<5	----	<5	<5
Chloroethane	75-00-3	5	mg/kg	<5	<5	----	<5	<5
Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	----	<5	<5
1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP074E: Halogenated Aliphatic Compounds - Continued								
Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
EP074G: Trihalomethanes								
Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
EP074H: Naphthalene								
Naphthalene	91-20-3	1	mg/kg	----	----	<1	----	----
EP074I: Volatile Halogenated Compounds								
Vinyl chloride	75-01-4	0.02	mg/kg	----	----	<0.02	----	----
1.1-Dichloroethene	75-35-4	0.01	mg/kg	----	----	<0.01	----	----
Methylene chloride	75-09-2	0.4	mg/kg	----	----	<0.4	----	----
trans-1.2-Dichloroethene	156-60-5	0.02	mg/kg	----	----	<0.02	----	----
cis-1.2-Dichloroethene	156-59-2	0.01	mg/kg	----	----	<0.01	----	----
Chloroform	67-66-3	0.02	mg/kg	----	----	<0.02	----	----
1.1.1-Trichloroethane	71-55-6	0.01	mg/kg	----	----	<0.01	----	----
Carbon Tetrachloride	56-23-5	0.01	mg/kg	----	----	<0.01	----	----
1.2-Dichloroethane	107-06-2	0.02	mg/kg	----	----	<0.02	----	----
Trichloroethene	79-01-6	0.02	mg/kg	----	----	<0.02	----	----
1.1.2-Trichloroethane	79-00-5	0.04	mg/kg	----	----	<0.04	----	----
Tetrachloroethene	127-18-4	0.02	mg/kg	----	----	<0.02	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.01	mg/kg	----	----	<0.01	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP074I: Volatile Halogenated Compounds - Continued								
1.1.2.2-Tetrachloroethane	79-34-5	0.02	mg/kg	----	----	<0.02	----	----
Hexachlorobutadiene	87-68-3	0.02	mg/kg	----	----	<0.02	----	----
Chlorobenzene	108-90-7	0.02	mg/kg	----	----	<0.02	----	----
1.4-Dichlorobenzene	106-46-7	0.02	mg/kg	----	----	<0.02	----	----
1.2-Dichlorobenzene	95-50-1	0.02	mg/kg	----	----	<0.02	----	----
1.2.4-Trichlorobenzene	120-82-1	0.01	mg/kg	----	----	<0.01	----	----
^ **Sum of volatile chlorinated hydrocarbons**	----	0.01	mg/kg	----	----	<0.01	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	----	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	----	**1.2**	**1.2**
EP075A: Phenolic Compounds (Halogenated)								
2-Chlorophenol	95-57-8	0.03	mg/kg	----	----	<0.03	----	----
2.4-Dichlorophenol	120-83-2	0.03	mg/kg	----	----	<0.03	----	----
2.6-Dichlorophenol	87-65-0	0.03	mg/kg	----	----	<0.03	----	----
4-Chloro-3-methylphenol	59-50-7	0.03	mg/kg	----	----	<0.03	----	----
2.4.5-Trichlorophenol	95-95-4	0.05	mg/kg	----	----	<0.05	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP075A: Phenolic Compounds (Halogenated) - Continued								
2.4.6-Trichlorophenol	88-06-2	0.05	mg/kg	----	----	<0.05	----	----
2.3.5.6-Tetrachlorophenol	935-95-5	0.03	mg/kg	----	----	<0.03	----	----
2.3.4.5 & 2.3.4.6-Tetrachlorophenol	4901-51-3/58-90-2	0.05	mg/kg	----	----	<0.05	----	----
Pentachlorophenol	87-86-5	0.2	mg/kg	----	----	<0.2	----	----
^ **Sum of Phenols (halogenated)**	----	0.03	mg/kg	----	----	<0.03	----	----
EP075A: Phenolic Compounds (Non-halogenated)								
Phenol	108-95-2	1	mg/kg	----	----	<1	----	----
2-Methylphenol	95-48-7	1	mg/kg	----	----	<1	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	----	----	<1	----	----
2-Nitrophenol	88-75-5	1	mg/kg	----	----	<1	----	----
2.4-Dimethylphenol	105-67-9	1	mg/kg	----	----	<1	----	----
2.4-Dinitrophenol	51-28-5	5	mg/kg	----	----	<5	----	----
4-Nitrophenol	100-02-7	5	mg/kg	----	----	<5	----	----
2-Methyl-4.6-dinitrophenol	8071-51-0	5	mg/kg	----	----	<5	----	----
Dinoseb	88-85-7	5	mg/kg	----	----	<5	----	----
2-Cyclohexyl-4.6-Dinitrophenol	131-89-5	5	mg/kg	----	----	<5	----	----
^ **Sum of Phenols (non-halogenated)**	----	1	mg/kg	----	----	<1	----	----
EP075B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	----	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	----	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	----	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	----	----	<0.5	----	----
Benzo(b+j) & Benzo(k)fluoranthene	205-99-2 207-08-9	1.0	mg/kg	----	----	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP075B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	----	<0.5	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	----	<0.5	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	----	**0.6**	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	----	**1.2**	----	----
EP075I: Organochlorine Pesticides								
alpha-BHC	319-84-6	0.03	mg/kg	----	----	<0.03	----	----
Hexachlorobenzene (HCB)	118-74-1	0.03	mg/kg	----	----	<0.03	----	----
beta-BHC	319-85-7	0.03	mg/kg	----	----	<0.03	----	----
gamma-BHC	58-89-9	0.03	mg/kg	----	----	<0.03	----	----
delta-BHC	319-86-8	0.03	mg/kg	----	----	<0.03	----	----
Heptachlor	76-44-8	0.03	mg/kg	----	----	<0.03	----	----
Aldrin	309-00-2	0.03	mg/kg	----	----	<0.03	----	----
Heptachlor epoxide	1024-57-3	0.03	mg/kg	----	----	<0.03	----	----
cis-Chlordane	5103-71-9	0.03	mg/kg	----	----	<0.03	----	----
trans-Chlordane	5103-74-2	0.03	mg/kg	----	----	<0.03	----	----
Endosulfan 1	959-98-8	0.03	mg/kg	----	----	<0.03	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	----	----	<0.05	----	----
Dieldrin	60-57-1	0.03	mg/kg	----	----	<0.03	----	----
Endrin aldehyde	7421-93-4	0.03	mg/kg	----	----	<0.03	----	----
Endrin	72-20-8	0.03	mg/kg	----	----	<0.03	----	----
Endosulfan 2	33213-65-9	0.03	mg/kg	----	----	<0.03	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	----	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.03	mg/kg	----	----	<0.03	----	----
4.4`-DDT	50-29-3	0.05	mg/kg	----	----	<0.05	----	----
Methoxychlor	72-43-5	0.03	mg/kg	----	----	<0.03	----	----
^ **Sum of organochlorine pesticides**	----	0.03	mg/kg	----	----	<0.03	----	----
^ **Chlordane**	57-74-9	0.03	mg/kg	----	----	<0.03	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	<10
C6 - C9 Fraction	----	10	mg/kg	----	----	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
C10 - C14 Fraction	----	50	mg/kg	----	----	<50	----	----
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	<10	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	<100	<100

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued								
C15 - C28 Fraction	----	100	mg/kg	----	----	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
C29 - C36 Fraction	----	100	mg/kg	----	----	<100	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	----	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	----	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	<50	<50
>C10 - C16 Fraction	----	50	mg/kg	----	----	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
>C16 - C34 Fraction	----	100	mg/kg	----	----	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	----	----	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	----	<50	<50
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	----	<50	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	----	<50	<50
>C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	----	<50	----	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	----	<10	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	----	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	**88.7**	----	----
Decachlorobiphenyl	2051-24-3	0.1	%	**87.5**	**85.2**	----	**92.7**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**107**	**96.4**	----	**102**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**122**	**93.7**	----	**128**	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.5	%	**88.8**	**106**	----	**93.4**	**89.8**
Toluene-D8	2037-26-5	0.5	%	**78.9**	**91.5**	----	**80.7**	**74.0**
4-Bromofluorobenzene	460-00-4	0.5	%	**86.0**	**101**	----	**85.5**	**80.6**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA15_0.1**	**HA15_1.0**	**HA10_0.1**	**HA05_0.1**	**HA05_1.0**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-007**	**EM2116590-009**	**EM2116590-010**	**EM2116590-012**	**EM2116590-014**
				Result	Result	Result	Result	Result
EP074S: VOC Surrogates (Ultra-Trace)								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	----	----	92.1	----	----
Toluene-D8	2037-26-5	0.1	%	----	----	86.8	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	----	----	97.0	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	88.3	93.0	----	90.0	85.6
Anthracene-d10	1719-06-8	0.5	%	104	109	----	107	105
4-Terphenyl-d14	1718-51-0	0.5	%	89.7	94.8	----	92.6	88.7
EP075S: Acid Extractable Surrogates (Waste Classification)								
Phenol-d6	13127-88-3	0.025	%	----	----	88.3	----	----
2-Chlorophenol-D4	93951-73-6	0.025	%	----	----	82.1	----	----
2.4.6-Tribromophenol	118-79-6	0.025	%	----	----	96.7	----	----
EP075T: Base/Neutral Extractable Surrogates (Waste Classification)								
Nitrobenzene-D5	4165-60-0	0.025	%	----	----	86.3	----	----
1.2-Dichlorobenzene-D4	2199-69-1	0.025	%	----	----	82.6	----	----
2-Fluorobiphenyl	321-60-8	0.025	%	----	----	89.5	----	----
Anthracene-d10	1719-06-8	0.025	%	----	----	90.8	----	----
4-Terphenyl-d14	1718-51-0	0.025	%	----	----	122	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	84.3	99.9	----	88.0	84.9
Toluene-D8	2037-26-5	0.2	%	84.9	98.6	----	87.8	80.5
4-Bromofluorobenzene	460-00-4	0.2	%	87.1	105	----	92.6	90.0
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	96.2	95.4	93.5	102	114
13C8-PFOA	----	0.0002	%	107	102	103	105	106

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	**4.8**	**----**	**5.3**	**6.0**	**----**
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.8**	**----**	**5.8**	**6.9**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**20**	**----**	**146**	**30**	**----**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**12.3**	**11.3**	**11.0**	**26.9**	**24.2**
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**50000**	**----**	**6850**	**33300**	**----**
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	**14**	**----**	**----**	**16**	**----**
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	**2.45**	**----**	**----**	**2.65**	**----**
EA167: Corrosion Classification (per AS2159-2009)								
ø **Exposure Classification - Concrete Piles Soil Condition A**	----	-	-	**Mild**	**----**	**Mild**	**Mild**	**----**
ø **Exposure Classification - Concrete Piles Soil Condition B**	----	-	-	**Non Aggressive**	**----**	**Non Aggressive**	**Non Aggressive**	**----**
ø **Exposure Classification - Steel Piles Soil Condition A**	----	-	-	**Non Aggressive**	**----**	**Non Aggressive**	**Non Aggressive**	**----**
ø **Exposure Classification - Steel Piles Soil Condition B**	----	-	-	**Non Aggressive**	**----**	**Non Aggressive**	**Non Aggressive**	**----**
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**2.1**	**----**	**1.6**	**6.7**	**----**
Exchangeable Magnesium	----	0.1	meq/100g	**0.3**	**----**	**3.0**	**3.9**	**----**
Exchangeable Potassium	----	0.1	meq/100g	**0.6**	**----**	**0.4**	**0.3**	**----**
Exchangeable Sodium	----	0.1	meq/100g	**0.1**	**----**	**0.7**	**0.2**	**----**
Cation Exchange Capacity	----	0.1	meq/100g	**3.2**	**----**	**5.7**	**11.2**	**----**
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	**----**	**40**	<10	**----**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<10	**----**	**260**	<10	**----**
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**3900**	**4030**	**14300**	**5930**	**6260**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	*CAS Number*	*LOR*	*Unit*	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
				EM2116590-018	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**10**	**10**	**32**	**13**	**13**
Cobalt	7440-48-4	2	mg/kg	<2	<2	**6**	**16**	**6**
Copper	7440-50-8	5	mg/kg	<5	<5	**10**	**7**	**8**
Iron	7439-89-6	0.005	%	**0.651**	----	**2.95**	**1.15**	----
Iron	7439-89-6	50	mg/kg	----	**6860**	----	----	**11700**
Lead	7439-92-1	5	mg/kg	**5**	**6**	**18**	**12**	**13**
Manganese	7439-96-5	5	mg/kg	**62**	**93**	**54**	**1080**	**414**
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	<2	<2
Nickel	7440-02-0	2	mg/kg	**2**	**3**	**11**	**11**	**9**
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Silver	7440-22-4	2	mg/kg	<2	<2	<2	<2	<2
Tin	7440-31-5	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	**11**	**11**	**36**	**12**	**12**
Zinc	7440-66-6	5	mg/kg	<5	<5	**9**	**23**	**23**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	<20	----	<20	<20	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	----	<0.1	<0.1	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	**0.5**	----	**1.8**	**0.2**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	**0.5**	----	**1.8**	**0.2**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	**1140**	----	**300**	**1800**	----
EK062: Total Nitrogen as N (TKN + NOx)								
^ Total Nitrogen as N	----	20	mg/kg	**1140**	----	**300**	**1800**	----
EK067G: Total Phosphorus as P by Discrete Analyser								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EK067G: Total Phosphorus as P by Discrete Analyser - Continued								
Total Phosphorus as P	----	2	mg/kg	**276**	----	**158**	**266**	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**3.1**	----	<0.5	**4.4**	----
Total Organic Carbon	----	0.5	%	**1.8**	----	<0.5	**2.5**	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP068B: Organophosphorus Pesticides (OP)								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	<5	<5	<5
2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	<5	<5	<5
4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	<5	<5	<5
2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	<5	<5	<5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	<5	<5	<5
Chloromethane	74-87-3	5	mg/kg	<5	<5	<5	<5	<5
Vinyl chloride	75-01-4	5	mg/kg	<5	<5	<5	<5	<5
Bromomethane	74-83-9	5	mg/kg	<5	<5	<5	<5	<5
Chloroethane	75-00-3	5	mg/kg	<5	<5	<5	<5	<5
Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	<5	<5	<5
1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EP074E: Halogenated Aliphatic Compounds - Continued								
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP074G: Trihalomethanes								
Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	<0.001	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	<0.0005	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	<0.0005	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	<0.0005	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	<0.0005	<0.0005	----
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	<0.0002	<0.0002	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**84.6**	**86.2**	**85.6**	**91.8**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**98.5**	**101**	**97.9**	**112**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**108**	**108**	**97.2**	**125**	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.5	%	**79.8**	**89.1**	**89.1**	**80.7**	**87.8**
Toluene-D8	2037-26-5	0.5	%	**74.4**	**84.5**	**81.5**	**68.9**	**81.2**
4-Bromofluorobenzene	460-00-4	0.5	%	**84.1**	**89.2**	**86.1**	**76.1**	**86.6**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**86.1**	**87.2**	**88.3**	**84.6**	**85.9**
Anthracene-d10	1719-06-8	0.5	%	**103**	**104**	**108**	**106**	**106**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**HA02_0.1**	**QC01_20210819**	**HA02_0.5**	**HA03_0.1**	**QA03_20210819**
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116590-018**	**EM2116590-019**	**EM2116590-020**	**EM2116590-021**	**EM2116590-022**
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued								
4-Terphenyl-d14	1718-51-0	0.5	%	**89.8**	**91.9**	**91.3**	**89.0**	**89.6**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**76.2**	**86.6**	**87.3**	**76.7**	**83.7**
Toluene-D8	2037-26-5	0.2	%	**79.8**	**90.0**	**89.0**	**73.7**	**85.0**
4-Bromofluorobenzene	460-00-4	0.2	%	**90.2**	**91.9**	**93.9**	**84.0**	**92.4**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**125**	**----**	**111**	**106**	**----**
13C8-PFOA	----	0.0002	%	**104**	**----**	**107**	**104**	**----**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	**7.0**	**4.4**	**5.3**	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**7.4**	**5.6**	**6.3**	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**318**	**25**	**60**	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.3**	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	**0.008**	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**20.5**	**21.2**	**20.1**	----	----
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**3140**	**40000**	**16700**	----	----
EA167: Corrosion Classification (per AS2159-2009)								
ø **Exposure Classification - Concrete Piles Soil Condition A**	----	-	-	**Mild**	**Mild**	**Mild**	----	----
ø **Exposure Classification - Concrete Piles Soil Condition B**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	----	----
ø **Exposure Classification - Steel Piles Soil Condition A**	----	-	-	**Mild**	**Non Aggressive**	**Non Aggressive**	----	----
ø **Exposure Classification - Steel Piles Soil Condition B**	----	-	-	**Non Aggressive**	**Non Aggressive**	**Non Aggressive**	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
ED006: Exchangeable Cations on Alkaline Soils								
ø **Exchangeable Calcium**	----	0.2	meq/100g	**3.5**	----	----	----	----
ø **Exchangeable Magnesium**	----	0.2	meq/100g	**6.7**	----	----	----	----
ø **Exchangeable Potassium**	----	0.2	meq/100g	**0.2**	----	----	----	----
ø **Exchangeable Sodium**	----	0.2	meq/100g	**1.2**	----	----	----	----
ø **Cation Exchange Capacity**	----	0.2	meq/100g	**11.6**	----	----	----	----
ø **Exchangeable Calcium Percent**	----	0.2	%	**29.8**	----	----	----	----
ø **Exchangeable Magnesium Percent**	----	0.2	%	**57.9**	----	----	----	----
ø **Exchangeable Potassium Percent**	----	0.2	%	**2.0**	----	----	----	----
ø **Exchangeable Sodium Percent**	----	0.2	%	**10.2**	----	----	----	----
ø **Calcium/Magnesium Ratio**	----	0.2	-	**0.5**	----	----	----	----
ø **Magnesium/Potassium Ratio**	----	0.2	-	**28.7**	----	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	**5.6**	**3.9**	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	**3.5**	**9.3**	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	**0.3**	**0.3**	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	**0.5**	**2.0**	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	**9.9**	**15.5**	----	----
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**40**	**10**	**60**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**440**	**20**	**10**	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**10600**	**19200**	**24700**	----	----
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	----	----
Arsenic	7440-38-2	5	mg/kg	<5	**6**	**14**	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	**3**	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<5	----	----
Chromium	7440-47-3	2	mg/kg	**21**	**34**	**58**	----	----
Cobalt	7440-48-4	2	mg/kg	**7**	**6**	**26**	----	----
Copper	7440-50-8	5	mg/kg	**12**	**7**	**18**	----	----
Iron	7439-89-6	0.005	%	**2.14**	**3.38**	**6.81**	----	----
Lead	7439-92-1	5	mg/kg	**15**	**12**	**34**	----	----
Manganese	7439-96-5	5	mg/kg	**206**	**106**	**108**	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EG005(ED093)T: Total Metals by ICP-AES - Continued								
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	----	----
Nickel	7440-02-0	2	mg/kg	**18**	**7**	**28**	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----
Silver	7440-22-4	2	mg/kg	<2	<2	<2	----	----
Tin	7440-31-5	5	mg/kg	<5	<5	<5	----	----
Vanadium	7440-62-2	5	mg/kg	**16**	**87**	**170**	----	----
Zinc	7440-66-6	5	mg/kg	**23**	**7**	**8**	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	----	<20	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	<0.1	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	**0.6**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	**0.6**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	----	**1900**	----	----	----
EK062: Total Nitrogen as N (TKN + NOx)								
^ **Total Nitrogen as N**	----	20	mg/kg	----	**1900**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	2	mg/kg	----	**366**	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	<0.5	**3.4**	**0.8**	----	----
Total Organic Carbon	----	0.5	%	<0.5	**2.0**	<0.5	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	----	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	----	----	----
EP074A: Monocyclic Aromatic Hydrocarbons								
Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
EP074B: Oxygenated Compounds								
Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	<5	----	----
2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	<5	----	----
4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	<5	----	----
2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	<5	----	----
EP074C: Sulfonated Compounds								
Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	<5	----	----
Chloromethane	74-87-3	5	mg/kg	<5	<5	<5	----	----
Vinyl chloride	75-01-4	5	mg/kg	<5	<5	<5	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EP074E: Halogenated Aliphatic Compounds - Continued								
Bromomethane	74-83-9	5	mg/kg	<5	<5	<5	----	----
Chloroethane	75-00-3	5	mg/kg	<5	<5	<5	----	----
Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	<5	----	----
1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
EP074F: Halogenated Aromatic Compounds								
Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EP074G: Trihalomethanes								
Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**HA03_1.0**	**HA04_0.1**	**HA04_0.88**	----	----
			Sampling date / time	18-Aug-2021 00:00	18-Aug-2021 00:00	18-Aug-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	**EM2116590-024**	**EM2116590-025**	**EM2116590-027**	--------	--------
				Result	Result	Result	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**89.2**	**90.8**	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**98.7**	**112**	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**115**	**104**	----	----	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.5	%	**86.6**	**88.7**	**80.1**	----	----
Toluene-D8	2037-26-5	0.5	%	**71.7**	**77.3**	**73.7**	----	----
4-Bromofluorobenzene	460-00-4	0.5	%	**75.1**	**83.7**	**79.4**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**88.4**	**86.8**	**83.6**	----	----
Anthracene-d10	1719-06-8	0.5	%	**109**	**107**	**106**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**92.1**	**91.3**	**87.1**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**82.9**	**83.7**	**75.7**	----	----
Toluene-D8	2037-26-5	0.2	%	**77.4**	**83.5**	**78.8**	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**88.1**	**89.5**	**80.8**	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**113**	**111**	**115**	----	----
13C8-PFOA	----	0.0002	%	**105**	**101**	**99.4**	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**RN_20210818**	**TB_20210818**	**RN_20210819**	----	----
			Sampling date / time	20-Aug-2021 00:00	20-Aug-2021 00:00	20-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-015**	**EM2116590-016**	**EM2116590-017**	--------	--------
				Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	**0.01**	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	----	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	<0.001	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	**0.002**	----	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	----	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	<0.001	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	----	<0.001	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	<0.005	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	<0.05	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	**0.21**	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	<0.0001	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	----	<0.01	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	**0.01**	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	**0.01**	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.2	----	<0.2	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	<0.2	----	<0.2	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**RN_20210818**	**TB_20210818**	**RN_20210819**	----	----
			Sampling date / time	20-Aug-2021 00:00	20-Aug-2021 00:00	20-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-015**	**EM2116590-016**	**EM2116590-017**	--------	--------
				Result	Result	Result	----	----
EK067G: Total Phosphorus as P by Discrete Analyser - Continued								
Total Phosphorus as P	----	0.01	mg/L	<0.01	----	<0.01	----	----
EP066: Polychlorinated Biphenyls (PCB)								
^ **Total Polychlorinated biphenyls**	----	1	µg/L	<1	----	<1	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	----	<0.5	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	----	<0.5	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	----	<0.5	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	----	<0.5	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	----	<0.5	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	----	<0.5	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	----	<0.5	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	----	<0.5	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	----	<0.5	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	----	<0.5	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	----	<0.5	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	----	<0.5	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	----	<0.5	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	----	<0.5	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	----	<0.5	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	----	<0.5	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	----	<0.5	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	----	<0.5	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	----	<2.0	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	----	<0.5	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	----	<2.0	----	----
^ **Total Chlordane (sum)**	----	0.5	µg/L	<0.5	----	<0.5	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	<0.5	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.5	µg/L	<0.5	----	<0.5	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	----	<0.5	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	----	<0.5	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	----	<2.0	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	----	<0.5	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**RN_20210818**	**TB_20210818**	**RN_20210819**	**----**	**----**
			Sampling date / time	20-Aug-2021 00:00	20-Aug-2021 00:00	20-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-015**	**EM2116590-016**	**EM2116590-017**	**--------**	**--------**
				Result	Result	Result	----	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Diazinon	333-41-5	0.5	µg/L	<0.5	----	<0.5	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	----	<0.5	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	----	<2.0	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	----	<0.5	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	----	<0.5	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	----	<0.5	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	----	<2.0	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	----	<0.5	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	----	<0.5	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	----	<0.5	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	----	<0.5	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	----	<0.5	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	----	<0.5	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	----	<0.5	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	----	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	<1.0	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	<1.0	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	----	<0.5	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L	<0.5	----	<0.5	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**RN_20210818**	**TB_20210818**	**RN_20210819**	**----**	**----**
			Sampling date / time	20-Aug-2021 00:00	20-Aug-2021 00:00	20-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-015**	**EM2116590-016**	**EM2116590-017**	**--------**	**--------**
				Result	Result	Result	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	<50	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	----	<100	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	----	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ **Total Xylenes**	----	2	µg/L	<2	<2	<2	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	<0.01	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	<0.02	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**RN_20210818**	**TB_20210818**	**RN_20210819**	----	----
			Sampling date / time	20-Aug-2021 00:00	20-Aug-2021 00:00	20-Aug-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116590-015**	**EM2116590-016**	**EM2116590-017**	--------	--------
				Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	<0.01	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	<0.01	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	1	%	**81.4**	----	**86.5**	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**80.4**	----	**86.9**	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**75.7**	----	**85.3**	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	**27.4**	----	**26.5**	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	**76.2**	----	**72.2**	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	**89.4**	----	**92.9**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	**86.3**	----	**84.7**	----	----
Anthracene-d10	1719-06-8	1.0	%	**82.8**	----	**88.4**	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	**79.4**	----	**83.3**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**105**	**106**	**111**	----	----
Toluene-D8	2037-26-5	2	%	**103**	**102**	**105**	----	----
4-Bromofluorobenzene	460-00-4	2	%	**101**	**99.2**	**102**	----	----
EP231S: PFAS Surrogate								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RN_20210818**	**TB_20210818**	**RN_20210819**	----	----
			Sampling date / time	20-Aug-2021 00:00	20-Aug-2021 00:00	20-Aug-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	**EM2116590-015**	**EM2116590-016**	**EM2116590-017**	--------	--------
				Result	Result	Result	----	----
EP231S: PFAS Surrogate - Continued								
13C4-PFOS	----	0.02	%	**102**	----	**102**	----	----
13C8-PFOA	----	0.02	%	**102**	----	**107**	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	36	140
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	62	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	40	139
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	62	122
Toluene-D8	2037-26-5	64	120
4-Bromofluorobenzene	460-00-4	66	124
EP074S: VOC Surrogates (Ultra-Trace)			
1.2-Dichloroethane-D4	17060-07-0	59	119
Toluene-D8	2037-26-5	55	117
4-Bromofluorobenzene	460-00-4	59	123
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP075S: Acid Extractable Surrogates (Waste Classification)			
Phenol-d6	13127-88-3	63	134
2-Chlorophenol-D4	93951-73-6	60	125
2.4.6-Tribromophenol	118-79-6	54	129
EP075T: Base/Neutral Extractable Surrogates (Waste Classification)			
Nitrobenzene-D5	4165-60-0	63	131
1.2-Dichlorobenzene-D4	2199-69-1	61	124
2-Fluorobiphenyl	321-60-8	69	131
Anthracene-d10	1719-06-8	70	133
4-Terphenyl-d14	1718-51-0	59	141
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP066S: PCB Surrogate			

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP066S: PCB Surrogate - Continued			
Decachlorobiphenyl	2051-24-3	41	125
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	117
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	51	127
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2.4.6-Tribromophenol	118-79-6	26	133
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA033-B: Potential Acidity

(SOIL) EA033-C: Acid Neutralising Capacity

(SOIL) EA033-D: Retained Acidity

(SOIL) EA033-A: Actual Acidity

(SOIL) EA033-E: Acid Base Accounting

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA152: Soil Particle Density

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM2116590**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: JYE GROGAN	Contact	: Peter Ravlic
Address	: PO BOX 312 FLINDERS LANE MELBOURNE VIC AUSTRALIA 8009	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: [redacted]	E-mail	: [redacted]
Telephone	: ----	Telephone	:
Facsimile	: ----	Facsimile	:
Project	: IS311800	Page	: 1 of 4
Order number	: IS311800	Quote number	: ES2018SINKNI0012 (MEBQ/003/18 - Vic Only - Primary Work Only)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: BG, JG		

Dates

Date Samples Received	: 20-Aug-2021 15:00	Issue Date	: 20-Aug-2021
Client Requested Due Date	: 25-Aug-2021	Scheduled Reporting Date	: **25-Aug-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 5	Temperature	: 8.9°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 27 / 21

General Comments

- This report contains the following information:
    - Sample Container(s)/Preservation Non-Compliances
    - Summary of Sample(s) and Requested Analysis
    - Proactive Holding Time Report
    - Requested Deliverables
- **PSD bags were not received for samples 003, 005, 020, 024, 025 and 027.**
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale, ALS Brisbane and ALS Newcastle.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Preliminary results will be available on the scheduled reporting date listed in this report. However the final report with Chromium Suite analysis will be complete on 31/08/2021.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - Corr. Schedule 2 Soil on Steel & Concrete Piles (AS2159-2009)	SOIL - EA055-103 Moisture Content	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EG035T (solids) Total Mercury by FIMS	SOIL - EP231 (solids) PFAS - Short Suite (12 analytes)	SOIL - S-10 TRH/VOC/PAH	SOIL - S-13 OC/OP/PCB
EM2116590-001	18-Aug-2021 00:00	HA19_0.1	✓	✓	✓	✓	✓	✓	✓
EM2116590-002	18-Aug-2021 00:00	HA19_0.4	✓	✓	✓	✓	✓	✓	✓
EM2116590-003	18-Aug-2021 00:00	HA17_0.1	✓	✓	✓	✓	✓	✓	✓
EM2116590-005	18-Aug-2021 00:00	HA17_0.5	✓	✓	✓	✓	✓	✓	✓
EM2116590-007	18-Aug-2021 00:00	HA15_0.1	✓	✓	✓	✓	✓	✓	✓
EM2116590-009	18-Aug-2021 00:00	HA15_1.0	✓	✓	✓	✓	✓	✓	✓
EM2116590-010	18-Aug-2021 00:00	HA10_0.1	✓	✓			✓		
EM2116590-012	18-Aug-2021 00:00	HA05_0.1	✓	✓	✓	✓	✓	✓	✓
EM2116590-014	18-Aug-2021 00:00	HA05_1.0	✓	✓	✓	✓	✓	✓	
EM2116590-018	18-Aug-2021 00:00	HA02_0.1	✓	✓	✓	✓	✓	✓	✓
EM2116590-019	18-Aug-2021 00:00	QC01_20210819		✓	✓	✓		✓	✓
EM2116590-020	18-Aug-2021 00:00	HA02_0.5	✓	✓	✓	✓	✓	✓	✓
EM2116590-021	18-Aug-2021 00:00	HA03_0.1	✓	✓	✓	✓	✓	✓	✓
EM2116590-022	18-Aug-2021 00:00	QA03_20210819		✓	✓	✓		✓	
EM2116590-024	18-Aug-2021 00:00	HA03_1.0	✓	✓	✓	✓	✓	✓	✓
EM2116590-025	18-Aug-2021 00:00	HA04_0.1	✓	✓	✓	✓	✓	✓	✓
EM2116590-027	18-Aug-2021 00:00	HA04_0.88	✓	✓	✓	✓	✓	✓	

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	(On Hold) SOIL No analysis requested	SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - P-22 (Melb) minus PSD Soil Characterisation Suite (minus PSD)	SOIL - P-30/4 EPA 1828.2 Table 3 Suite EPA 1828.2 Table 3 Fill Material Suite
EM2116590-003	18-Aug-2021 00:00	HA17_0.1			✓	
EM2116590-004	20-Aug-2021 00:00	HA17_0.3		✓		
EM2116590-005	18-Aug-2021 00:00	HA17_0.5			✓	
EM2116590-006	18-Aug-2021 00:00	HA17_1.0	✓			
EM2116590-008	18-Aug-2021 00:00	HA15_0.5	✓			
EM2116590-009	18-Aug-2021 00:00	HA15_1.0		✓		
EM2116590-010	18-Aug-2021 00:00	HA10_0.1				✓

			(On Hold) SOIL No analysis requested	SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - P-22 (Melb) minus PSD Soil Characterisation Suite (minus PSD)	SOIL - P-30/4 EPA 1828.2 Table 3 Suite EPA 1828.2 Table 3 Fill Material Suite
EM2116590-011	18-Aug-2021 00:00	HA10_0.3	✓			
EM2116590-013	18-Aug-2021 00:00	HA05_0.5	✓			
EM2116590-020	18-Aug-2021 00:00	HA02_0.5			✓	
EM2116590-023	18-Aug-2021 00:00	HA03_0.5	✓			
EM2116590-024	18-Aug-2021 00:00	HA03_1.0		✓	✓	
EM2116590-025	18-Aug-2021 00:00	HA04_0.1			✓	
EM2116590-026	18-Aug-2021 00:00	HA04_0.5	✓			
EM2116590-027	18-Aug-2021 00:00	HA04_0.88			✓	

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - NT-8S NH3, NO2, NO3, NOX, TKN, TN, TP	SOIL - P-22 (Melb) Soil Characterisation Package
EM2116590-018	18-Aug-2021 00:00	HA02_0.1	✓	✓
EM2116590-020	18-Aug-2021 00:00	HA02_0.5	✓	
EM2116590-021	18-Aug-2021 00:00	HA03_0.1	✓	✓
EM2116590-025	18-Aug-2021 00:00	HA04_0.1	✓	

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EG035T Total Mercury	WATER - EP231 PFAS - Short Suite (12 analytes)
EM2116590-015	20-Aug-2021 00:00	RN_20210818	✓	✓	✓
EM2116590-017	20-Aug-2021 00:00	RN_20210819	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - NT-08 Total Nitrogen + NO2 + NO3 + NH3 + Total P	WATER - W-07 TRH/BTEXN/PAH	WATER - W-13 OC/OP/PCB	WATER - W-18 TRH(C6 - C9)/BTEXN
EM2116590-015	20-Aug-2021 00:00	RN_20210818	✓	✓	✓	
EM2116590-016	20-Aug-2021 00:00	TB_20210818				✓
EM2116590-017	20-Aug-2021 00:00	RN_20210819	✓	✓	✓	

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ARTHUR TEO

- *AU Certificate of Analysis - NATA (COA)	Email	[redacted]
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	[redacted]
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	[redacted]
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	[redacted]
- A4 - AU Tax Invoice (INV)	Email	[redacted]
- Attachment - Report (SUBCO)	Email	[redacted]
- Chain of Custody (CoC) (COC)	Email	[redacted]
- EDI Format - ESDAT (ESDAT)	Email	[redacted]
- EDI Format - XTab (XTAB)	Email	[redacted]

BENJAMIN GRASSO

- *AU Certificate of Analysis - NATA (COA)	Email	[redacted]
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	[redacted]
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	[redacted]
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	[redacted]
- Attachment - Report (SUBCO)	Email	[redacted]
- Chain of Custody (CoC) (COC)	Email	[redacted]
- EDI Format - ESDAT (ESDAT)	Email	[redacted]
- EDI Format - XTab (XTAB)	Email	[redacted]

JACOBS RESULTS

- EDI Format - ESDAT (ESDAT)	Email	[redacted]

JYE GROGAN

- *AU Certificate of Analysis - NATA (COA)	Email	[redacted]
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	[redacted]
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	[redacted]
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	[redacted]
- A4 - AU Tax Invoice (INV)	Email	[redacted]
- Attachment - Report (SUBCO)	Email	[redacted]
- Chain of Custody (CoC) (COC)	Email	[redacted]
- EDI Format - ESDAT (ESDAT)	Email	[redacted]
- EDI Format - XTab (XTAB)	Email	[redacted]

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2116590**	Page	: 1 of 40
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: JYE GROGAN	Contact	: Peter Ravlic
Address	: PO BOX 312 FLINDERS LANE MELBOURNE VIC AUSTRALIA 8009	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: IS311800	Date Samples Received	: 20-Aug-2021
Order number	: IS311800	Date Analysis Commenced	: 21-Aug-2021
C-O-C number	: ----	Issue Date	: 27-Aug-2021
Sampler	: BG, JG		
Site	:		
Quote number	: MEBQ/003/18 - Vic Only - Primary Work Only		
No. of samples received	: 27		
No. of samples analysed	: 21		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3859900)									
EM2116590-001	HA19_0.1	EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	59	54	9.5	0% - 50%
		EG005T: Iron	7439-89-6	50	mg/kg	8230	8740	5.9	0% - 20%
EM2116590-001	HA19_0.1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	14	13	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	2	12	131	No Limit
		EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	14	92.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	7	36.6	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Tin	7440-31-5	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	27	14	60.9	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	8	32	123	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	2700	2560	5.2	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
EM2116590-010	HA10_0.1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	10	24.7	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	11	12	11.2	No Limit
		EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	<2	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3859900) - continued									
EM2116590-010	HA10_0.1	EG005T: Nickel	7440-02-0	2	mg/kg	10	11	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	12	11	12.6	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	61	55	10.9	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	5	<5	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	182	193	5.8	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Tin	7440-31-5	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	15	13	17.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	46	43	5.3	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	2030	1910	6.5	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	17000	14600	15.1	0% - 20%
EA001: pH in soil using 0.01M CaCl extract (QC Lot: 3862260)									
EM2116553-009	Anonymous	EA001: pH (CaCl2)	----	0.1	pH Unit	5.1	5.0	0.0	0% - 20%
EM2116590-025	HA04_0.1	EA001: pH (CaCl2)	----	0.1	pH Unit	4.4	4.4	0.0	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 3859881)									
EM2116590-014	HA05_1.0	EA002: pH Value	----	0.1	pH Unit	8.1	8.5	4.8	0% - 20%
EM2116590-018	HA02_0.1	EA002: pH Value	----	0.1	pH Unit	5.8	5.7	1.7	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3859880)									
EM2116590-014	HA05_1.0	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	725	826	13.0	0% - 20%
EM2116590-018	HA02_0.1	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	20	20	0.0	0% - 50%
EA033-A: Actual Acidity (QC Lot: 3865270)									
EM2116590-004	HA17_0.3	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.03	0.03	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	16	18	8.8	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.7	4.7	0.0	0% - 20%
ES2130320-013	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	8.5	8.5	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 3865270)									
EM2116590-004	HA17_0.3	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.012	0.010	14.1	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
ES2130320-013	Anonymous	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.016	0.013	22.2	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3859997)									
EM2116590-001	HA19_0.1	EA055: Moisture Content	----	0.1	%	1.7	1.9	10.2	0% - 50%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3859997) - continued									
EM2116590-019	QC01_20210819	EA055: Moisture Content	----	0.1	%	11.3	11.7	3.4	0% - 20%
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 3860958)									
EM2116217-005	Anonymous	ED006: Calcium/Magnesium Ratio	----	0.1	-	2.9	2.9	0.0	0% - 50%
		ED006: Magnesium/Potassium Ratio	----	0.1	-	1.5	1.5	0.0	No Limit
		ED006: Exchangeable Calcium Percent	----	0.2	%	60.6	60.6	0.0	0% - 20%
		ED006: Exchangeable Magnesium Percent	----	0.2	%	21.2	21.2	0.0	0% - 20%
		ED006: Exchangeable Potassium Percent	----	0.2	%	13.8	13.8	0.0	0% - 20%
		ED006: Exchangeable Sodium Percent	----	0.2	%	4.4	4.4	0.0	0% - 20%
		ED006: Exchangeable Calcium	----	0.2	meq/100g	14.8	14.9	0.0	0% - 20%
		ED006: Exchangeable Magnesium	----	0.2	meq/100g	5.2	5.2	0.0	0% - 20%
		ED006: Exchangeable Potassium	----	0.2	meq/100g	3.4	3.4	0.0	0% - 50%
		ED006: Exchangeable Sodium	----	0.2	meq/100g	1.1	1.1	0.0	No Limit
		ED006: Cation Exchange Capacity	----	0.2	meq/100g	24.4	24.5	0.6	0% - 20%
EM2116590-024	HA03_1.0	ED006: Calcium/Magnesium Ratio	----	0.1	-	0.5	0.5	0.0	No Limit
		ED006: Magnesium/Potassium Ratio	----	0.1	-	28.7	28.9	0.8	0% - 20%
		ED006: Exchangeable Calcium Percent	----	0.2	%	29.8	29.7	0.0	0% - 20%
		ED006: Exchangeable Magnesium Percent	----	0.2	%	57.9	57.9	0.0	0% - 20%
		ED006: Exchangeable Potassium Percent	----	0.2	%	2.0	2.0	0.0	0% - 50%
		ED006: Exchangeable Sodium Percent	----	0.2	%	10.2	10.3	0.0	0% - 20%
		ED006: Exchangeable Calcium	----	0.2	meq/100g	3.5	3.6	4.6	0% - 50%
		ED006: Exchangeable Magnesium	----	0.2	meq/100g	6.7	7.1	5.0	0% - 20%
		ED006: Exchangeable Potassium	----	0.2	meq/100g	0.2	0.2	0.0	No Limit
		ED006: Exchangeable Sodium	----	0.2	meq/100g	1.2	1.3	0.0	No Limit
		ED006: Cation Exchange Capacity	----	0.2	meq/100g	11.6	12.2	5.0	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3860957)									
EM2116590-003	HA17_0.1	ED007: Exchangeable Calcium	----	0.1	meq/100g	2.4	2.4	0.0	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	1.7	1.7	0.0	0% - 50%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	4.4	4.4	0.0	0% - 20%
EM2116590-021	HA03_0.1	ED007: Exchangeable Calcium	----	0.1	meq/100g	6.7	6.8	1.5	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	3.9	4.0	0.0	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	11.2	11.4	1.5	0% - 20%
ED040S: Soluble Major Anions (QC Lot: 3859879)									
EM2116590-014	HA05_1.0	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	640	640	0.0	0% - 20%
EM2116590-018	HA02_0.1	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	<10	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3859882)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED045G: Chloride by Discrete Analyser (QC Lot: 3859882) - continued									
EM2116590-014	HA05_1.0	ED045G: Chloride	16887-00-6	10	mg/kg	860	870	1.3	0% - 20%
EM2116590-018	HA02_0.1	ED045G: Chloride	16887-00-6	10	mg/kg	<10	<10	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3859899)									
EM2116590-001	HA19_0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EM2116590-010	HA10_0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG048: Hexavalent Chromium (Alkaline Digest) (QC Lot: 3864589)									
EM2116495-052	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 3860972)									
EM2116463-010	Anonymous	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.0	No Limit
EM2116475-047	Anonymous	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.0	No Limit
EK040T: Fluoride Total (QC Lot: 3859562)									
EM2116461-004	Anonymous	EK040T: Fluoride	16984-48-8	40	mg/kg	120	130	7.8	No Limit
EK055: Ammonia as N (QC Lot: 3859908)									
EM2116584-001	Anonymous	EK055: Ammonia as N	7664-41-7	20	mg/kg	<20	<20	0.0	No Limit
EM2116590-021	HA03_0.1	EK055: Ammonia as N	7664-41-7	20	mg/kg	<20	<20	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3859885)									
EM2116590-018	HA02_0.1	EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3859884)									
EM2116590-018	HA02_0.1	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	0.5	0.4	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 3863318)									
EM2116590-018	HA02_0.1	EK061G: Total Kjeldahl Nitrogen as N	----	20	mg/kg	1140	1110	2.6	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3863317)									
EM2116590-018	HA02_0.1	EK067G: Total Phosphorus as P	----	2	mg/kg	276	272	1.5	0% - 20%
EP004: Organic Matter (QC Lot: 3858973)									
EM2116369-047	Anonymous	EP004: Organic Matter	----	0.5	%	<0.5	<0.5	0.0	No Limit
		EP004: Total Organic Carbon	----	0.5	%	<0.5	<0.5	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3859505)									
EM2115963-001	Anonymous	EP066-EM: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EM2116273-005	Anonymous	EP066-EM: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3859510)									
EM2116590-001	HA19_0.1	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EM2116590-021	HA03_0.1	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3859511)									
EM2116590-001	HA19_0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3859511) - continued									
EM2116590-001	HA19_0.1	EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EM2116590-021	HA03_0.1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3859511)									
EM2116590-001	HA19_0.1	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3859511) - continued									
EM2116590-001	HA19_0.1	EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EM2116590-021	HA03_0.1	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 3859482)									
EM2116217-003	Anonymous	EP074-UT: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP074-UT: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074-UT: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 3859482) - continued									
EM2116217-003	Anonymous	EP074-UT: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074-UT: Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074-UT: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116455-017	Anonymous	EP074-UT: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP074-UT: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074-UT: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074-UT: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074-UT: Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074-UT: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074A: Monocyclic Aromatic Hydrocarbons (QC Lot: 3859489)									
EM2116590-001	HA19_0.1	EP074: Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116590-020	HA02_0.5	EP074: Styrene	100-42-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074B: Oxygenated Compounds (QC Lot: 3859489)									
EM2116590-001	HA19_0.1	EP074: Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	0.0	No Limit
EM2116590-020	HA02_0.5	EP074: Vinyl Acetate	108-05-4	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 2-Butanone (MEK)	78-93-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	<5	0.0	No Limit
		EP074: 2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	<5	0.0	No Limit
EP074C: Sulfonated Compounds (QC Lot: 3859489)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP074C: Sulfonated Compounds (QC Lot: 3859489) - continued									
EM2116590-001	HA19_0.1	EP074: Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116590-020	HA02_0.5	EP074: Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074D: Fumigants (QC Lot: 3859489)									
EM2116590-001	HA19_0.1	EP074: 2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116590-020	HA02_0.5	EP074: 2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 3859489)									
EM2116590-001	HA19_0.1	EP074: 1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Chloromethane	74-87-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Bromomethane	74-83-9	5	mg/kg	<5	<5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP074E: Halogenated Aliphatic Compounds (QC Lot: 3859489) - continued									
EM2116590-001	HA19_0.1	EP074: Chloroethane	75-00-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	0.0	No Limit
EM2116590-020	HA02_0.5	EP074: 1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Iodomethane	74-88-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Chloromethane	74-87-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Bromomethane	74-83-9	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Chloroethane	75-00-3	5	mg/kg	<5	<5	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	5	mg/kg	<5	<5	0.0	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 3859489)									
EM2116590-001	HA19_0.1	EP074: Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP074F: Halogenated Aromatic Compounds (QC Lot: 3859489) - continued									
EM2116590-020	HA02_0.5	EP074: Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 3859489)									
EM2116590-001	HA19_0.1	EP074: Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116590-020	HA02_0.5	EP074: Chloroform	67-66-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP074: Bromoform	75-25-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP074H: Naphthalene (QC Lot: 3859482)									
EM2116217-003	Anonymous	EP074-UT: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EM2116455-017	Anonymous	EP074-UT: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP074I: Volatile Halogenated Compounds (QC Lot: 3859482)									
EM2116217-003	Anonymous	EP074-UT: 1.1-Dichloroethene	75-35-4	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: cis-1.2-Dichloroethene	156-59-2	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: 1.1.1-Trichloroethane	71-55-6	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: Carbon Tetrachloride	56-23-5	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: 1.1.1.2-Tetrachloroethane	630-20-6	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: 1.2.4-Trichlorobenzene	120-82-1	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: Vinyl chloride	75-01-4	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: trans-1.2-Dichloroethene	156-60-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Chloroform	67-66-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.2-Dichloroethane	107-06-2	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Trichloroethene	79-01-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Tetrachloroethene	127-18-4	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.1.2.2-Tetrachloroethane	79-34-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Hexachlorobutadiene	87-68-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Chlorobenzene	108-90-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.4-Dichlorobenzene	106-46-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.2-Dichlorobenzene	95-50-1	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.1.2-Trichloroethane	79-00-5	0.04	mg/kg	<0.04	<0.04	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP074I: Volatile Halogenated Compounds (QC Lot: 3859482) - continued									
EM2116217-003	Anonymous	EP074-UT: Methylene chloride	75-09-2	0.4	mg/kg	<0.4	<0.4	0.0	No Limit
EM2116455-017	Anonymous	EP074-UT: 1.1-Dichloroethene	75-35-4	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: cis-1.2-Dichloroethene	156-59-2	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: 1.1.1-Trichloroethane	71-55-6	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: Carbon Tetrachloride	56-23-5	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: 1.1.1.2-Tetrachloroethane	630-20-6	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: 1.2.4-Trichlorobenzene	120-82-1	0.01	mg/kg	<0.01	<0.01	0.0	No Limit
		EP074-UT: Vinyl chloride	75-01-4	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: trans-1.2-Dichloroethene	156-60-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Chloroform	67-66-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.2-Dichloroethane	107-06-2	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Trichloroethene	79-01-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Tetrachloroethene	127-18-4	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.1.2.2-Tetrachloroethane	79-34-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Hexachlorobutadiene	87-68-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: Chlorobenzene	108-90-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.4-Dichlorobenzene	106-46-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.2-Dichlorobenzene	95-50-1	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP074-UT: 1.1.2-Trichloroethane	79-00-5	0.04	mg/kg	<0.04	<0.04	0.0	No Limit
		EP074-UT: Methylene chloride	75-09-2	0.4	mg/kg	<0.4	<0.4	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859509)									
EM2116590-001	HA19_0.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116590-021	HA03_0.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859509) - continued									
EM2116590-021	HA03_0.1	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP075A: Phenolic Compounds (Halogenated) (QC Lot: 3859504)									
EM2115963-001	Anonymous	EP075-EM: 2-Chlorophenol	95-57-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.4-Dichlorophenol	120-83-2	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.6-Dichlorophenol	87-65-0	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 4-Chloro-3-methylphenol	59-50-7	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.3.5.6-Tetrachlorophenol	935-95-5	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.4.5-Trichlorophenol	95-95-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 2.4.6-Trichlorophenol	88-06-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 2.3.4.5 & 2.3.4.6-Tetrachlorophenol	4901-51-3/58-90-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: Pentachlorophenol	87-86-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EM2116273-005	Anonymous	EP075-EM: 2-Chlorophenol	95-57-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.4-Dichlorophenol	120-83-2	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.6-Dichlorophenol	87-65-0	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 4-Chloro-3-methylphenol	59-50-7	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.3.5.6-Tetrachlorophenol	935-95-5	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 2.4.5-Trichlorophenol	95-95-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 2.4.6-Trichlorophenol	88-06-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 2.3.4.5 & 2.3.4.6-Tetrachlorophenol	4901-51-3/58-90-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: Pentachlorophenol	87-86-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075A: Phenolic Compounds (Non-halogenated) (QC Lot: 3859504)									
EM2115963-001	Anonymous	EP075-EM: Phenol	108-95-2	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 2-Methylphenol	95-48-7	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075A: Phenolic Compounds (Non-halogenated) (QC Lot: 3859504) - continued									
EM2115963-001	Anonymous	EP075-EM: 2-Nitrophenol	88-75-5	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 2.4-Dimethylphenol	105-67-9	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 2.4-Dinitrophenol	51-28-5	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: 4-Nitrophenol	100-02-7	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: 2-Methyl-4.6-dinitrophenol	8071-51-0	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: Dinoseb	88-85-7	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: 2-Cyclohexyl-4.6-Dinitrophenol	131-89-5	5	mg/kg	<5	<5	0.0	No Limit
EM2116273-005	Anonymous	EP075-EM: Phenol	108-95-2	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 2-Methylphenol	95-48-7	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 2-Nitrophenol	88-75-5	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 2.4-Dimethylphenol	105-67-9	1	mg/kg	<1	<1	0.0	No Limit
		EP075-EM: 2.4-Dinitrophenol	51-28-5	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: 4-Nitrophenol	100-02-7	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: 2-Methyl-4.6-dinitrophenol	8071-51-0	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: Dinoseb	88-85-7	5	mg/kg	<5	<5	0.0	No Limit
		EP075-EM: 2-Cyclohexyl-4.6-Dinitrophenol	131-89-5	5	mg/kg	<5	<5	0.0	No Limit
EP075B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859504)									
EM2115963-001	Anonymous	EP075-EM: Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benzo(b+j) & Benzo(k)fluoranthene	205-99-2 207-08-9	1	mg/kg	<1.0	<1.0	0.0	No Limit
EM2116273-005	Anonymous	EP075-EM: Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859504) - continued									
EM2116273-005	Anonymous	EP075-EM: Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075-EM: Benzo(b+j) & Benzo(k)fluoranthene	205-99-2 207-08-9	1	mg/kg	<1.0	<1.0	0.0	No Limit
EP075I: Organochlorine Pesticides (QC Lot: 3859504)									
EM2115963-001	Anonymous	EP075-EM: alpha-BHC	319-84-6	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Hexachlorobenzene (HCB)	118-74-1	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: beta-BHC	319-85-7	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: gamma-BHC	58-89-9	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: delta-BHC	319-86-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Heptachlor	76-44-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Aldrin	309-00-2	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Heptachlor epoxide	1024-57-3	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: cis-Chlordane	5103-71-9	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: trans-Chlordane	5103-74-2	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endosulfan 1	959-98-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Dieldrin	60-57-1	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endrin aldehyde	7421-93-4	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endrin	72-20-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endosulfan 2	33213-65-9	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endosulfan sulfate	1031-07-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Methoxychlor	72-43-5	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 4.4`-DDT	50-29-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
EM2116273-005	Anonymous	EP075-EM: alpha-BHC	319-84-6	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Hexachlorobenzene (HCB)	118-74-1	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: beta-BHC	319-85-7	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: gamma-BHC	58-89-9	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: delta-BHC	319-86-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Heptachlor	76-44-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Aldrin	309-00-2	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Heptachlor epoxide	1024-57-3	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: cis-Chlordane	5103-71-9	0.03	mg/kg	<0.03	<0.03	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075I: Organochlorine Pesticides (QC Lot: 3859504) - continued									
EM2116273-005	Anonymous	EP075-EM: trans-Chlordane	5103-74-2	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endosulfan 1	959-98-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Dieldrin	60-57-1	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endrin aldehyde	7421-93-4	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endrin	72-20-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endosulfan 2	33213-65-9	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Endosulfan sulfate	1031-07-8	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: Methoxychlor	72-43-5	0.03	mg/kg	<0.03	<0.03	0.0	No Limit
		EP075-EM: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP075-EM: 4.4`-DDT	50-29-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859482)									
EM2116217-003	Anonymous	EP074-UT: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EM2116455-017	Anonymous	EP074-UT: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859490)									
EM2116590-001	HA19_0.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EM2116590-020	HA02_0.5	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859506)									
EM2115963-001	Anonymous	EP071-EM: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EM2116273-005	Anonymous	EP071-EM: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859512)									
EM2116590-001	HA19_0.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EM2116590-021	HA03_0.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859482)									
EM2116217-003	Anonymous	EP074-UT: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
		EP074-UT: C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	0.0	No Limit
EM2116455-017	Anonymous	EP074-UT: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
		EP074-UT: C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859490)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859490) - continued									
EM2116590-001	HA19_0.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EM2116590-020	HA02_0.5	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859506)									
EM2115963-001	Anonymous	EP071-EM: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EM2116273-005	Anonymous	EP071-EM: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071-EM: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859512)									
EM2116590-001	HA19_0.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EM2116590-021	HA03_0.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 3859490)									
EM2116590-001	HA19_0.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EM2116590-020	HA02_0.5	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3861242)									
EM2116043-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2116590-010	HA10_0.1	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3861242)									
EM2116043-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EM2116590-010	HA10_0.1	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3861242)									
EM2116043-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2116590-010	HA10_0.1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3861242)									
EM2116043-001	Anonymous	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2116590-010	HA10_0.1	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 3859771)									
EM2116412-001	Anonymous	EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3859772)									
EM2116412-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 3859772) - continued									
EM2116412-002	Anonymous	EG020A-T: Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.039	0.039	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.03	0.02	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3862355)									
EM2116590-015	RN_20210818	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3860205)									
EM2116483-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.17	0.16	6.7	0% - 50%
EM2116575-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	119	137	14.5	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3859181)									
EM2116578-019	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EM2116578-029	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3860206)									
EM2116575-004	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.39	0.39	0.0	0% - 20%
EM2116591-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.02	0.03	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 3859831)									
EM2116518-005	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.7	0.7	0.0	No Limit
EM2116550-005	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.8	0.9	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3859830)									
EM2116460-004	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.05	0.07	21.6	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3859119)									
EM2116590-015	RN_20210818	EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	<1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3859120)									
EM2116590-015	RN_20210818	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **WATER**				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3859120) - continued									
EM2116590-015	RN_20210818	EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3859120)									
EM2116590-015	RN_20210818	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.0	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859118)									
EM2116590-015	RN_20210818	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859118) - continued									
EM2116590-015	RN_20210818	EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	<1.0	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859013)									
EM2116587-046	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EM2116592-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859121)									
EM2116590-015	RN_20210818	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859013)									
EM2116587-046	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EM2116592-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859121)									
EM2116590-015	RN_20210818	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080: BTEXN (QC Lot: 3859013)									
EM2116587-046	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EM2116592-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 3859013) - continued									
EM2116592-003	Anonymous	EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3859548)									
EM2116590-017	RN_20210819	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3859548)									
EM2116590-017	RN_20210819	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3859548)									
EM2116590-017	RN_20210819	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3859548)									
EM2116590-017	RN_20210819	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3859900)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	15910 mg/kg	94.7	70.0	130
EG005T: Antimony	7440-36-0	5	mg/kg	<5	2.57 mg/kg	101	70.0	130
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	123 mg/kg	98.1	70.0	130
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.67 mg/kg	99.7	70.0	130
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.23 mg/kg	60.1	50.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	20.2 mg/kg	107	70.0	130
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	11.2 mg/kg	94.0	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	55.9 mg/kg	96.7	70.0	130
EG005T: Iron	7439-89-6	50	mg/kg	<50	33227 mg/kg	106	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	62.4 mg/kg	91.0	70.0	130
EG005T: Manganese	7439-96-5	5	mg/kg	<5	590 mg/kg	92.1	70.0	130
EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	2.19 mg/kg	91.0	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.4 mg/kg	98.6	70.0	130
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Silver	7440-22-4	2	mg/kg	<2	2.9 mg/kg	96.4	70.0	130
EG005T: Tin	7440-31-5	5	mg/kg	<5	5.33 mg/kg	85.4	70.0	130
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	61.3 mg/kg	99.6	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	162 mg/kg	75.7	70.0	130
EA010: Conductivity (1:5) (QCLot: 3859880)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1413 µS/cm	101	94.5	105
EA033-A: Actual Acidity (QCLot: 3865270)								
EA033: pH KCl (23A)	----	----	pH Unit	----	4.4 pH Unit	99.9	91.0	107
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	15 mole H+ / t	83.3	70.0	124
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 3865270)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.246 % S	103	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils (QCLot: 3860958)								
ED006: Exchangeable Calcium	----	0.2	meq/100g	<0.2	33 meq/100g	84.8	66.6	101
ED006: Exchangeable Magnesium	----	0.2	meq/100g	<0.2	32 meq/100g	91.4	66.9	120
ED006: Exchangeable Potassium	----	0.2	meq/100g	<0.2	2.2 meq/100g	96.0	72.8	119
ED006: Exchangeable Sodium	----	0.2	meq/100g	<0.2	5.6 meq/100g	88.2	67.5	112
ED006: Cation Exchange Capacity	----	0.2	meq/100g	<0.2	----	----	----	----

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
ED006: Exchangeable Cations on Alkaline Soils (QCLot: 3860958) - continued								
ED006: Exchangeable Calcium Percent	----	0.2	%	<0.2	----	----	----	----
ED006: Exchangeable Magnesium Percent	----	0.2	%	<0.2	----	----	----	----
ED006: Exchangeable Potassium Percent	----	0.2	%	<0.2	----	----	----	----
ED006: Exchangeable Sodium Percent	----	0.2	%	<0.2	----	----	----	----
ED006: Calcium/Magnesium Ratio	----	0.1	-	<0.1	----	----	----	----
ED006: Magnesium/Potassium Ratio	----	0.1	-	<0.1	----	----	----	----
ED007: Exchangeable Cations (QCLot: 3860957)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	24.13 meq/100g	93.5	80.0	130
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.96 meq/100g	97.9	72.2	130
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1.01 meq/100g	108	77.4	130
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.86 meq/100g	120	89.2	130
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED040S: Soluble Major Anions (QCLot: 3859879)								
ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	----	----	----	----
ED045G: Chloride by Discrete Analyser (QCLot: 3859882)								
ED045G: Chloride	16887-00-6	10	mg/kg	<10 <10	50 mg/kg 5000 mg/kg	95.0 104	85.5 85.5	120 120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3859899)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.64 mg/kg	76.7	70.0	130
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3864589)								
EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	20 mg/kg	72.8	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3860972)								
EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	20 mg/kg	95.5	70.0	130
EK040T: Fluoride Total (QCLot: 3859562)								
EK040T: Fluoride	16984-48-8	40	mg/kg	<40	400 mg/kg	82.0	75.2	110
EK055: Ammonia as N (QCLot: 3859908)								
EK055: Ammonia as N	7664-41-7	20	mg/kg	<20	25 mg/kg	97.4	83.0	109
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3859885)								
EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	2.5 mg/kg	103	88.9	113
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3859884)								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.5 mg/kg	107	89.5	119
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3863318)								
EK061G: Total Kjeldahl Nitrogen as N	----	20	mg/kg	<20	500 mg/kg	111	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3863317)								
EK067G: Total Phosphorus as P	----	2	mg/kg	<2	221 mg/kg	108	78.3	127
EP004: Organic Matter (QCLot: 3858973)								
EP004: Organic Matter	----	0.5	%	<0.5	77 %	89.9	70.0	130

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP004: Organic Matter (QCLot: 3858973) - continued								
EP004: Total Organic Carbon	----	0.5	%	<0.5	43.5 %	92.2	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859505)								
EP066-EM: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	131	67.4	136
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859510)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	89.4	68.0	133
EP068A: Organochlorine Pesticides (OC) (QCLot: 3859511)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	89.6	71.8	126
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	87.3	72.2	125
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	89.4	70.0	124
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	90.5	69.1	124
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	86.4	69.2	125
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.1	66.6	122
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	87.7	68.8	123
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	85.6	67.2	124
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	85.4	66.0	126
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.8	70.2	126
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	85.8	72.1	124
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	88.8	68.0	122
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	88.3	68.9	124
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	80.6	55.8	130
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	87.8	67.9	124
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.8	72.0	127
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	92.2	66.3	131
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	89.1	62.4	131
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	88.5	55.4	130
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	92.2	68.8	128
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	89.6	55.5	132
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859511)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	91.8	65.6	127
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	78.7	63.0	129
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	66.6	10.0	136
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	81.0	58.3	128
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.2	69.0	122
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	85.5	68.0	122
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	75.5	59.6	124
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	84.4	63.8	128
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	86.2	71.1	124
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	87.1	67.4	126

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859511) - continued								
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	73.3	57.9	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	83.7	66.2	123
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	83.3	59.8	123
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	86.3	65.4	127
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	76.6	52.1	128
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	84.0	65.2	122
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	86.9	63.2	124
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	90.3	65.9	127
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	78.0	43.1	131
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 3859482)								
EP074-UT: Benzene	71-43-2	0.2	mg/kg	<0.2	2.1 mg/kg	87.2	69.2	116
EP074-UT: Toluene	108-88-3	0.5	mg/kg	<0.5	2.1 mg/kg	83.7	67.7	116
EP074-UT: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2.1 mg/kg	81.6	66.6	115
EP074-UT: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4.2 mg/kg	80.4	65.2	112
EP074-UT: Styrene	100-42-5	0.5	mg/kg	<0.5	2.1 mg/kg	83.7	69.4	111
EP074-UT: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2.1 mg/kg	81.8	68.4	110
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 3859489)								
EP074: Styrene	100-42-5	0.5	mg/kg	<0.5	1 mg/kg	86.8	70.8	115
EP074: Isopropylbenzene	98-82-8	0.5	mg/kg	<0.5	1 mg/kg	97.4	68.6	116
EP074: n-Propylbenzene	103-65-1	0.5	mg/kg	<0.5	1 mg/kg	99.6	59.8	113
EP074: 1.3.5-Trimethylbenzene	108-67-8	0.5	mg/kg	<0.5	1 mg/kg	91.8	63.4	112
EP074: sec-Butylbenzene	135-98-8	0.5	mg/kg	<0.5	1 mg/kg	94.3	61.5	114
EP074: 1.2.4-Trimethylbenzene	95-63-6	0.5	mg/kg	<0.5	1 mg/kg	93.0	63.1	112
EP074: tert-Butylbenzene	98-06-6	0.5	mg/kg	<0.5	1 mg/kg	100	63.6	113
EP074: p-Isopropyltoluene	99-87-6	0.5	mg/kg	<0.5	1 mg/kg	93.7	60.8	114
EP074: n-Butylbenzene	104-51-8	0.5	mg/kg	<0.5	1 mg/kg	84.8	54.9	113
EP074B: Oxygenated Compounds (QCLot: 3859489)								
EP074: Vinyl Acetate	108-05-4	5	mg/kg	<5	10 mg/kg	85.8	51.4	128
EP074: 2-Butanone (MEK)	78-93-3	5	mg/kg	<5	10 mg/kg	71.2	61.2	128
EP074: 4-Methyl-2-pentanone (MIBK)	108-10-1	5	mg/kg	<5	10 mg/kg	73.4	63.2	137
EP074: 2-Hexanone (MBK)	591-78-6	5	mg/kg	<5	10 mg/kg	68.8	65.0	130
EP074C: Sulfonated Compounds (QCLot: 3859489)								
EP074: Carbon disulfide	75-15-0	0.5	mg/kg	<0.5	1 mg/kg	101	48.5	132
EP074D: Fumigants (QCLot: 3859489)								
EP074: 2.2-Dichloropropane	594-20-7	0.5	mg/kg	<0.5	1 mg/kg	95.2	61.4	116
EP074: 1.2-Dichloropropane	78-87-5	0.5	mg/kg	<0.5	1 mg/kg	88.9	70.1	116
EP074: cis-1.3-Dichloropropylene	10061-01-5	0.5	mg/kg	<0.5	1 mg/kg	85.4	61.7	112

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP074D: Fumigants (QCLot: 3859489) - continued								
EP074: trans-1.3-Dichloropropylene	10061-02-6	0.5	mg/kg	<0.5	1 mg/kg	81.7	63.8	110
EP074: 1.2-Dibromoethane (EDB)	106-93-4	0.5	mg/kg	<0.5	1 mg/kg	86.0	67.0	114
EP074E: Halogenated Aliphatic Compounds (QCLot: 3859489)								
EP074: Dichlorodifluoromethane	75-71-8	5	mg/kg	<5	10 mg/kg	96.6	26.0	137
EP074: Chloromethane	74-87-3	5	mg/kg	<5	10 mg/kg	111	49.4	140
EP074: Vinyl chloride	75-01-4	5	mg/kg	<5	10 mg/kg	107	46.0	138
EP074: Bromomethane	74-83-9	5	mg/kg	<5	10 mg/kg	102	39.1	127
EP074: Chloroethane	75-00-3	5	mg/kg	<5	10 mg/kg	100	59.2	128
EP074: Trichlorofluoromethane	75-69-4	5	mg/kg	<5	10 mg/kg	98.5	60.1	124
EP074: 1.1-Dichloroethene	75-35-4	0.5	mg/kg	<0.5	1 mg/kg	99.2	55.2	122
EP074: Iodomethane	74-88-4	0.5	mg/kg	<0.5	1 mg/kg	65.2	47.0	125
EP074: trans-1.2-Dichloroethene	156-60-5	0.5	mg/kg	<0.5	1 mg/kg	96.4	63.6	120
EP074: 1.1-Dichloroethane	75-34-3	0.5	mg/kg	<0.5	1 mg/kg	94.4	64.5	120
EP074: cis-1.2-Dichloroethene	156-59-2	0.5	mg/kg	<0.5	1 mg/kg	95.4	67.5	121
EP074: 1.1.1-Trichloroethane	71-55-6	0.5	mg/kg	<0.5	1 mg/kg	93.5	57.0	117
EP074: 1.1-Dichloropropylene	563-58-6	0.5	mg/kg	<0.5	1 mg/kg	95.7	60.3	120
EP074: Carbon Tetrachloride	56-23-5	0.5	mg/kg	<0.5	1 mg/kg	90.2	57.7	113
EP074: 1.2-Dichloroethane	107-06-2	0.5	mg/kg	<0.5	1 mg/kg	89.4	68.9	117
EP074: Trichloroethene	79-01-6	0.5	mg/kg	<0.5	1 mg/kg	89.8	65.5	119
EP074: Dibromomethane	74-95-3	0.5	mg/kg	<0.5	1 mg/kg	81.2	68.4	115
EP074: 1.1.2-Trichloroethane	79-00-5	0.5	mg/kg	<0.5	1 mg/kg	88.4	69.8	118
EP074: 1.3-Dichloropropane	142-28-9	0.5	mg/kg	<0.5	1 mg/kg	87.0	70.6	118
EP074: Tetrachloroethene	127-18-4	0.5	mg/kg	<0.5	1 mg/kg	100	65.6	117
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	0.5	mg/kg	<0.5	1 mg/kg	91.8	62.8	106
EP074: trans-1.4-Dichloro-2-butene	110-57-6	0.5	mg/kg	<0.5	1 mg/kg	77.3	58.9	117
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	0.5	mg/kg	<0.5	1 mg/kg	77.6	57.8	110
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	0.5	mg/kg	<0.5	1 mg/kg	81.9	72.3	127
EP074: 1.2.3-Trichloropropane	96-18-4	0.5	mg/kg	<0.5	1 mg/kg	80.5	69.0	123
EP074: Pentachloroethane	76-01-7	0.5	mg/kg	<0.5	1 mg/kg	81.9	59.0	100
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	0.5	mg/kg	<0.5	1 mg/kg	77.9	60.8	111
EP074: Hexachlorobutadiene	87-68-3	0.5	mg/kg	<0.5	1 mg/kg	113	54.1	132
EP074F: Halogenated Aromatic Compounds (QCLot: 3859489)								
EP074: Chlorobenzene	108-90-7	0.5	mg/kg	<0.5	1 mg/kg	95.9	72.5	115
EP074: Bromobenzene	108-86-1	0.5	mg/kg	<0.5	1 mg/kg	90.0	69.2	112
EP074: 2-Chlorotoluene	95-49-8	0.5	mg/kg	<0.5	1 mg/kg	104	65.9	114
EP074: 4-Chlorotoluene	106-43-4	0.5	mg/kg	<0.5	1 mg/kg	96.4	65.4	113
EP074: 1.3-Dichlorobenzene	541-73-1	0.5	mg/kg	<0.5	1 mg/kg	88.1	64.1	116
EP074: 1.4-Dichlorobenzene	106-46-7	0.5	mg/kg	<0.5	1 mg/kg	90.8	66.3	119
EP074: 1.2-Dichlorobenzene	95-50-1	0.5	mg/kg	<0.5	1 mg/kg	86.7	71.4	112

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP074F: Halogenated Aromatic Compounds (QCLot: 3859489) - continued								
EP074: 1.2.4-Trichlorobenzene	120-82-1	0.5	mg/kg	<0.5	1 mg/kg	90.3	55.6	124
EP074: 1.2.3-Trichlorobenzene	87-61-6	0.5	mg/kg	<0.5	1 mg/kg	90.6	59.3	123
EP074G: Trihalomethanes (QCLot: 3859489)								
EP074: Chloroform	67-66-3	0.5	mg/kg	<0.5	1 mg/kg	92.3	67.5	119
EP074: Bromodichloromethane	75-27-4	0.5	mg/kg	<0.5	1 mg/kg	85.2	57.8	117
EP074: Dibromochloromethane	124-48-1	0.5	mg/kg	<0.5	1 mg/kg	80.6	60.3	108
EP074: Bromoform	75-25-2	0.5	mg/kg	<0.5	1 mg/kg	75.4	55.7	108
EP074H: Naphthalene (QCLot: 3859482)								
EP074-UT: Naphthalene	91-20-3	1	mg/kg	<1	0.6 mg/kg	85.4	72.3	114
EP074I: Volatile Halogenated Compounds (QCLot: 3859482)								
EP074-UT: Vinyl chloride	75-01-4	0.02	mg/kg	<0.02	0.1 mg/kg	89.2	47.0	138
EP074-UT: 1.1-Dichloroethene	75-35-4	0.01	mg/kg	<0.01	0.1 mg/kg	86.2	57.6	125
EP074-UT: Methylene chloride	75-09-2	0.4	mg/kg	<0.4	2.1 mg/kg	90.4	72.3	115
EP074-UT: trans-1.2-Dichloroethene	156-60-5	0.02	mg/kg	<0.02	0.1 mg/kg	88.0	60.5	122
EP074-UT: cis-1.2-Dichloroethene	156-59-2	0.01	mg/kg	<0.01	0.1 mg/kg	88.8	70.3	112
EP074-UT: Chloroform	67-66-3	0.02	mg/kg	<0.02	0.1 mg/kg	88.5	66.6	115
EP074-UT: 1.1.1-Trichloroethane	71-55-6	0.01	mg/kg	<0.01	0.1 mg/kg	87.8	64.4	122
EP074-UT: Carbon Tetrachloride	56-23-5	0.01	mg/kg	<0.01	0.1 mg/kg	83.3	58.4	127
EP074-UT: 1.2-Dichloroethane	107-06-2	0.02	mg/kg	<0.02	0.1 mg/kg	97.5	72.9	114
EP074-UT: Trichloroethene	79-01-6	0.02	mg/kg	<0.02	0.1 mg/kg	83.2	64.7	115
EP074-UT: 1.1.2-Trichloroethane	79-00-5	0.04	mg/kg	<0.04	0.1 mg/kg	85.8	72.6	116
EP074-UT: Tetrachloroethene	127-18-4	0.02	mg/kg	<0.02	0.1 mg/kg	82.0	60.0	119
EP074-UT: 1.1.1.2-Tetrachloroethane	630-20-6	0.01	mg/kg	<0.01	0.1 mg/kg	82.2	71.8	116
EP074-UT: 1.1.2.2-Tetrachloroethane	79-34-5	0.02	mg/kg	<0.02	0.1 mg/kg	83.2	66.1	116
EP074-UT: Hexachlorobutadiene	87-68-3	0.02	mg/kg	<0.02	0.1 mg/kg	74.8	39.8	128
EP074-UT: Chlorobenzene	108-90-7	0.02	mg/kg	<0.02	0.1 mg/kg	87.3	70.3	113
EP074-UT: 1.4-Dichlorobenzene	106-46-7	0.02	mg/kg	<0.02	0.1 mg/kg	83.9	62.6	113
EP074-UT: 1.2-Dichlorobenzene	95-50-1	0.02	mg/kg	<0.02	0.1 mg/kg	85.0	70.8	110
EP074-UT: 1.2.4-Trichlorobenzene	120-82-1	0.01	mg/kg	<0.01	0.1 mg/kg	82.6	48.4	120
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859509)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	101	85.7	123
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	99.5	81.0	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	100	83.6	120
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	90.4	81.3	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	95.6	79.4	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	98.9	81.7	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	92.0	78.3	124
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	95.3	79.9	128

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859509) - continued								
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	89.4	76.9	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	102	80.9	130
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	82.4	70.0	121
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	96.6	80.4	130
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	91.0	70.2	123
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	78.4	67.9	122
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	80.5	65.8	123
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	89.4	65.8	127
EP075A: Phenolic Compounds (Halogenated) (QCLot: 3859504)								
EP075-EM: 2-Chlorophenol	95-57-8	0.03	mg/kg	<0.03	2 mg/kg	108	74.5	126
EP075-EM: 2.4-Dichlorophenol	120-83-2	0.03	mg/kg	<0.03	2 mg/kg	107	72.7	126
EP075-EM: 2.6-Dichlorophenol	87-65-0	0.03	mg/kg	<0.03	2 mg/kg	108	73.5	132
EP075-EM: 4-Chloro-3-methylphenol	59-50-7	0.03	mg/kg	<0.03	2 mg/kg	108	72.8	128
EP075-EM: 2.4.5-Trichlorophenol	95-95-4	0.05	mg/kg	<0.05	2 mg/kg	117	73.3	134
EP075-EM: 2.4.6-Trichlorophenol	88-06-2	0.05	mg/kg	<0.05	2 mg/kg	119	72.4	128
EP075-EM: 2.3.5.6-Tetrachlorophenol	935-95-5	0.03	mg/kg	<0.03	2 mg/kg	106	69.4	126
EP075-EM: 2.3.4.5 & 2.3.4.6-Tetrachlorophenol	4901-51-3/5 8-90-2	0.05	mg/kg	<0.05	4 mg/kg	108	71.9	128
EP075-EM: Pentachlorophenol	87-86-5	0.2	mg/kg	<0.2	4 mg/kg	110	54.4	135
EP075A: Phenolic Compounds (Non-halogenated) (QCLot: 3859504)								
EP075-EM: Phenol	108-95-2	1	mg/kg	<1	2 mg/kg	116	71.5	130
EP075-EM: 2-Methylphenol	95-48-7	1	mg/kg	<1	2 mg/kg	106	73.4	129
EP075-EM: 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	4 mg/kg	102	74.3	129
EP075-EM: 2-Nitrophenol	88-75-5	1	mg/kg	<1	2 mg/kg	99.2	70.9	133
EP075-EM: 2.4-Dimethylphenol	105-67-9	1	mg/kg	<1	2 mg/kg	106	71.8	132
EP075-EM: 2.4-Dinitrophenol	51-28-5	5	mg/kg	<5	10 mg/kg	96.0	41.0	156
EP075-EM: 4-Nitrophenol	100-02-7	5	mg/kg	<5	10 mg/kg	116	65.3	134
EP075-EM: 2-Methyl-4.6-dinitrophenol	8071-51-0	5	mg/kg	<5	10 mg/kg	96.4	43.6	128
EP075-EM: Dinoseb	88-85-7	5	mg/kg	<5	10 mg/kg	104	62.0	128
EP075-EM: 2-Cyclohexyl-4.6-Dinitrophenol	131-89-5	5	mg/kg	<5	10 mg/kg	106	34.5	137
EP075B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859504)								
EP075-EM: Naphthalene	91-20-3	0.5	mg/kg	<0.5	2 mg/kg	101	73.0	131
EP075-EM: Acenaphthene	83-32-9	0.5	mg/kg	<0.5	2 mg/kg	112	76.3	130
EP075-EM: Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	2 mg/kg	117	72.0	135
EP075-EM: Fluorene	86-73-7	0.5	mg/kg	<0.5	2 mg/kg	103	74.4	131
EP075-EM: Phenanthrene	85-01-8	0.5	mg/kg	<0.5	2 mg/kg	106	73.3	130
EP075-EM: Anthracene	120-12-7	0.5	mg/kg	<0.5	2 mg/kg	104	78.4	127

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP075B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859504) - continued								
EP075-EM: Fluoranthene	206-44-0	0.5	mg/kg	<0.5	2 mg/kg	105	75.3	132
EP075-EM: Pyrene	129-00-0	0.5	mg/kg	<0.5	2 mg/kg	106	75.4	130
EP075-EM: Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	2 mg/kg	109	69.6	133
EP075-EM: Chrysene	218-01-9	0.5	mg/kg	<0.5	2 mg/kg	111	75.0	133
EP075-EM: Benzo(b+j) & Benzo(k)fluoranthene	205-99-2 207-08-9	1	mg/kg	<1.0	4 mg/kg	113	75.8	133
EP075-EM: Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	2 mg/kg	129	65.1	130
EP075-EM: Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	2 mg/kg	108	72.1	134
EP075-EM: Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	2 mg/kg	110	72.9	135
EP075-EM: Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	2 mg/kg	113	71.3	134
EP075I: Organochlorine Pesticides (QCLot: 3859504)								
EP075-EM: alpha-BHC	319-84-6	0.03	mg/kg	<0.03	2 mg/kg	116	71.0	129
EP075-EM: Hexachlorobenzene (HCB)	118-74-1	0.03	mg/kg	<0.03	2 mg/kg	114	74.8	126
EP075-EM: beta-BHC	319-85-7	0.03	mg/kg	<0.03	2 mg/kg	116	75.7	130
EP075-EM: gamma-BHC	58-89-9	0.03	mg/kg	<0.03	2 mg/kg	119	70.8	130
EP075-EM: delta-BHC	319-86-8	0.03	mg/kg	<0.03	2 mg/kg	112	76.5	134
EP075-EM: Heptachlor	76-44-8	0.03	mg/kg	<0.03	2 mg/kg	112	75.5	131
EP075-EM: Aldrin	309-00-2	0.03	mg/kg	<0.03	2 mg/kg	106	76.8	130
EP075-EM: Heptachlor epoxide	1024-57-3	0.03	mg/kg	<0.03	2 mg/kg	105	73.6	130
EP075-EM: cis-Chlordane	5103-71-9	0.03	mg/kg	<0.03	2 mg/kg	102	75.0	133
EP075-EM: trans-Chlordane	5103-74-2	0.03	mg/kg	<0.03	2 mg/kg	102	75.3	131
EP075-EM: Endosulfan 1	959-98-8	0.03	mg/kg	<0.03	2 mg/kg	106	69.4	134
EP075-EM: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	2 mg/kg	120	71.0	132
EP075-EM: Dieldrin	60-57-1	0.03	mg/kg	<0.03	2 mg/kg	119	78.0	133
EP075-EM: Endrin aldehyde	7421-93-4	0.03	mg/kg	<0.03	2 mg/kg	125	69.0	143
EP075-EM: Endrin	72-20-8	0.03	mg/kg	<0.03	2 mg/kg	124	55.7	145
EP075-EM: Endosulfan 2	33213-65-9	0.03	mg/kg	<0.03	2 mg/kg	128	71.4	135
EP075-EM: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	2 mg/kg	112	74.8	134
EP075-EM: Endosulfan sulfate	1031-07-8	0.03	mg/kg	<0.03	2 mg/kg	116	70.2	135
EP075-EM: 4.4`-DDT	50-29-3	0.05	mg/kg	<0.05	2 mg/kg	114	77.7	133
EP075-EM: Methoxychlor	72-43-5	0.03	mg/kg	<0.03	2 mg/kg	111	63.6	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859482)								
EP074-UT: C6 - C9 Fraction	----	10	mg/kg	<10	39.6 mg/kg	93.9	61.1	119
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859490)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	97.9	58.6	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859506)								
EP071-EM: C10 - C14 Fraction	----	50	mg/kg	<50	840 mg/kg	83.2	74.4	129
EP071-EM: C15 - C28 Fraction	----	100	mg/kg	<100	2900 mg/kg	92.5	81.0	123

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859506) - continued								
EP071-EM: C29 - C36 Fraction	----	100	mg/kg	<100	1490 mg/kg	88.3	81.8	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859512)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	840 mg/kg	98.4	75.0	128
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	2900 mg/kg	101	82.0	123
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1490 mg/kg	96.9	82.4	121
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859482)								
EP074-UT: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	48.9 mg/kg	93.3	59.9	119
EP074-UT: C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859490)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	95.4	59.3	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859506)								
EP071-EM: >C10 - C16 Fraction	----	50	mg/kg	<50	1110 mg/kg	88.3	75.4	132
EP071-EM: >C16 - C34 Fraction	----	100	mg/kg	<100	3900 mg/kg	89.4	80.8	120
EP071-EM: >C34 - C40 Fraction	----	100	mg/kg	<100	290 mg/kg	81.5	73.3	136
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859512)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1110 mg/kg	102	77.0	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3900 mg/kg	97.4	81.5	120
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	290 mg/kg	98.4	73.3	137
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 3859490)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	99.6	61.6	117
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	96.8	65.8	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	97.2	65.8	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	103	64.8	134
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	99.4	68.7	132
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	93.9	61.8	123
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3861242)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00111 mg/kg	110	72.0	128
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.0014 mg/kg	87.8	67.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	116	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3861242)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	101	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	71.0	131

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3861242) - continued								
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.0	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3861242)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	99.4	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	120	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	109	70.0	130
EP231P: PFAS Sums (QCLot: 3861242)								
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low	High
EG020T: Total Metals by ICP-MS (QCLot: 3859771)								
EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	0.02 mg/L	107	83.3	117
EG020T: Total Metals by ICP-MS (QCLot: 3859772)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	112	90.8	115
EG020A-T: Antimony	7440-36-0	0.001	mg/L	<0.001	0.02 mg/L	113	86.9	118
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	109	89.2	115
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	107	86.0	115
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	105	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	111	86.9	112
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	106	87.7	113
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	103	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	105	88.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	106	88.7	113
EG020A-T: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	112	88.3	116
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	106	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	101	84.8	116
EG020A-T: Tin	7440-31-5	0.001	mg/L	<0.001	0.1 mg/L	114	91.2	118
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	110	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	108	86.7	117
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	101	89.3	118
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	103	92.8	118
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3862355)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	80.6	73.4	119
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3860205)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	107	84.1	116

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3859181)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	95.7	90.9	112
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3860206)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	110	90.0	117
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3859831)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	97.9	70.0	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3859830)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	83.4	71.9	114
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859119)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	92.0	52.0	136
EP068A: Organochlorine Pesticides (OC) (QCLot: 3859120)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	2.5 µg/L	94.0	50.6	119
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	2.5 µg/L	89.4	44.2	117
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	2.5 µg/L	80.7	53.7	119
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	2.5 µg/L	87.7	47.7	117
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	2.5 µg/L	94.6	52.5	117
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	2.5 µg/L	92.6	46.9	118
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	2.5 µg/L	90.0	48.0	115
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	2.5 µg/L	93.3	51.1	119
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	2.5 µg/L	93.2	48.4	120
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	2.5 µg/L	93.8	50.1	122
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	2.5 µg/L	93.2	51.0	118
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	2.5 µg/L	94.7	48.4	116
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	2.5 µg/L	93.0	49.3	116
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	2.5 µg/L	95.6	47.1	130
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	2.5 µg/L	98.2	51.6	118
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	2.5 µg/L	92.2	48.6	122
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	2.5 µg/L	114	49.4	128
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	2.5 µg/L	97.6	49.1	123
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	2.5 µg/L	101	45.6	126
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	2.5 µg/L	83.3	52.8	117
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	2.5 µg/L	94.9	47.1	126
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859120)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	2.5 µg/L	96.5	47.4	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	2.5 µg/L	102	46.4	129
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	2.5 µg/L	17.4	10.0	42.9
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	2.5 µg/L	99.3	41.7	131
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	2.5 µg/L	88.0	50.5	122
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	2.5 µg/L	91.4	52.4	123

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859120) - continued								
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	2.5 µg/L	95.4	52.0	132
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	2.5 µg/L	90.1	51.8	133
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	2.5 µg/L	90.1	52.3	123
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	2.5 µg/L	88.1	48.7	122
EP068: Parathion	56-38-2	2	µg/L	<2.0	2.5 µg/L	95.3	49.5	136
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	2.5 µg/L	91.9	50.4	123
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	2.5 µg/L	91.0	50.9	131
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	2.5 µg/L	90.0	47.5	126
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	2.5 µg/L	92.3	46.5	138
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	2.5 µg/L	92.7	49.2	119
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	2.5 µg/L	90.6	50.0	126
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	2.5 µg/L	95.3	50.0	131
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	2.5 µg/L	102	41.7	147
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859118)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	75.9	42.8	114
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	88.5	48.6	119
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	84.6	47.0	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	89.9	49.5	119
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	92.5	49.4	121
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	89.0	48.4	122
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	94.6	50.3	124
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	94.2	50.0	126
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	97.1	49.4	127
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	97.4	48.7	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	95.8	54.5	134
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	97.3	56.1	134
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	95.4	55.6	135
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	89.7	54.4	126
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	90.3	54.5	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	88.6	54.4	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859013)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	95.1	66.2	134
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859121)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4670 µg/L	67.8	44.2	140
EP071: C15 - C28 Fraction	----	100	µg/L	<100	15800 µg/L	74.2	46.9	127
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8180 µg/L	71.9	47.4	128
EP071: C10 - C36 Fraction (sum)	----	----	µg/L	----	28650 µg/L	72.4	70.0	130

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859013)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	101	66.2	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859121)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6100 µg/L	68.1	43.0	127
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	21200 µg/L	73.4	48.6	129
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1620 µg/L	72.0	42.2	133
EP071: >C10 - C40 Fraction (sum)	----	----	µg/L	----	28920 µg/L	72.4	70.0	130
EP080: BTEXN (QCLot: 3859013)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	103	68.8	127
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	103	72.9	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	104	71.7	130
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	104	72.3	136
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	105	75.9	134
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	98.8	68.3	131
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3859548)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.222 µg/L	110	72.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.228 µg/L	113	68.0	131
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.232 µg/L	124	65.0	140
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3859548)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	107	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	109	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	106	71.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3859548)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.234 µg/L	104	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.238 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.24 µg/L	125	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.242 µg/L	96.9	70.0	130
EP231P: PFAS Sums (QCLot: 3859548)								
EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3859900)							
EM2116590-001	HA19_0.1	EG005T: Nickel	7440-02-0	50 mg/kg	98.9	78.0	120
EM2116590-001	HA19_0.1	EG005T: Arsenic	7440-38-2	50 mg/kg	96.8	78.0	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	98.2	79.7	116
		EG005T: Chromium	7440-47-3	50 mg/kg	83.8	79.0	121
		EG005T: Copper	7440-50-8	250 mg/kg	97.2	80.0	120
		EG005T: Lead	7439-92-1	250 mg/kg	99.2	80.0	120
		EG005T: Zinc	7440-66-6	250 mg/kg	93.7	80.0	120
ED045G: Chloride by Discrete Analyser (QCLot: 3859882)							
EM2116378-003	Anonymous	ED045G: Chloride	16887-00-6	2000 mg/kg	108	93.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3859899)							
EM2116590-001	HA19_0.1	EG035T: Mercury	7439-97-6	0.5 mg/kg	108	76.0	116
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3864589)							
EM2116590-010	HA10_0.1	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	61.0	58.0	114
EM2116590-010	HA10_0.1	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	73.3	58.0	114
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3860972)							
EM2116463-013	Anonymous	EK026SF: Total Cyanide	57-12-5	20 mg/kg	95.6	70.0	130
EK040T: Fluoride Total (QCLot: 3859562)							
EM2116472-002	Anonymous	EK040T: Fluoride	16984-48-8	400 mg/kg	99.5	70.0	130
EK055: Ammonia as N (QCLot: 3859908)							
EM2116584-002	Anonymous	EK055: Ammonia as N	7664-41-7	50 mg/kg	88.7	80.0	110
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3859885)							
EM2116590-020	HA02_0.5	EK057G: Nitrite as N (Sol.)	14797-65-0	2.5 mg/kg	101	84.0	128
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3859884)							
EM2116590-020	HA02_0.5	EK059G: Nitrite + Nitrate as N (Sol.)	----	2.5 mg/kg	98.2	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3863318)							
EM2116590-020	HA02_0.5	EK061G: Total Kjeldahl Nitrogen as N	----	500 mg/kg	86.7	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3863317)							
EM2116590-020	HA02_0.5	EK067G: Total Phosphorus as P	----	100 mg/kg	71.8	70.0	130
EP004: Organic Matter (QCLot: 3858973)							
EM2116590-003	HA17_0.1	EP004: Organic Matter	----	2.95633 %	70.2	70.0	120
		EP004: Total Organic Carbon	----	1.71467 %	70.2	70.0	120
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859505)							
EM2116224-001	Anonymous	EP066-EM: Total Polychlorinated biphenyls	----	1 mg/kg	112	59.6	152
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859510)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859510) - continued							
EM2116590-005	HA17_0.5	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	86.3	63.2	144
EP068A: Organochlorine Pesticides (OC) (QCLot: 3859511)							
EM2116590-007	HA15_0.1	EP068: gamma-BHC	58-89-9	0.5 mg/kg	111	51.4	139
		EP068: Heptachlor	76-44-8	0.5 mg/kg	102	49.1	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	110	38.4	135
		EP068: Dieldrin	60-57-1	0.5 mg/kg	116	58.4	136
		EP068: Endrin	72-20-8	0.5 mg/kg	140	33.0	146
		EP068: 4.4`-DDT	50-29-3	0.5 mg/kg	69.3	20.0	133
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859511)							
EM2116590-007	HA15_0.1	EP068: Diazinon	333-41-5	0.5 mg/kg	117	65.1	135
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	111	56.3	127
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	103	55.0	133
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	105	55.1	133
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	82.6	43.8	128
EP074A: Monocyclic Aromatic Hydrocarbons (QCLot: 3859482)							
EM2116238-013	Anonymous	EP074-UT: Benzene	71-43-2	2 mg/kg	77.2	53.7	130
		EP074-UT: Toluene	108-88-3	2 mg/kg	75.9	55.1	124
EP074E: Halogenated Aliphatic Compounds (QCLot: 3859489)							
EM2116590-002	HA19_0.4	EP074: 1.1-Dichloroethene	75-35-4	2 mg/kg	78.2	29.0	141
		EP074: Trichloroethene	79-01-6	2 mg/kg	78.7	50.0	126
EP074F: Halogenated Aromatic Compounds (QCLot: 3859489)							
EM2116590-002	HA19_0.4	EP074: Chlorobenzene	108-90-7	2 mg/kg	87.4	65.0	133
EP074I: Volatile Halogenated Compounds (QCLot: 3859482)							
EM2116238-013	Anonymous	EP074-UT: 1.1-Dichloroethene	75-35-4	2 mg/kg	67.2	38.4	145
		EP074-UT: Trichloroethene	79-01-6	2 mg/kg	67.0	48.1	128
		EP074-UT: Chlorobenzene	108-90-7	2 mg/kg	73.4	55.5	122
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859509)							
EM2116590-003	HA17_0.1	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	90.2	77.2	116
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	84.7	65.5	136
EP075A: Phenolic Compounds (Halogenated) (QCLot: 3859504)							
EM2115963-002	Anonymous	EP075-EM: 2-Chlorophenol	95-57-8	3 mg/kg	83.5	44.0	143
		EP075-EM: 4-Chloro-3-methylphenol	59-50-7	3 mg/kg	70.0	41.5	139
		EP075-EM: Pentachlorophenol	87-86-5	3 mg/kg	57.8	10.0	144
EP075A: Phenolic Compounds (Non-halogenated) (QCLot: 3859504)							
EM2115963-002	Anonymous	EP075-EM: Phenol	108-95-2	3 mg/kg	85.2	44.2	134
		EP075-EM: 2-Nitrophenol	88-75-5	3 mg/kg	76.2	34.2	129

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP075B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859504)							
EM2115963-002	Anonymous	EP075-EM: Acenaphthene	83-32-9	3 mg/kg	70.5	42.6	138
		EP075-EM: Pyrene	129-00-0	3 mg/kg	91.1	37.8	152
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859482)							
EM2116238-013	Anonymous	EP074-UT: C6 - C9 Fraction	----	28 mg/kg	87.9	42.3	111
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859490)							
EM2116590-002	HA19_0.4	EP080: C6 - C9 Fraction	----	28 mg/kg	85.2	33.4	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859506)							
EM2116224-002	Anonymous	EP071-EM: C10 - C14 Fraction	----	840 mg/kg	81.6	71.3	126
		EP071-EM: C15 - C28 Fraction	----	2900 mg/kg	91.5	75.1	123
		EP071-EM: C29 - C36 Fraction	----	1490 mg/kg	91.2	78.1	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859512)							
EM2116590-002	HA19_0.4	EP071: C10 - C14 Fraction	----	840 mg/kg	98.9	71.2	125
		EP071: C15 - C28 Fraction	----	2900 mg/kg	102	75.6	122
		EP071: C29 - C36 Fraction	----	1490 mg/kg	99.6	78.0	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859482)							
EM2116238-013	Anonymous	EP074-UT: C6 - C10 Fraction	C6_C10	33 mg/kg	86.0	39.9	109
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859490)							
EM2116590-002	HA19_0.4	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	78.9	30.8	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859506)							
EM2116224-002	Anonymous	EP071-EM: >C10 - C16 Fraction	----	1110 mg/kg	85.7	71.5	130
		EP071-EM: >C16 - C34 Fraction	----	3900 mg/kg	89.6	76.9	119
		EP071-EM: >C34 - C40 Fraction	----	290 mg/kg	94.3	65.3	139
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859512)							
EM2116590-002	HA19_0.4	EP071: >C10 - C16 Fraction	----	1110 mg/kg	103	72.2	128
		EP071: >C16 - C34 Fraction	----	3900 mg/kg	99.2	76.5	119
		EP071: >C34 - C40 Fraction	----	290 mg/kg	110	66.8	138
EP080: BTEXN (QCLot: 3859490)							
EM2116590-002	HA19_0.4	EP080: Benzene	71-43-2	2 mg/kg	90.8	54.4	127
		EP080: Toluene	108-88-3	2 mg/kg	94.6	57.1	131
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3861242)							
EM2116377-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	110	72.0	128
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	112	67.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	127	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3861242)							
EM2116377-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	103	71.0	135

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3861242) - continued							
EM2116377-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	110	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	111	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	105	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	96.1	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3861242)							
EM2116377-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	97.7	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	97.1	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	110	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	93.2	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020T: Total Metals by ICP-MS (QCLot: 3859772)							
EM2116412-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	106	82.0	123
		EG020A-T: Beryllium	7440-41-7	1 mg/L	112	79.0	126
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	107	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	112	78.9	119
		EG020A-T: Cobalt	7440-48-4	1 mg/L	109	80.7	121
		EG020A-T: Copper	7440-50-8	1 mg/L	106	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	110	80.5	121
		EG020A-T: Manganese	7439-96-5	1 mg/L	110	73.0	123
		EG020A-T: Nickel	7440-02-0	1 mg/L	112	80.0	118
		EG020A-T: Vanadium	7440-62-2	1 mg/L	111	81.0	119
		EG020A-T: Zinc	7440-66-6	1 mg/L	104	74.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3862355)							
EM2116590-017	RN_20210819	EG035T: Mercury	7439-97-6	0.01 mg/L	86.3	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3860205)							
EM2116520-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	112	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3859181)							
EM2116578-020	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	94.7	80.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3860206)							
EM2116575-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	1 mg/L	77.7	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3859831)							
EM2116518-006	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	90.7	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3859830)							
EM2116460-005	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	86.6	70.0	130

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859118)							
EM2116590-015	RN_20210818	EP075(SIM): Acenaphthene	83-32-9	5 µg/L	88.2	39.3	123
		EP075(SIM): Pyrene	129-00-0	5 µg/L	95.3	44.0	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859013)							
EM2116587-047	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	76.4	33.9	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859121)							
EM2116590-017	RN_20210819	EP071: C10 - C14 Fraction	----	4670 µg/L	93.2	41.2	149
		EP071: C15 - C28 Fraction	----	15800 µg/L	96.9	41.8	131
		EP071: C29 - C36 Fraction	----	8180 µg/L	93.8	43.5	130
		EP071: C10 - C36 Fraction (sum)	----	28650 µg/L	94.8	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859013)							
EM2116587-047	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	73.5	34.0	122
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859121)							
EM2116590-017	RN_20210819	EP071: >C10 - C16 Fraction	----	6100 µg/L	91.6	38.4	133
		EP071: >C16 - C34 Fraction	----	21200 µg/L	95.8	43.1	132
		EP071: >C34 - C40 Fraction	----	1620 µg/L	93.2	38.4	135
		EP071: >C10 - C40 Fraction (sum)	----	28920 µg/L	94.5	70.0	130
EP080: BTEXN (QCLot: 3859013)							
EM2116587-047	Anonymous	EP080: Benzene	71-43-2	20 µg/L	94.6	56.3	133
		EP080: Toluene	108-88-3	20 µg/L	97.1	60.4	132

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2116590**	Page	: 1 of 24
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: JYE GROGAN	Telephone	: +6138549 9645
Project	: IS311800	Date Samples Received	: 20-Aug-2021
Site	:	Issue Date	: 27-Aug-2021
Sampler	: BG, JG	No. of samples received	: 27
Order number	: IS311800	No. of samples analysed	: 21

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	16	6.25	10.00	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	1	13	7.69	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	16	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	0	2	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	0	2	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA001: pH in soil using 0.01M CaCl extract							
Soil Glass Jar - Unpreserved (EA001) HA17_0.1, HA17_0.5, HA10_0.1, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**24-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	24-Aug-2021	✓
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	23-Aug-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	20-Sep-2021	✓
EA033-A: Actual Acidity							
Snap Lock Bag - frozen (EA033) HA15_1.0, HA03_1.0	**18-Aug-2021**	**26-Aug-2021**	18-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
Snap Lock Bag - frozen (EA033) HA17_0.3	**20-Aug-2021**	**26-Aug-2021**	20-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
EA033-B: Potential Acidity							
Snap Lock Bag - frozen (EA033) HA15_1.0, HA03_1.0	**18-Aug-2021**	**26-Aug-2021**	18-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
Snap Lock Bag - frozen (EA033) HA17_0.3	**20-Aug-2021**	**26-Aug-2021**	20-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag - frozen (EA033) HA15_1.0, HA03_1.0	**18-Aug-2021**	**26-Aug-2021**	18-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
Snap Lock Bag - frozen (EA033) HA17_0.3	**20-Aug-2021**	**26-Aug-2021**	20-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
EA033-D: Retained Acidity							
Snap Lock Bag - frozen (EA033) HA15_1.0, HA03_1.0	**18-Aug-2021**	**26-Aug-2021**	18-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
Snap Lock Bag - frozen (EA033) HA17_0.3	**20-Aug-2021**	**26-Aug-2021**	20-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
EA033-E: Acid Base Accounting							
Snap Lock Bag - frozen (EA033) HA15_1.0, HA03_1.0	**18-Aug-2021**	**26-Aug-2021**	18-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓
Snap Lock Bag - frozen (EA033) HA17_0.3	**20-Aug-2021**	**26-Aug-2021**	20-Aug-2022	✓	**26-Aug-2021**	24-Nov-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**----**	----	----	**23-Aug-2021**	01-Sep-2021	✓
EA150: Soil Classification based on Particle Size							
Snap Lock Bag (EA150H) HA02_0.1, HA03_0.1	**18-Aug-2021**	**----**	----	----	**27-Aug-2021**	14-Feb-2022	✓
EA152: Soil Particle Density							
Snap Lock Bag (EA152) HA02_0.1, HA03_0.1	**18-Aug-2021**	**----**	----	----	**27-Aug-2021**	14-Feb-2022	✓
ED006: Exchangeable Cations on Alkaline Soils							
Soil Glass Jar - Unpreserved (ED006) HA17_0.1, HA17_0.5, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**25-Aug-2021**	15-Sep-2021	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007) HA17_0.1, HA17_0.5, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**25-Aug-2021**	15-Sep-2021	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008) HA17_0.1, HA17_0.5, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**25-Aug-2021**	15-Sep-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
ED040S: Soluble Major Anions							
Soil Glass Jar - Unpreserved (ED040S) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**24-Aug-2021**	20-Sep-2021	✓
ED045G: Chloride by Discrete Analyser							
Soil Glass Jar - Unpreserved (ED045G) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**23-Aug-2021**	20-Sep-2021	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	14-Feb-2022	✓	**23-Aug-2021**	14-Feb-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**24-Aug-2021**	15-Sep-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG048: Hexavalent Chromium (Alkaline Digest)							
Soil Glass Jar - Unpreserved (EG048G) HA10_0.1	**18-Aug-2021**	**25-Aug-2021**	15-Sep-2021	✓	**25-Aug-2021**	01-Sep-2021	✓
EK026SF: Total CN by Segmented Flow Analyser							
Soil Glass Jar - Unpreserved (EK026SF) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	06-Sep-2021	✓
EK040T: Fluoride Total							
Soil Glass Jar - Unpreserved (EK040T) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**25-Aug-2021**	15-Sep-2021	✓
EK055: Ammonia as N							
Soil Glass Jar - Unpreserved (EK055) HA02_0.1, HA02_0.5, HA03_0.1, HA04_0.1	**18-Aug-2021**	**----**	----	----	**23-Aug-2021**	15-Sep-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK057G) HA02_0.1, HA02_0.5, HA03_0.1, HA04_0.1	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK059G) HA02_0.1, HA02_0.5, HA03_0.1, HA04_0.1	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Soil Glass Jar - Unpreserved (EK061G) HA02_0.1, HA02_0.5, HA03_0.1, HA04_0.1	**18-Aug-2021**	**25-Aug-2021**	15-Sep-2021	✓	**25-Aug-2021**	22-Sep-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK067G) HA02_0.1, HA02_0.5, HA03_0.1, HA04_0.1	**18-Aug-2021**	**25-Aug-2021**	15-Sep-2021	✓	**25-Aug-2021**	22-Sep-2021	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004) HA17_0.1, HA17_0.5, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	15-Sep-2021	✓	**23-Aug-2021**	15-Sep-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**23-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP066-EM) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**23-Aug-2021**	02-Oct-2021	✓
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved (EP068) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**23-Aug-2021**	02-Oct-2021	✓
EP074A: Monocyclic Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP074) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP074B: Oxygenated Compounds							
Soil Glass Jar - Unpreserved (EP074) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EP074C: Sulfonated Compounds							
Soil Glass Jar - Unpreserved (EP074) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EP074D: Fumigants							
Soil Glass Jar - Unpreserved (EP074) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EP074E: Halogenated Aliphatic Compounds							
Soil Glass Jar - Unpreserved (EP074) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method **Container** / Client Sample ID(s)	**Sample Date**	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP074F: Halogenated Aromatic Compounds							
Soil Glass Jar - Unpreserved (EP074) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EP074G: Trihalomethanes							
Soil Glass Jar - Unpreserved (EP074) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EP074H: Naphthalene							
Soil Glass Jar - Unpreserved (EP074-UT) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EP074I: Volatile Halogenated Compounds							
Soil Glass Jar - Unpreserved (EP074-UT) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**23-Aug-2021**	02-Oct-2021	✓
EP075A: Phenolic Compounds (Halogenated)							
Soil Glass Jar - Unpreserved (EP075-EM) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP075A: Phenolic Compounds (Non-halogenated)							
Soil Glass Jar - Unpreserved (EP075-EM) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	02-Oct-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container */ Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP075B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075-EM) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP075I: Organochlorine Pesticides							
Soil Glass Jar - Unpreserved (EP075-EM) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**23-Aug-2021**	01-Sep-2021	✓
Soil Glass Jar - Unpreserved (EP071-EM) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**23-Aug-2021**	01-Sep-2021	✓
Soil Glass Jar - Unpreserved (EP071-EM) HA10_0.1	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA05_0.1, HA05_1.0, HA02_0.1, QC01_20210819, HA02_0.5, HA03_0.1, QA03_20210819, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	01-Sep-2021	✓	**23-Aug-2021**	01-Sep-2021	✓

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	14-Feb-2022	✓	**23-Aug-2021**	02-Oct-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	14-Feb-2022	✓	**23-Aug-2021**	02-Oct-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	14-Feb-2022	✓	**23-Aug-2021**	02-Oct-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) HA19_0.1, HA19_0.4, HA17_0.1, HA17_0.5, HA15_0.1, HA15_1.0, HA10_0.1, HA05_0.1, HA05_1.0, HA02_0.1, HA02_0.5, HA03_0.1, HA03_1.0, HA04_0.1, HA04_0.88	**18-Aug-2021**	**23-Aug-2021**	14-Feb-2022	✓	**23-Aug-2021**	02-Oct-2021	✓

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** / *Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020B-T) RN_20210818, RN_20210819	**20-Aug-2021**	**23-Aug-2021**	16-Feb-2022	✓	**23-Aug-2021**	16-Feb-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T) RN_20210818, RN_20210819	**20-Aug-2021**	**----**	----	----	**24-Aug-2021**	17-Sep-2021	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) RN_20210818, RN_20210819	**20-Aug-2021**	**----**	----	----	**24-Aug-2021**	17-Sep-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) RN_20210818, RN_20210819	**20-Aug-2021**	**----**	----	----	**21-Aug-2021**	22-Aug-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) RN_20210818, RN_20210819	**20-Aug-2021**	**----**	----	----	**24-Aug-2021**	17-Sep-2021	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) RN_20210818, RN_20210819	**20-Aug-2021**	**23-Aug-2021**	17-Sep-2021	✓	**24-Aug-2021**	17-Sep-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) RN_20210818, RN_20210819	**20-Aug-2021**	**23-Aug-2021**	17-Sep-2021	✓	**24-Aug-2021**	17-Sep-2021	✓
EP066: Polychlorinated Biphenyls (PCB)							
Amber Glass Bottle - Unpreserved (EP066) RN_20210818, RN_20210819	**20-Aug-2021**	**21-Aug-2021**	27-Aug-2021	✓	**21-Aug-2021**	30-Sep-2021	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068) RN_20210818, RN_20210819	**20-Aug-2021**	**21-Aug-2021**	27-Aug-2021	✓	**21-Aug-2021**	30-Sep-2021	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068) RN_20210818, RN_20210819	**20-Aug-2021**	**21-Aug-2021**	27-Aug-2021	✓	**21-Aug-2021**	30-Sep-2021	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) RN_20210818, RN_20210819	**20-Aug-2021**	**21-Aug-2021**	27-Aug-2021	✓	**21-Aug-2021**	30-Sep-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) RN_20210818, RN_20210819	**20-Aug-2021**	**21-Aug-2021**	27-Aug-2021	✓	**21-Aug-2021**	30-Sep-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080) RN_20210818, TB_20210818, RN_20210819	**20-Aug-2021**	**21-Aug-2021**	03-Sep-2021	✓	**21-Aug-2021**	03-Sep-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071)		**20-Aug-2021**	**21-Aug-2021**	27-Aug-2021	✓	**21-Aug-2021**	30-Sep-2021	✓
RN_20210818,	RN_20210819							
Amber VOC Vial - Sulfuric Acid (EP080)		**20-Aug-2021**	**21-Aug-2021**	03-Sep-2021	✓	**21-Aug-2021**	03-Sep-2021	✓
RN_20210818,	TB_20210818,							
RN_20210819								
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080)		**20-Aug-2021**	**21-Aug-2021**	03-Sep-2021	✓	**21-Aug-2021**	03-Sep-2021	✓
RN_20210818,	TB_20210818,							
RN_20210819								
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		**20-Aug-2021**	**23-Aug-2021**	16-Feb-2022	✓	**23-Aug-2021**	16-Feb-2022	✓
RN_20210818,	RN_20210819							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		**20-Aug-2021**	**23-Aug-2021**	16-Feb-2022	✓	**23-Aug-2021**	16-Feb-2022	✓
RN_20210818,	RN_20210819							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		**20-Aug-2021**	**23-Aug-2021**	16-Feb-2022	✓	**23-Aug-2021**	16-Feb-2022	✓
RN_20210818,	RN_20210819							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		**20-Aug-2021**	**23-Aug-2021**	16-Feb-2022	✓	**23-Aug-2021**	16-Feb-2022	✓
RN_20210818,	RN_20210819							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Buchi Ammonia	EK055	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB - VIC EPA 448.3 Screen	EP066-EM	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH in soil using a 0.01M CaCl2 extract	EA001	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Organic Compounds - Waste Classification	EP075-EM	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Fluoride	EK040T	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	20	**15.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosporus By Discrete Analyser	EK067G	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071-EM	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds - Ultra-trace	EP074-UT	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Buchi Ammonia	EK055	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Electrical Conductivity (1:5)	EA010	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	2	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB - VIC EPA 448.3 Screen	EP066-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Organic Compounds - Waste Classification	EP075-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Fluoride	EK040T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosporus By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds - Ultra-trace	EP074-UT	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Buchi Ammonia	EK055	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB - VIC EPA 448.3 Screen	EP066-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Organic Compounds - Waste Classification	EP075-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Fluoride	EK040T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosporus By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds - Ultra-trace	EP074-UT	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Buchi Ammonia	EK055	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride Soluble By Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	2	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB - VIC EPA 448.3 Screen	EP066-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Organic Compounds - Waste Classification	EP075-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TKN as N By Discrete Analyser	EK061G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Fluoride	EK040T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosporus By Discrete Analyser	EK067G	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071-EM	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds - Ultra-trace	EP074-UT	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite B	EG020B-T	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.69**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite B	EG020B-T	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Total Metals by ICP-MS - Suite B	EG020B-T	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	16	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	0	2	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	0	2	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH in soil using a 0.01M CaCl2 extract	EA001	SOIL	In house: Referenced to Rayment and Lyons 4B3 (mod.) or 4B4 (mod.) 10 g of soil is mixed with 50 mL of 0.01M CaCl2 and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM Schedule B(3).
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Resistivity (1:5)	EA080	SOIL	In house: Calculated from Electrical Conductivity
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1: Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Corrosion Classification for Steel and Concrete Piles	* EA167	SOIL	In house: Exposure classification is determined according to Australian Standard AS2159-2009.
Exchangeable Cations on Alkaline Soils	* ED006	SOIL	In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Major Anions - Soluble	ED040S	SOIL	In house: Soluble Anions are determined off a 1:5 soil / water extract by ICPAES.
Chloride Soluble By Discrete Analyser	ED045G	SOIL	In house: Referenced to APHA 4500-Cl- E. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	SOIL	In house: Referenced to USEPA SW846, Method 3060. Hexavalent chromium is extracted by alkaline digestion. The digest is determined by photometrically by automatic discrete analyser, following pH adjustment. The instrument uses colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	SOIL	In house: Referenced to APHA 4500-CN C / ASTM D7511 / ISO 14403. Caustic leachates of soil samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3).
Total Fluoride	EK040T	SOIL	(In-house) Total fluoride is determined by ion specific electrode (ISE) in a solution obtained after a Sodium Carbonate / Potassium Carbonate fusion dissolution.
Buchi Ammonia	EK055	SOIL	In house: Referenced to APHA 4500-NH3 B&G, H Samples are steam distilled (Buchi) prior to analysis and quantified using titration, FIA or Discrete Analyser.
Nitrite as N - Soluble by Discrete Analyser	EK057G	SOIL	In house: Referenced to APHA 4500-NO3- B. Nitrite in a water extract is determined by direct colourimetry by Discrete Analyser.
Nitrate as N - Soluble by Discrete Analyser	EK058G	SOIL	In house: Referenced to APHA 4500-NO3- F. Nitrate in the 1:5 soil:water extract is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	SOIL	In house: Thermo Scientific Method D08727 and NEMI (National Environmental Method Index) Method ID: 9171. This method covers the determination of total oxidised nitrogen (NOx-N) and nitrate (NO3-N) by calculation, Combined oxidised Nitrogen (NO2+NO3) in a water extract is determined by direct colourimetry by Discrete Analyser.
TKN as N By Discrete Analyser	EK061G	SOIL	In house: Referenced to APHA 4500-Norg-D Soil samples are digested using Kjeldahl digestion followed by determination by Discrete Analyser.
Total Nitrogen as N (TKN + NOx) By Discrete Analyser	EK062G	SOIL	In house: Referenced to APHA 4500 Norg/NO3- Total Nitrogen is determined as the sum of TKN and Oxidised Nitrrogen, each determined seperately as N.
Total Phosporus By Discrete Analyser	EK067G	SOIL	In house: Referenced to APHA 4500 P-B&F This procedure involves sulfuric acid digestion and quantification using Discrete Analyser.

Analytical Methods	Method	Matrix	Method Descriptions
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
PCB - VIC EPA 448.3 Screen	EP066-EM	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071-EM	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
Volatile Organic Compounds	EP074	SOIL	In house: Referenced to USEPA SW 846 - 8260 Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
Volatile Organic Compounds - Ultra-trace	EP074-UT	SOIL	In house: Referenced to USEPA SW 846 - 8260 Extracts are analysed by Purge and Trap, Capillary GC/MS in partial SIM/Scan mode. Quantification is by comparison against an established multi-point calibration curves. This method is compliant with NEPM Schedule B(3).
Volatile Organic Compounds - Ultra-trace - Summations	EP074-UT-SUM	SOIL	Summation of MAHs and VHCs
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
Semivolatile Organic Compounds - Waste Classification	EP075-EM	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
SVOC - Waste Classification (Sums)	EP075-EM-SUM	SOIL	Summations for EP075 (EM variation)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
Pesticides by GCMS	EP068	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
NaOH leach for CN in Soils	CN-PR	SOIL	In house: APHA 4500 CN. Samples are extracted by end-over-end tumbling with NaOH.
pH in soil using a 0.01M CaCl2 extract	EA001-PR	SOIL	In house: Referenced to Rayment and Lyons 4B1, 10 g of soil is mixed with 50 mL of 0.01M CaCl2 and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations Preparation Method (Alkaline Soils)	ED006PR	SOIL	In house: Referenced to Rayment and Lyons method 15C1.
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
Alkaline digestion for Hexavalent Chromium	EG048PR	SOIL	In house: Referenced to USEPA SW846, Method 3060A.
Total Fluoride	EK040T-PR	SOIL	In house: Samples are fused with Sodium Carbonate / Potassium Carbonate flux.
TKN/TP Digestion	EK061/EK067	SOIL	In house: Referenced to APHA 4500 Norg- D; APHA 4500 P - H. Macro Kjeldahl digestion.
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
1:5 solid / water leach following drying at 40°C	EN34-AD	SOIL	10 g of 40°C dried soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Methanolic Extraction of Soils - Ultra-trace.	ORG16-UT	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids - VIC EPA Screen	ORG17-EM	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

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ALS Laboratory: please tick →

☐ **Sydney**: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
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☐ **Brisbane**: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
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☐ **Melbourne**: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide**: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ **Perth**: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ **Launceston**: 27 Wellington St, Launceston TAS 725 Ph. 03 6331 2158 E. launceston@alsenviro.com

URGENT

Environmental Division
Melbourne
Work Order Reference
EM2116590

Telephone : + 61-3-8549 9600

CLIENT: Jacobs
OFFICE: Melbourne
PROJECT: IS311800
ORDER NUMBER: Jacobs PO # TBC
CONSULTANT: Jye Grogan **CONTACT PH:** [redacted]
SAMPLER: Jye Grogan and Benjamin Grasso **SAMPLER MOBILE:** [redacted]
COC emailed to ALS? (YES / ~~NO~~ **)** **EDD FORMAT (or default):** ESDAT
Email Reports to: [redacted]
Email ESDAT Files to: [redacted]
Email Invoice to: [redacted]

TURNAROUND REQUIREMENTS : ☐ Standard TAT (List **due date**):
(Standard TAT may be longer for some tests e.g.. Ultra Trace Organics) ☐ Non Standard or urgent TAT (**List due date**): 3 day turn-around

ALS QUOTE NO.: MEBQ/003/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle
Custody Seal Intact?
Free ice / frozen ice bricks present upon receipt?
Random Sample Temperature on Receipt:
Other comment:

Yes No N/A
Yes No N/A
°C

RELINQUISHED BY: Jye Grogan	RECEIVED BY: *Courier*	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 14:29 20/08/2021	DATE/TIME: 14:29 20/08/2021	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Freeze any acid sulfate soil samples upon receipt. Retain samples on hold. **Rinsate Analysis:** Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury), PFAS (12 analytes), Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P), OCPs/ OPPs/ PCBs, TRH(C6-C40)/BTEXN/PAH

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)						CONTAINER INFORMATION					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).																Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX				TYPE & PRESERVATIVE *(refer to codes below)*				No OF CONTAINERS	Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury);	NT-8S: Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P)	EP231: PFAS (12 analytes)	Pesticides (S-13): OCPs/ OPPs/ PCBs	S-10: TRH (C6-C40)/BTEXN/PAH/VOC	P-30/4: EPA 1828.2 Table 3 Fill Material Suite (Metals (As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Sn, Se, Ag, Zn), Total CN, F, Phenols, MAH, PAH (incl. BaP), VOC, OC, pH(CaCl2))	Complete Chromium Suite for Acid Sulfate Soils (EA033)	NEPM Screen for Soil classification (P-22)	ALS Corrosion Schedule 7 – Soil on Concrete & Steel Piles (CORR-7)	Asbestos Identification in Soils - Presence/Absence (EA200)					Rinsate: see comments above	HOLD	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
			WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE																		
1	HA19_0.1	18/08/2021		X			X				3	X		X	X	X				X								
2	HA19_0.4	18/08/2021		X			X				3	X		X	X	X				X								
→	HA19_GT_0.2-0.4	18/08/2021		X			X				1																	Please forward to Ground Science, 13 Brock Street, Thomastown VIC 3074
3	HA17_0.1	18/08/2021		X			X				3	X		X	X	X			X	X								
4	HA17_0.3	18/08/2021		X			X				1							X										Acid Sulfate Soil sample has been frozen, please freeze on receipt
5	HA17_0.5	18/08/2021		X			X				3	X		X	X	X			X	X								
6	HA17_1.0	18/08/2021		X			X				3																X	
→	HA17-GT_0.8-1.0	18/08/2021		X			X				1																	Please forward to Ground Science, 13 Brock Street, Thomastown VIC 3074
7	HA15_0.1	18/08/2021		X			X				3	X		X	X	X				X								
8	HA15_0.5	18/08/2021		X			X				4																X	Acid Sulfate Soil sample has been frozen, please freeze on receipt
9	HA15_1.0	18/08/2021		X			X				4	X		X	X	X		X		X								Acid Sulfate Soil sample has been frozen, please freeze on receipt
										TOTAL	29																	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Received: 20/8, 15:00 Carrier: courier
C/note:
Temp: 8.9 °C Seal: [✓ Y] / N
[✓ Ice] / Icebricks / NA
Tim

ALS

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ALS Laboratory: please tick →

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☐ **Launceston**: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: Jacobs
OFFICE: Melbourne
PROJECT: IS311800
ORDER NUMBER: Jacobs PO # TBC
CONSULTANT: Jye Grogan
CONTACT PH: [redacted]
SAMPLER: Jye Grogan and Benjamin Grasso
SAMPLER MOBILE: [redacted]
COC emailed to ALS? (YES / ~~NO~~)
EDD FORMAT (or default): ESDAT
Email Reports to: [redacted]
Email ESDAT Files to: [redacted]
Email Invoice to: [redacted]

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☐ Standard TAT **(List due date):**
☐ Non Standard or urgent TAT **(List due date):** 3 day turn-around

ALS QUOTE NO.: MEBQ/003/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY: Jye Grogan	**RECEIVED BY:** *Courier*	**RELINQUISHED BY:**	**RECEIVED BY:**
DATE/TIME: 14:29 20/08/2021	DATE/TIME: 14:29 20/08/2021	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Freeze any acid sulfate soil samples upon receipt. Retain samples on hold. **Rinsate Analysis**: Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury), PFAS (12 analytes), Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P), OCPs/ OPPs/ PCBs, TRH(C6-C40)/BTEXN/PAH

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)						CONTAINER INFORMATION					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).																Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX				TYPE & PRESERVATIVE *(refer to codes below)*				No OF CONTAINERS	Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury);	NT-8S: Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P)	EP231: PFAS (12 analytes)	Pesticides (S-13): OCPs/ OPPs/ PCBs	S-10: TRH (C6-C40)/BTEXN/PAH/VOC	P-30/4: EPA 1828.2 Table 3 Fill Material Suite (Metals (As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Sn, Se, Ag, Zn), Total CN, F, Phenols, MAH, PAH (incl. BaP), VOC, OC, pH(CaCl2))	Complete Chromium Suite for Acid Sulfate Soils (EA033)	NEPM Screen for Soil classification (P-22)	ALS Corrosion Schedule 7 – Soil on Concrete & Steel Piles (CORR-7)	Asbestos Identification in Soils - Presence/Absence (EA200)				Trip Blank (TRH(C6 - C9)/BTEXN)	Rinsate: see comments above	HOLD	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
			WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE																		
10	HA10_0.1	18/08/2021		X			X				4			X			X			X								
11	HA10_0.3	18/08/2021		X			X				3																X	
12	HA05_0.1	18/08/2021		X			X				3	X		X	X	X				X								
13	HA05_0.5	18/08/2021		X			X				3																X	
14	HA05_1.0	18/08/2021		X			X				3	X		X		X				X								
15	RN_20210818	18/08/2021	X				X				12															X		
16	TB_20210818	18/08/2021	X				X				3														X			
17	RN_20210819	19/08/2021	X				X				12															X		
18	HA02_0.1	19/08/2021		X			X				3	X	X	X	X	X			X	X								
19	QC01_20210819	19/08/2021		X			X				3	X			X	X												
→	QC02_20210819	19/08/2021		X			X				3	X			X	X												Please forward to Eurofins Melbourne
20	HA02_0.5	19/08/2021		X			X				3	X	X	X	X	X			X	X								
										TOTAL	55																	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176
Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304
Ph:02 4968 9433 E:samples.newcastle@alsenviro.com

☐ **Brisbane** 32 Shand St, Stafford QLD 4053
Ph:07 3243 7222 E.samples.brisbane@alsenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
Ph:07 4796 0600 E townsville.environmental@alsenviro.com

☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171
Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095
Ph: 08 8359 0890 E:adelaide@alsenviro.com

☐ **Perth.** 10 Hod Way, Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ **Launceston:** 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: Jacobs
OFFICE: Melbourne
PROJECT: IS311800
ORDER NUMBER: Jacobs PO # TBC
CONSULTANT: Jye Grogan
CONTACT PH: [redacted]
SAMPLER: Jye Grogan and Benjamin Grasso
SAMPLER MOBILE: [redacted]
COC emailed to ALS? (YES / ~~NO~~)
EDD FORMAT (or default): ESDAT
Email Reports to: [redacted]
Email ESDAT Files to: [redacted]
Email Invoice to: [redacted]

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT **(List due date):**
☐ Non Standard or urgent TAT **(List due date):** 3 day turn-around

ALS QUOTE NO.: MEBQ/003/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY: Jye Grogan
DATE/TIME:
14:29 20/08/2021

RECEIVED BY:
Courier
DATE/TIME:
14:29 20/08/2021

RELINQUISHED BY:
DATE/TIME:

RECEIVED BY:
DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Freeze any acid sulfate soil samples upon receipt. Retain samples on hold. **Rinsate Analysis:** Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury), PFAS (12 analytes), Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P), OCPs/ OPPs/ PCBs, TRH(C6-C40)/BTEXN/PAH

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)						CONTAINER INFORMATION					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).																Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX				TYPE & PRESERVATIVE *(refer to codes below)*				No OF CONTAINERS	Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury);	NT-8S: Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P)	EP231: PFAS (12 analytes)	Pesticides (S-13): OCPs/ OPPs/ PCBs	S-10: TRH (C6-C40)/BTEXN/PAH/VOC	P-30/4: EPA 1828.2 Table 3 Fill Material Suite (Metals (As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Sn, Se, Ag, Zn), Total CN, F, Phenols, MAH, PAH (incl. BaP), VOC, OC, pH(CaCl2))	Complete Chromium Suite for Acid Sulfate Soils (EA033)	NEPM Screen for Soil classification (P-22)	ALS Corrosion Schedule 7 – Soil on Concrete & Steel Piles (CORR-7)	Asbestos Identification in Soils - Presence/Absence (EA200)					Rinsate: see comments above	HOLD	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
			WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE																		
→	HA02-GT_0.5-0.6	18/08/2021		X			X				1																	Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
21	HA03_0.1	18/08/2021		X			X				4	X	X	X	X	X			X	X								
22	QC03_20210819	18/08/2021		X			X				3	X				X												
→	QC04_20210819	18/08/2021		X			X				3	X				X												Please forward to Eurofins Melbourne
23	HA03_0.5	18/08/2021		X			X				4																X	Acid Sulfate Soil sample has been frozen, please freeze on receipt
24	HA03_1.0	18/08/2021		X			X				4	X	X	X	X			X	X	X								Acid Sulfate Soil sample has been frozen, please freeze on receipt
→	HA03-GT_0.67-1.0	19/08/2021		X			X				1																	Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
25	HA04_0.1	19/08/2021		X			X				3	X	X	X	X	X			X	X								
26	HA04_0.5	19/08/2021		X			X				3																	
27	HA04_0.88	19/08/2021		X			X				3	X		X		X			X	X								
→	HA04-GT_0.5-0.88	19/08/2021		X			X				1																	Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
										TOTAL	30																	

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V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Certificate of Analysis

Jacobs Group (Australia) P/L VIC
PO Box 312 Flinders Lane
Melbourne
VIC 8009

Attention: **Jye Grogan**

Report **818783-S**
Project name IS311800
Received Date Aug 23, 2021

Client Sample ID			**QC04_20210819**	**QC02_20210819**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**M21-Au39945**	**M21-Au39946**
Date Sampled			**Aug 19, 2021**	**Aug 19, 2021**
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons				
TRH C6-C9	20	mg/kg	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50
Naphthalene^{N02}	0.5	mg/kg	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20
TRH C6-C10 less BTEX (F1)^{N04}	20	mg/kg	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)^{N01}	50	mg/kg	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100
BTEX				
Benzene	0.1	mg/kg	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	82	93
Volatile Organics				
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5

Client Sample ID			QC04_20210819	QC02_20210819
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**M21-Au39945**	**M21-Au39946**
Date Sampled			**Aug 19, 2021**	**Aug 19, 2021**
Test/Reference	LOR	Unit		
Volatile Organics				
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5
Benzene	0.1	mg/kg	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	82	93
Toluene-d8 (surr.)	1	%	74	85
Polycyclic Aromatic Hydrocarbons				
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5

Client Sample ID			**QC04_20210819**	**QC02_20210819**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**M21-Au39945**	**M21-Au39946**
Date Sampled			**Aug 19, 2021**	**Aug 19, 2021**
Test/Reference	LOR	Unit		
Polycyclic Aromatic Hydrocarbons				
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	128	75
p-Terphenyl-d14 (surr.)	1	%	115	70
Heavy Metals				
Aluminium	20	mg/kg	6600	4300
Antimony	10	mg/kg	< 10	< 10
Arsenic	2	mg/kg	2.4	< 2
Beryllium	2	mg/kg	< 2	< 2
Boron	10	mg/kg	14	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4
Chromium	5	mg/kg	14	12
Cobalt	5	mg/kg	9.1	< 5
Copper	5	mg/kg	9.8	< 5
Iron	20	mg/kg	12000	8400
Lead	5	mg/kg	15	8.0
Manganese	5	mg/kg	510	95
Mercury	0.1	mg/kg	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5
Nickel	5	mg/kg	11	< 5
Selenium	2	mg/kg	< 2	< 2
Silver	2	mg/kg	< 2	< 2
Tin	10	mg/kg	< 10	< 10
Vanadium	10	mg/kg	13	14
Zinc	5	mg/kg	26	7.6
% Moisture	1	%	23	13
Organochlorine Pesticides				
Chlordanes - Total	0.1	mg/kg	-	< 0.1
4.4'-DDD	0.05	mg/kg	-	< 0.05
4.4'-DDE	0.05	mg/kg	-	< 0.05
4.4'-DDT	0.05	mg/kg	-	< 0.05
a-HCH	0.05	mg/kg	-	< 0.05
Aldrin	0.05	mg/kg	-	< 0.05
b-HCH	0.05	mg/kg	-	< 0.05

Client Sample ID			**QC04_20210819**	**QC02_20210819**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**M21-Au39945**	**M21-Au39946**
Date Sampled			**Aug 19, 2021**	**Aug 19, 2021**
Test/Reference	LOR	Unit		
Organochlorine Pesticides				
d-HCH	0.05	mg/kg	-	< 0.05
Dieldrin	0.05	mg/kg	-	< 0.05
Endosulfan I	0.05	mg/kg	-	< 0.05
Endosulfan II	0.05	mg/kg	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	-	< 0.05
Endrin	0.05	mg/kg	-	< 0.05
Endrin aldehyde	0.05	mg/kg	-	< 0.05
Endrin ketone	0.05	mg/kg	-	< 0.05
g-HCH (Lindane)	0.05	mg/kg	-	< 0.05
Heptachlor	0.05	mg/kg	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	-	< 0.05
Methoxychlor	0.05	mg/kg	-	< 0.05
Toxaphene	0.5	mg/kg	-	< 0.5
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	< 0.1
Dibutylchlorendate (surr.)	1	%	-	76
Tetrachloro-m-xylene (surr.)	1	%	-	110
Organophosphorus Pesticides				
Azinphos-methyl	0.2	mg/kg	-	< 0.2
Bolstar	0.2	mg/kg	-	< 0.2
Chlorfenvinphos	0.2	mg/kg	-	< 0.2
Chlorpyrifos	0.2	mg/kg	-	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	-	< 0.2
Coumaphos	2	mg/kg	-	< 2
Demeton-S	0.2	mg/kg	-	< 0.2
Demeton-O	0.2	mg/kg	-	< 0.2
Diazinon	0.2	mg/kg	-	< 0.2
Dichlorvos	0.2	mg/kg	-	< 0.2
Dimethoate	0.2	mg/kg	-	< 0.2
Disulfoton	0.2	mg/kg	-	< 0.2
EPN	0.2	mg/kg	-	< 0.2
Ethion	0.2	mg/kg	-	< 0.2
Ethoprop	0.2	mg/kg	-	< 0.2
Ethyl parathion	0.2	mg/kg	-	< 0.2
Fenitrothion	0.2	mg/kg	-	< 0.2
Fensulfothion	0.2	mg/kg	-	< 0.2
Fenthion	0.2	mg/kg	-	< 0.2
Malathion	0.2	mg/kg	-	< 0.2
Merphos	0.2	mg/kg	-	< 0.2
Methyl parathion	0.2	mg/kg	-	< 0.2
Mevinphos	0.2	mg/kg	-	< 0.2
Monocrotophos	2	mg/kg	-	< 2
Naled	0.2	mg/kg	-	< 0.2
Omethoate	2	mg/kg	-	< 2
Phorate	0.2	mg/kg	-	< 0.2
Pirimiphos-methyl	0.2	mg/kg	-	< 0.2

Client Sample ID			**QC04_20210819**	**QC02_20210819**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**M21-Au39945**	**M21-Au39946**
Date Sampled			**Aug 19, 2021**	**Aug 19, 2021**
Test/Reference	LOR	Unit		
Organophosphorus Pesticides				
Pyrazophos	0.2	mg/kg	-	< 0.2
Ronnel	0.2	mg/kg	-	< 0.2
Terbufos	0.2	mg/kg	-	< 0.2
Tetrachlorvinphos	0.2	mg/kg	-	< 0.2
Tokuthion	0.2	mg/kg	-	< 0.2
Trichloronate	0.2	mg/kg	-	< 0.2
Triphenylphosphate (surr.)	1	%	-	77
Polychlorinated Biphenyls				
Aroclor-1016	0.1	mg/kg	-	< 0.1
Aroclor-1221	0.1	mg/kg	-	< 0.1
Aroclor-1232	0.1	mg/kg	-	< 0.1
Aroclor-1242	0.1	mg/kg	-	< 0.1
Aroclor-1248	0.1	mg/kg	-	< 0.1
Aroclor-1254	0.1	mg/kg	-	< 0.1
Aroclor-1260	0.1	mg/kg	-	< 0.1
Total PCB*	0.1	mg/kg	-	< 0.1
Dibutylchlorendate (surr.)	1	%	-	76
Tetrachloro-m-xylene (surr.)	1	%	-	110

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX and Naphthalene			
BTEX	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Volatile Organics	Melbourne	Aug 23, 2021	7 Days
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices (USEPA 8260)			
Polycyclic Aromatic Hydrocarbons	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Heavy Metals	Melbourne	Aug 23, 2021	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			
Eurofins Suite B15			
Organochlorine Pesticides	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8270)			
Organophosphorus Pesticides	Melbourne	Aug 23, 2021	14 Days
- Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS (USEPA 8270)			
Polychlorinated Biphenyls	Melbourne	Aug 23, 2021	28 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8082)			

Company Name: Jacobs Group (Australia) P/L VIC
Address: PO Box 312 Flinders Lane
Melbourne
VIC 8009

Project Name: IS311800

Order No.:
Report #: 818783
Phone: 03 8668 3000
Fax: 03 8668 3001

Received: Aug 23, 2021 9:58 AM
Due: Aug 26, 2021
Priority: 3 Day
Contact Name: Jye Grogan

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Vanadium	Zinc	Polycyclic Aromatic Hydrocarbons	Eurofins Suite B15	BTEX and Naphthalene	Volatile Organics	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																															
Brisbane Laboratory - NATA Site # 20794																															
Perth Laboratory - NATA Site # 23736																															
Mayfield Laboratory - NATA Site # 25079																															
External Laboratory																															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																										
1	QC04_20210819	Aug 19, 2021		Soil	M21-Au39945	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
2	QC02_20210819	Aug 19, 2021		Soil	M21-Au39946	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	M21-Au38594	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	M21-Au35782	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	M21-Au35782	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	M21-Au35782	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Naphthalene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	M21-Au38594	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	M21-Au35782	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	M21-Au35782	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	M21-Au35782	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M21-Au38594	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	M21-Au38594	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	M21-Au38594	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	M21-Au38594	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	M21-Au38594	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	M21-Au38594	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
1.1-Dichloroethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1-Dichloroethene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.1-Trichloroethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.1.2-Tetrachloroethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.2-Trichloroethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.2.2-Tetrachloroethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dibromoethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichlorobenzene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichloroethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichloropropane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3-Trichloropropane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4-Trimethylbenzene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichlorobenzene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichloropropane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3.5-Trimethylbenzene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.4-Dichlorobenzene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Butanone (MEK)	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Propanone (Acetone)	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Chlorotoluene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Methyl-2-pentanone (MIBK)	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Allyl chloride	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromobenzene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromochloromethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromodichloromethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromoform	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromomethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Carbon disulfide	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Carbon Tetrachloride	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chlorobenzene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloroethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloroform	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
Chloromethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
cis-1.2-Dichloroethene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
cis-1.3-Dichloropropene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibromochloromethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibromomethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dichlorodifluoromethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Iodomethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Isopropyl benzene (Cumene)	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Methylene Chloride	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Styrene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Tetrachloroethene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.2-Dichloroethene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.3-Dichloropropene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichloroethene	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichlorofluoromethane	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Vinyl chloride	M21-Au38594	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	B21-Au34444	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	M21-Au38672	NCP	mg/kg	27000	27000	<1	30%	Pass	
Antimony	M21-Au38672	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Arsenic	M21-Au38672	NCP	mg/kg	5.0	5.1	2.0	30%	Pass	
Beryllium	M21-Au38672	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	M21-Au38672	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	M21-Au38672	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M21-Au38672	NCP	mg/kg	43	43	1.0	30%	Pass	
Cobalt	M21-Au38672	NCP	mg/kg	5.8	5.8	<1	30%	Pass	
Copper	M21-Au38672	NCP	mg/kg	23	23	1.0	30%	Pass	
Iron	M21-Au38672	NCP	mg/kg	30000	30000	<1	30%	Pass	
Lead	M21-Au38672	NCP	mg/kg	27	27	2.0	30%	Pass	
Manganese	M21-Au38672	NCP	mg/kg	25	25	1.0	30%	Pass	
Mercury	M21-Au38672	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	M21-Au38672	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	M21-Au38672	NCP	mg/kg	10	10	2.0	30%	Pass	
Selenium	M21-Au38672	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	M21-Au38672	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Tin	M21-Au38672	NCP	mg/kg	< 10	< 10	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Vanadium	M21-Au38672	NCP	mg/kg	51	51	<1	30%	Pass	
Zinc	M21-Au38672	NCP	mg/kg	57	57	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	M21-Au39945	CP	%	23	22	3.0	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	M21-Au38830	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-HCH	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-HCH	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-HCH	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-HCH (Lindane)	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	M21-Au38830	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	M21-Au26791	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Azinphos-methyl	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Bolstar	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorfenvinphos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos-methyl	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Coumaphos	M21-Au38830	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Demeton-S	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Demeton-O	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Diazinon	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dichlorvos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dimethoate	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Disulfoton	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
EPN	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethoprop	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethyl parathion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenitrothion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fensulfothion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenthion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Malathion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Merphos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Methyl parathion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Mevinphos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Monocrotophos	M21-Au38830	NCP	mg/kg	< 2	< 2	<1	30%	Pass	

Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Naled	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Omethoate	M21-Au38830	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Phorate	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pirimiphos-methyl	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pyrazophos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ronnel	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Terbufos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tetrachlorvinphos	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tokuthion	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Trichloronate	M21-Au38830	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Duplicate									
Polychlorinated Biphenyls				Result 1	Result 2	RPD			
Aroclor-1016	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1221	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1232	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1242	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1248	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1254	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1260	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Total PCB*	B21-Au32386	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised by:

Harry Bacalis	Analytical Services Manager
Vivian Wang	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Emily Rosenberg	Senior Analyst-Metal (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

eurofins | Environment Testing

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261 Site # 1254

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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46-48 Banksia Road
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Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Jacobs Group (Australia) P/L VIC
Address: PO Box 312 Flinders Lane
Melbourne
VIC 8009

Project Name: IS311800

Order No.:
Report #: 818783
Phone: 03 8668 3000
Fax: 03 8668 3001

Received: Aug 23, 2021 9:58 AM
Due: Aug 26, 2021
Priority: 3 Day
Contact Name: Jye Grogan

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Aluminium	Antimony	Arsenic	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Vanadium	Zinc	Polycyclic Aromatic Hydrocarbons	Eurofins Suite B15	BTEX and Naphthalene	Volatile Organics	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																															
Brisbane Laboratory - NATA Site # 20794																															
Perth Laboratory - NATA Site # 23736																															
Mayfield Laboratory - NATA Site # 25079																															
External Laboratory																															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																										
1	QC04_20210819	Aug 19, 2021		Soil	M21-Au39945	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
2	QC02_20210819	Aug 19, 2021		Soil	M21-Au39946	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2

Sample Receipt Advice

Company name:	Jacobs Group (Australia) P/L VIC
Contact name:	Jye Grogan
Project name:	IS311800
Project ID:	Not provided
Turnaround time:	3 Day
Date/Time received	Aug 23, 2021 9:58 AM
Eurofins reference	818783

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Jye Grogan - jye.grogan@jacobs.com.

Global Leader - Results you can trust

ALS

CHAIN OF CUSTODY

ALS Laboratory: please tick →

URGENT

(24)

CLIENT:	Jacobs	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date): 3 day turn-around
OFFICE:	Melbourne	ALS QUOTE NO.:	MEBQ/003/18
PROJECT:	IS311800	COC SEQUENCE NUMBER (Circle)	COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER:	Jacobs PO # TBC		
CONSULTANT:	Jye Grogan	CONTACT PH:	[redacted]
SAMPLER:	Jye Grogan and Benjamin Grasso	SAMPLER MOBILE:	[redacted]
COC emailed to ALS? (YES / ~~NO~~)		EDD FORMAT (or default):	ESDAT
Email Reports to:	[redacted]		
Email ESDAT Files to:	[redacted]		
Email Invoice to:	[redacted]		

RELINQUISHED BY: Jye Grogan	RECEIVED BY: Courier	RELINQUISHED BY: Mitka (ALS)	RECEIVED BY:
DATE/TIME: 14:29 20/08/2021	DATE/TIME: 14:29 20/08/2021	DATE/TIME: 20/8/21	DATE/TIME:

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:			
Other comment:			

71

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Freeze any acid sulfate soil samples upon receipt. Retain samples on hold. **Rinsate Analysis:** Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury), PFAS (12 analytes), Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P), OCPs/ OPPs/ PCBs, TRH(C6-C40)/BTEXN/PAH

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)		CONTAINER INFORMATION									ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)																Additional Information
			MATRIX				TYPE & PRESERVATIVE (refer to codes below)																					
LAB ID	SAMPLE ID	DATE / TIME	WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE	No OF CONTAINERS	Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury);	NT-8S: Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P)	EP231: PFAS (12 analytes)	Pesticides (S-13): OCPs/ OPPs/ PCBs	S-10: TRH (C6-C40)/BTEXN/PAH/VOC	P-30/4: EPA 1828.2 Table 3 Fill Material Suite (Metals (As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Sn, Se, Ag, Zn), Total CN, F, Phenols, MAH, PAH (incl. BaP), VOC, OC, pH(CaCl2))	Complete Chromium Suite for Acid Sulfate Soils (EA033)	NEPM Screen for Soil classification (P-22)	ALS Corrosion Schedule 7 – Soil on Concrete & Steel Piles (CORR-7)	Asbestos Identification in Soils - Presence/Absence (EA200)				Rinsate: see comments above	HOLD	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	HA19_0.1	18/08/2021		X			X				3	X		X	X	X				X							CT 23/8/21 9:52am FLE 2.3 to 5 2.8
	HA19_0.4	18/08/2021		X			X				3	X		X	X	X				X							
	HA19_GT_0.2-0.4	18/08/2021		X			X				1																Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
	HA17_0.1	18/08/2021		X			X				3	X		X	X	X			X	X							
	HA17_0.3	18/08/2021		X			X				1							X									Acid Sulfate Soil sample has been frozen, please freeze on receipt
	HA17_0.5	18/08/2021		X			X				3	X		X	X	X			X	X							
	HA17_1.0	18/08/2021		X			X				3															X	
	HA17-GT_0.8-1.0	18/08/2021		X			X				1																Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
	HA15_0.1	18/08/2021		X			X				3	X		X	X	X				X							
	HA15_0.5	18/08/2021		X			X				4															X	Acid Sulfate Soil sample has been frozen, please freeze on receipt
	HA15_1.0	18/08/2021		X			X				4	X		X	X	X		X		X							Acid Sulfate Soil sample has been frozen, please freeze on receipt
										TOTAL	29																

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

818783

Received: 20/8, 1500 Carrier: courier
C/note:
Temp: 8.9 °C Seal [✓ Y] N
[✓ Ice] Icebricks N/A
Tim

ALS

2W

CHAIN OF CUSTODY

ALS Laboratory: please tick →

CLIENT:	Jacobs		
OFFICE:	Melbourne		
PROJECT:	IS311800		
ORDER NUMBER:	Jacobs PO # TBC		
CONSULTANT:	Jye Grogan	CONTACT PH:	[redacted]
SAMPLER:	Jye Grogan and Benjamin Grasso	SAMPLER MOBILE:	[redacted]
COC emailed to ALS? (YES / ~~NO~~)		EDD FORMAT (or default): ESDAT	
Email Reports to:	[redacted]		
Email ESDAT Files to:	[redacted]		
Email Invoice to:	[redacted]		

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date): 3 day turn-around

ALS QUOTE NO.: MEBQ/003/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt:
Other comment:

RELINQUISHED BY: Jye Grogan	RECEIVED BY: Courier	RELINQUISHED BY: Milika (ALS)	RECEIVED BY: E.F
DATE/TIME: 14:29 20/08/2021	DATE/TIME: 14:29 20/08/2021	DATE/TIME: 20/8/21	DATE/TIME: 23/8 9.52

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Freeze any acid sulfate soil samples upon receipt. Retain samples on hold. **Rinsate Analysis:** Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury), PFAS (12 analytes), Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P), OCPs/ OPPs/ PCBs, TRH(C6-C40)/BTEXN/PAH

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)		MATRIX				CONTAINER INFORMATION TYPE & PRESERVATIVE (refer to codes below)					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).																Additional Information
LAB ID	SAMPLE ID	DATE / TIME	WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE	No OF CONTAINERS	Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury);	NT-8S: Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P)	EP231: PFAS (12 analytes)	Pesticides (S-13): OCPs/ OPPs/ PCBs	S-10: TRH (C6-C40)/BTEXN/PAH/VOC	P-30/4: EPA 1828.2 Table 3 Fill Material Suite (Metals (As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Sn, Se, Ag, Zn), Total CN, F, Phenols, MAH, PAH (incl. BaP), VOC, OC, pH(CaCl2))	Complete Chromium Suite for Acid Sulfate Soils (EA033)	NEPM Screen for Soil classification (P-22)	ALS Corrosion Schedule 7 – Soil on Concrete & Steel Piles (CORR-7)	Asbestos Identification in Soils - Presence/Absence (EA200)				Trip Blank (TRH(C6 - C9)/BTEXN)	Rinsate: see comments above	HOLD	
	HA10_0.1	18/08/2021		X			X				4			X			X			X								
	HA10_0.3	18/08/2021		X			X				3																X	
	HA05_0.1	18/08/2021		X			X				3	X		X	X	X				X								
	HA05_0.5	18/08/2021		X			X				3																X	
	HA05_1.0	18/08/2021		X			X				3	X		X		X				X								
	RN_20210818	18/08/2021	X				X				12															X		
	TB_20210818	18/08/2021	X				X				3														X			
	RN_20210819	19/08/2021	X				X				12															X		
	HA02_0.1	19/08/2021		X			X				3	X	X	X	X	X			X	X								
	QC01_20210819	19/08/2021		X			X				3	X			X	X												
	QC02_20210819	19/08/2021		X			X				3	X			X	X												Please forward to Eurofins Melbourne
	HA02_0.5	19/08/2021		X			X				3	X	X	X	X	X			X	X								
										TOTAL	55																	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

818783

CHAIN OF CUSTODY

ALS Laboratory: *please tick* →

CLIENT: Jacobs
OFFICE: Melbourne
PROJECT: IS311800
ORDER NUMBER: Jacobs PO # TBC
CONSULTANT: Jye Grogan
CONTACT PH: [redacted]
SAMPLER: Jye Grogan and Benjamin Grasso
SAMPLER MOBILE: [redacted]
COC emailed to ALS? (YES / ~~NO~~)
EDD FORMAT (or default): ESDAT
Email Reports to: [redacted]
Email ESDAT Files to [redacted]
Email Invoice to: [redacted]

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date): 3 day turn-around
ALS QUOTE NO.: MEBQ/003/18

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY: Jye Grogan
DATE/TIME: 14:29 20/08/2021

RECEIVED BY: *Courier*
DATE/TIME: 14:29 20/08/2021

RELINQUISHED BY: Milika (ALS)
DATE/TIME: 20/8

RECEIVED BY: Catherine
DATE/TIME: 23/8 9:52

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Freeze any acid sulfate soil samples upon receipt. Retain samples on hold. **Rinsate Analysis:** Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury), PFAS (12 analytes), Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P), OCPs/ OPPs/ PCBs, TRH(C6-C40)/BTEXN/PAH

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)		MATRIX				CONTAINER INFORMATION TYPE & PRESERVATIVE (refer to codes below)					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)																Additional Information
LAB ID	SAMPLE ID	DATE / TIME	WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE	No OF CONTAINERS	Metals (aluminium, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, tin, vanadium, zinc, boron, iron and mercury);	NT-8S: Nutrients Suite (Ammonia, Nitrite, Nitrate, TKN, Total N and Total P)	EP231: PFAS (12 analytes)	Pesticides (S-13): OCPs/ OPPs/ PCBs	S-10: TRH (C6-C40)/BTEXN/PAH/VOC	P-30/4: EPA 1828.2 Table 3 Fill Material Suite (Metals (As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Sn, Se, Ag, Zn), Total CN, F, Phenols, MAH, PAH (incl. BaP), VOC, OC, pH(CaCl2))	Complete Chromium Suite for Acid Sulfate Soils (EA033)	NEPM Screen for Soil classification (P-22)	ALS Corrosion Schedule 7 – Soil on Concrete & Steel Piles (CORR-7)	Asbestos Identification in Soils - Presence/Absence (EA200)					Rinsate: see comments above	HOLD	
	HA02-GT_0.5-0.6	18/08/2021		X			X				1																	Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
	HA03_0.1	18/08/2021		X			X				4	X	X	X	X	X			X	X								
	QC03_20210819	18/08/2021		X			X				3	X				X												
	QC04_20210819	18/08/2021		X			X				3	X				X												Please forward to Eurofins Melbourne
	HA03_0.5	18/08/2021		X			X				4																X	Acid Sulfate Soil sample has been frozen, please freeze on receipt
	HA03_1.0	18/08/2021		X			X				4	X	X	X	X			X	X	X								Acid Sulfate Soil sample has been frozen, please freeze on receipt
	HA03-GT_0.67-1.0	19/08/2021		X			X				1																	Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
	HA04_0.1	19/08/2021		X			X				3	X	X	X	X	X			X	X								
	HA04_0.5	19/08/2021		X			X				3																	
	HA04_0.88	19/08/2021		X			X				3	X		X		X			X	X								
	HA04-GT_0.5-0.88	19/08/2021		X			X				1																	Please forward to Ground Science, 13 Brook Street, Thomastown VIC 3074
										TOTAL	30																	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

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Appendix F. Quality Assurance / Quality Control

The following summarises the results relevant to Quality Assurance & Quality Control (QA/QC) of soil samples collected for the scope of works presented in this report for the contaminated land assessment. The QA/QC assessment includes both field and laboratory based QA/QC with comparison with adopted acceptance criteria.

F.1 Sample collection, preservation and handling

All soil samples were directly collected from the decontaminated hand auger or from the boreholes using fresh disposable nitrile gloves and placed into labelled laboratory supplied jars suitable for the required analysis. High-density polyethylene containers for PFAS analysis were placed into two sealed zip lock bags. Samples were chilled in eskies soon after collection and transported to the laboratory under chain of custody protocols.

The average temperature of the chilled samples as received by the laboratory was measured as 8.9˚C, over double the target temperature of <5 ˚C. Concentrations of volatile organic compounds in the soil samples, most likely to be affected by higher temperatures, are unlikely to be present given the environmental settings where the soil samples were collected. No volatile organic compounds or semi-volatile organic compounds were detected above the respective laboratory limits of reporting in any sample. On this basis, the higher temperatures recorded by the laboratory are not considered to affect the representativeness of the data.

All samples were analysed within the holding times relevant to the analytes scheduled for analysis.

F.2 Decontamination

Decontamination of reusable equipment (i.e. hand auger, hand tools) using a triple wash system after every location and/or sample. Consisted of a triple rinse as follows:

1) Tap water and Liquinox;
2) Tap water rinse; and
3) Laboratory supplied deionised PFAS free water rinse.

Rinsate samples were collected from reusable sampling equipment to check the effectiveness of the decontamination procedures applied during sampling at the site. Dedicated or single use disposable equipment such as sample tubing, filters and nitrile gloves were not reused during sampling.

F.3 PFAS Specific Protocols

During the collection of samples all field clothing used had been washed a minimum of six times after purchase before use for sampling. Where practical; polyethylene, vinyl, or PVC wet weather clothing was not worn when sampling during wet weather. HDPE, silicone or polypropylene based field equipment was used during sampling. Laboratory prepared sample jars made of PFAS free materials were used for collection of samples scheduled for PFAS analysis. PFAS free deionised water and PFAS sampling containers were provided by the laboratory.

Use of aluminium foil, tyvex, self-sticking notes, waterproof paper, notebooks, labels, detergents, decontamination solutions (other than Liquinox), reusable chemical or gel ice packs, marker pens or other products which are not known to be PFAS free were avoided during sampling, where practicable.

F.4 Repeatability and Reproducibility

Pairs of primary blind (intra-laboratory duplicate) and secondary (inter-laboratory duplicate) samples were collected to assess the repeatability and reproducibility of the analytical results, respectively. Pairs of blind duplicates are collected for every 20 primary samples. The relative percentage difference (RPD) between the intra-laboratory duplicate pair and the inter-laboratory duplicate pair were assessed against the acceptable upper limit for the RPD, as specified in AS4482.1, of <30-50% of the mean analyte concentration. Higher RPDs are acceptable for heterogenous media or where concentrations are low compared to the effective quantitation limit (EQL), i.e. less than 10 times the EQL. An acceptable upper limit for the RPD was adopted based on the magnitude of the reported concentration compared to the EQL;1-10 x EQL = 30%, 10 – 30 x EQL = 30%, and >30 x EQL = 30%.

Two pairs of intra- and inter-laboratory duplicate samples was collected, one from HA02_0.1 and another from HA03_0.1. The required 1 in 20 duplicate sampling frequency was exceeded with two pairs representing 16 primary samples. The RPDs between primary sample results and the duplicates identified two exceedances of the acceptable upper RPD limit for the intra-laboratory sample (QA03_20210819) for cobalt (91%) and manganese (89%). A single exceedance was also identified for the inter-laboratory sample (QA04_20210819) for manganese (72%). The elevated RPDs are likely attributable to the heterogenous nature of the dark brown clay with fine sand and gravels observed at the sample depth interval. On this basis, the RPD exceedances are not considered to adversely impact the repeatability or reproducibility of the results.

Calculated RPDs screened with acceptance criteria are presented in Table 4 of Appendix D.

F.5 Decontamination Validation

Rinsate blanks were collected from the hand auger using laboratory supplied deionised water after the final decontamination for the sampling day to assess the effectiveness of the decontamination procedures employed between each sample location. Decontamination was undertaken under a triple wash with Liquinox®. Both rinsate samples are dated on 19 August 2021, as the rinsate for the previous day was collected in the morning prior to commencing sampling. Two rinsate blanks were collected. Analytical results of the rinsate samples indicated all analytes were below the LOR with the exception of aluminium, iron and manganese in sample RN_20210819. Aluminium and manganese were detected at or just above the LOR of 10 and 2 µg/L, respectively. Iron was detected at just over 4 times the LOR with a concentration of 210 µg/L. These analytes were detected at relatively high concentrations in primary samples compared with other analytes and their detection in the rinsate sample indicated some soil residue passed through the decontamination procedure. Given the low magnitude of the detections of aluminium and manganese and that iron is not a contaminant of potential concern, these detections are not considered to adversely impact the integrity of the sample results nor represent any gross deficiency of the decontamination procedures employed.

Rinsate blank sample results are presented in Table 5 of Appendix D.

F.6 Transport and Handling Validation

A single trip blank (TB_20210818), supplied by the primary laboratory was inserted into the batch of eskies before transport to the primary laboratory and analysed for select volatile organic compounds. No analytes were detected above the respective LOR in the trip blank sample.

Trip blank sample results are presented in Table 6 of Appendix D.

F.7 Laboratory QA/QC

Laboratory duplicates, matrix spike recoveries and method blank results were reported within the acceptable limits by the primary and secondary laboratories.

Relevant results are enclosed within the relevant laboratory records presented in Appendix E.

F.8 QA/QC Appraisal

Based on the outcomes from the quality assurance program, the soil data set is considered suitable for interpretation for the purposes of this report.

Analytical data validation checklist

Project and Data Details

Project number	IS311800	Client	AusNet Services
Site	Various- western alignment in regional VIC	Laboratory report number	EM2116590, 818783
Validated by	B. Grasso	Matrix type/s	Soil, water
Validation date	11 Oct 2021	Primary laboratory	ALS
Sampling date range	18-19 August 2021	Secondary laboratory	Eurofins

Field QAQC	Yes	No	NA		Yes	No	NA
Correct sample naming on COC?	☒	☐	☐	Were field blank/s collected?	☒	☐	☐
Correct sample naming in laboratory SRN?	☒	☐	☐	Trip blank/s collected?	☒	☐	☐
Do the requested limits of reporting match the project SAQP?	☐	☐	☒	Intra and inter laboratory duplicate/s?	☒	☐	☐
Analysis on COC correct compared to project SAQP?	☐	☐	☒	Do field blank/s results meet criteria?	☐	☒	☐
Analysis on SRN correct as compared to COC?	☒	☐	☐	Do trip blank/s results meet criteria?	☒	☐	☐
All samples received intact and within acceptable temp. range?	☐	☒	☐	Do duplicate results meet criteria?	☐	☒	☐

Laboratory QAQC	Yes	No	NA		Yes	No	NA
Do samples meet analysis holding times?	☒	☐	☐	Are laboratory duplicate RPDs < 30%?	☒	☐	☐
Do analytes reported in COA match SRN?	☒	☐	☐	Are LCS/standards within laboratory specified ranges?	☒	☐	☐
Is internal laboratory QAQC frequency adequate?	☒	☐	☐	Are laboratory MS recoveries within laboratory specified ranges?	☒	☐	☐
Do lab reports and EDD match?	☒	☐	☐	Are surrogate spikes recoveries within laboratory specified ranges?	☒	☐	☐
Are all results below LOR for method blanks?	☒	☐	☐				

Acronyms

COA – Certificate of analysis
COC – Chain of custody
EDD – Electronic data deliverable
LCS – Laboratory control spike
LOR – Limit of reporting
MS – Matrix spike
RPD – Relative percentage difference
SAQP – Sample analysis quality plan
SRN – Service recipient notice

Comments

Sample chilled and temperature recorded as 8.9C upon receipt by laboratory

Aluminium result in RN_20210819 returned a detection at the LOR (at 10 ug/L)

Iron result in RN_210210819 returned a detection over four times the LOR (at 210 ug/L)

Manganese result in RN_20210819 returned a detection just above the LOR (at 2 ug/L)

The detections of analytes above the LOR in rinsate blank samples indicate that some degree of soil residue may have remained on the auger after decontamination. The concentration of aluminium, iron and manganese were generally high in soil samples relative to other analytes. Given the magnitude of the detections and the fact that iron is not a CoPC, these results are not considered to significantly impact sample integrity.

Intra-laboratory duplicate RPD results for QA03_20210819 exceeded the acceptable range with cobalt (91%) and manganese (89%)

Inter-laboratory duplicate RPD results for QA04_20210819 exceeded the acceptable range with manganese (72%)

The elevated RPDs for some metals are likely attributed to the heterogeneity of the observed layering within the soil and challenges associated with producing homogenous split samples under field sampling conditions..

Appendix G. Equipment Calibration Records

HydroTerra
Environmental Monitoring Specialists

DataStream™

REVIEWED BY: WM
APPROVED BY: OM
NEXT REVIEW DATE: 08/21

EQUIPMENT QUALITY REPORT

MiniRae 3000 PID:

Equipment Code: MPI-219 Serial Number: 592-908219

The following equipment has been issued as follows:

✓ Equipment is clean & filters replaced ✓ Pump, lamp & battery voltage check

Calibration Results					
Parameter	Standard	Result	Range	Alarm Settings	Cal Gas Expiry Date
Fresh Air	0 ppm	0.0 ppm	± 1 ppm		Fresh Air
Isobutylene	100 ppm*	100.6 ppm	± 2 ppm	Lo Alarm 25ppm ☑ Hi Alarm 100ppm ☑ STEL 25ppm ☑ TWA 10ppm ☑	47 – WO201076-3 Exp.22/2/2024
Correction					

Date: 17/08/2021

Calibrated by: John Morton

*For quality control purposes HydroTerra can supply gas calibration data.

Please check that the following items are received and all items are returned. Please clean equipment before retuning. **A minimum $20 service/repair charge applies to any unclean or damaged items.**

Photo Ref.	Item (See photo at the back of this form)	HT Id No.	Sent	Returned
1	Hard case for PID	N/A	✓	
2	Manual, Quick Start Guide, Calibration certificate	N/A	✓	
3	MiniRae 3000 PID (plus yellow rubber boot)	MPI-219	✓	
4	Spare alkaline battery compartment with batteries 6.04 V Spare water trap filter(s) Qty_1___	N/A	✓	
5	Charger 240/110V to 12V 500mA	N/A	✓	
6	Flow Gas Regulator (Optional – Charge extra)			
7	Isobutylene 100ppm Gas bottle (Optional – Charge extra)			
-	Test and tag	N/A	✓	

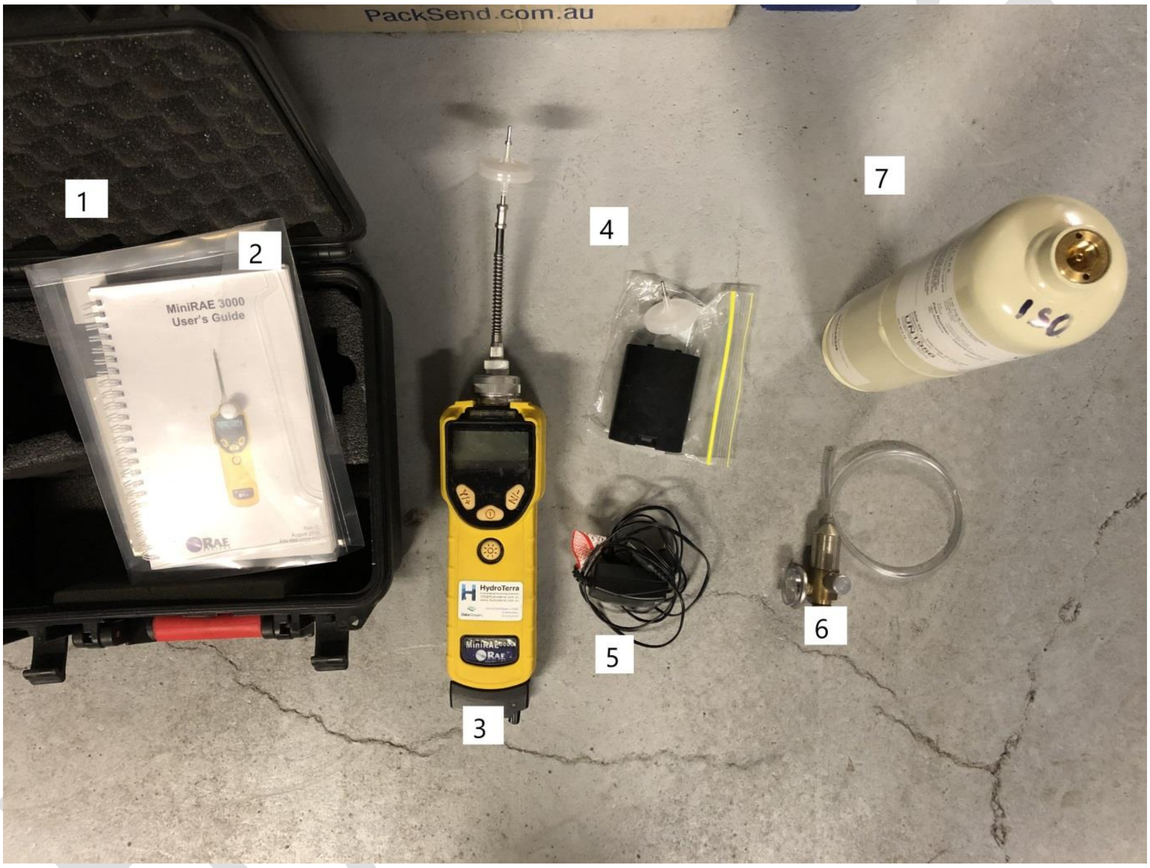
✓ Equipment voltage ✓ Pre-delivery Calibration Test Complete

Date: 17/08/2021

Calibrated by: John Morton

HT JOB NO: 18301 CLIENTS REF: P/O No: TBC

RETURN DATE: / / TIME: CONDITION ON RETURN:


PackSend.com.au
1
2
MiniRAE 3000
User's Guide
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7
150

Appendix D. EPA Priority Sites Register (20 May 2024)

OFFICIAL

PRIORITY SITES REGISTER

Information as at 31 Jul 2024

The Priority Sites Register is updated monthly and the information on it may not be accurate, current or complete and may be subject to change without notice.

Land contaminated by former waste disposal, industrial and similar activities is frequently discovered during changes to land use - for example, from industrial to residential use. In most cases these can be managed at the time that the change of land use occurs. Some sites however, present a potential risk to human health or to the environment and must be dealt with as a priority. Such sites are typically subject to clean-up and/or management under EPA directions.

WHAT ARE PRIORITY SITES?

Priority Sites are sites for which EPA has issued a:

- Clean Up Notice pursuant to section 62A) of the Environment Protection Act 1970
- Pollution Abatement Notice pursuant to section 31A or 31B (relevant to land and/or groundwater) of the Environment Protection Act 1970.
- Environment Action Notice pursuant to Section 274 of the Environment Protection Act 2017
- Site Management Order (related to land and groundwater) pursuant to Section 275 of the Environment Protection Act 2017
- Improvement Notice (related to land and groundwater) pursuant to Section 271 of the Environment Protection Act 2017
- Prohibition Notices (related to land and groundwater) pursuant to Section 272 of the Environment Protection Act 2017

These remedial notices are issued on the occupier or controller of the site to require active management of these sites, or where EPA believes it is in the community interest to be notified of a potential contaminated site and this cannot be communicated by any other legislative means. Sites are removed from the Priority Sites Register once all conditions of a Notice have been complied with.

Typically these are sites where pollution of land and/or groundwater presents a potential risk to human health or to the environment. The condition of these sites is not compatible with the current or approved use of the site without active management to reduce the risk to human health and the environment. Such management can include clean up, monitoring and/or institutional controls.

The Priority Sites Register does not list all sites that are known to be contaminated in Victoria. A site should not be presumed to be free of contamination just because it does not appear on the Priority Sites Register. Persons intending to enter into property transactions should be aware that many properties may have been contaminated by past land uses and EPA may not be aware of the presence of contamination. Council and other planning authorities hold information about previous land uses, and it is advisable that such sources of information should also be consulted.

DISCLAIMER

The Environment Protection Authority does not warrant the accuracy or completeness of information in this Extract and any person using or relying upon such information does so on the basis that the Environment Protection Authority shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Users of this site accept all risks and responsibilities for losses, damages, costs and other consequences resulting directly or indirectly from use of this site and information from it.

To the maximum permitted by law, the EPA excludes all liability to any person directly or indirectly from using this site and information from it.

FURTHER INFORMATION

Additional information is available from:
EPA Victoria
200 Victoria Street
Carlton VIC 3053
1300 EPA VIC (1300 372 842)
www.epa.vic.gov.au
contact@epa.vic.gov.au

Municipality	Suburb	Address	Issue	Notice Number
Brimbank City	Keilor	100a Green Gully Road, Keilor, Victoria, 3036, Australia	Industrial waste has been dumped at the site. Requires ongoing management	EAN-00001325-4
Darebin City	Northcote	56 Brickworks Lane Northcote 3070	Former Landfill. Requires ongoing management	EAN-00005000-1

Municipality	Suburb	Address	Issue	Notice Number
Central Goldfields Shire	Carisbrook	Crown Allotment 38D Section 3 Parish of Carisbrook, 129 Williams Road, Carisbrook, Victoria, 3464, Australia	Former Landfill. Requires ongoing management	SMO-00004473
Greater Geelong City	Corio	1500-1580 Biddlecombe Avenue Corio 3214	Former Landfill. Requires ongoing management	SMO-00003496-1
Swan Hill Rural City	Towan	801 Nyrraby Road Towan 3596	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00007282
Kingston City	Moorabbin	422-424 South Road Moorabbin 3189	Current Service Station. Requires assessment and/or clean up	EAN-00004609-1
Ballarat City	Ballarat	Ballarat Airport, Mitchell Park, Ballarat, Victoria, 3355, Australia	Accidental spill/leak (non-industrial site). Requires assessment and/or clean up	EAN-00006736
Boroondara City	Hawthorn East	Fritsch Holzer Park, Hawthorn East, VIC, 3123, Australia	Former Landfill. Requires ongoing management	EAN-00002514-1
Latrobe City	Morwell	145-147 Princes Drive Morwell 3840	Former Service Station. Requires assessment and/or clean up	EAN-00006409
Latrobe City	Traralgon	23-29 Shakespeare Street, Traralgon, Victoria, 3844, Australia	Current Service Station. Requires ongoing management	EAN-00004886
Greater Geelong City	Moolap	132 - 140 Hays Rd Moolap VIC 3224 AU	Current industrial site. Requires ongoing management	EAN-00005307
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002229
Brimbank City	Keilor	110a Rowan Drive, Keilor, Victoria, 3036, Australia	Industrial waste has been dumped at the site. Requires ongoing management	EAN-00001327-3
Mildura Rural City	Irymple	Lots 1, 2, 4, 5, 6, 7, 690 TWENTIETH STREET, Irymple, Victoria, 3498, Australia	Former Landfill. Requires ongoing management	SMO-00004368-1
Manningham City	Doncaster	330 Manningham Road, Doncaster, Victoria, 3108, Australia	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00006233
Greater Dandenong City	Dandenong South	21-23 Elliott Road Dandenong South 3175	Current industrial site. Requires assessment and/or clean up	EAN-00004917-2
East Gippsland Shire	Bairnsdale	68 Giles St Bairnsdale VIC 3875 AU	Former Landfill. Requires ongoing management	SMO-00003613
Whitehorse City	Box Hill North	604 Elgar Road, Box Hill North, Victoria, 3129, Australia	Current Service Station. Requires assessment and/or clean up	EAN-00007020
Brimbank City	BROOKLYN	84-92 Jones Road, 124 Jones Road, 159 Bunting Road, BROOKLYN, Victoria, 3012, Australia	Current landfill. Requires assessment and/or clean up	EAN-00002856-1
Whittlesea City	South Morang	994-1044 Plenty Road South Morang 3752	Former Landfill. Requires ongoing management	EAN-00004975-1
Darebin City	Northcote	24 Leinster Grove Northcote 3070	Former chemical storage facility. Requires assessment and/or clean up	EAN-00005869
Hume City	Bulla	80 Blackwells Lane Bulla 3428	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00003655
Casey City	Cranbourne	16-32i Cyril Beechey Lane Cranbourne 3977	Former Landfill. Requires ongoing management	SMO-00003374-1
Macedon Ranges Shire	Lancefield	137 Golf House Lane Lancefield 3435	Former Landfill. Requires ongoing management	SMO-00004331-1
Mildura Rural City	Irymple	2090 Fifteenth Street Irymple 3498	Current Service Station. Requires assessment and/or clean up	EAN-00003492
Hobsons Bay City	Altona	351 - 381 Millers Rd Altona VIC 3018 AU	Current petroleum storage site. Requires assessment and/or clean up	EAN-00004527
Kingston City	Moorabbin	57 Keys Road Moorabbin 3189	Former chemical storage facility. Requires assessment and/or clean up	EAN-00006029-2
Moorabool Shire	Fiskville	4549 Geelong-ballan Road Fiskville 3342	Accidental spill/leak (non-industrial site). Requires ongoing management	EAN-00001088-1
Hobsons Bay City	Newport	438 Melbourne Road Newport 3015	Current Service Station. Requires assessment and/or clean up	EAN-00002977-2
Bass Coast Shire	Rhyll	309 Cowes-rhyll Road Rhyll 3923	Former Landfill. Requires ongoing management	SMO-00004489
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002232
Latrobe City	Newborough	Haunted Hills Road Newborough 3825	Former Landfill. Requires ongoing management	SMO-00004520
Maribyrnong City	Yarraville	3013, Melbourne, Victoria	Former Industrial Site. Requires ongoing management	SMO-00004195

Municipality	Suburb	Address	Issue	Notice Number
Whittlesea City	Epping	480 Cooper Street, 335 O'Herns Road and 38 Companion Place, Epping, Victoria, 3076, Australia	Former Landfill. Requires ongoing management	EAN-00004806-1
Darebin City	Preston	62 Albert Street Preston 3072	Former Industrial Site. Requires ongoing management	EAN-00004820-1
Monash City	Glen Waverley	310-336 Springvale Rd Glen Waverley VIC 3150 AU	Current industrial site. Requires assessment and/or clean up	EAN-00005714-1
Melton City	Cobblebank	Cobblebank, Victoria, Australia	Former Landfill. Requires ongoing management	SMO-00004294
Nillumbik Shire	Plenty	103 Goldsworthy Lane, Plenty, Victoria, 3090, Australia	Former Landfill. Requires ongoing management	EAN-00004619
Darebin City	Northcote	24 Leinster Grove Northcote 3070	Former chemical storage facility. Requires assessment and/or clean up	EAN-00005870
Hume City	Melbourne Airport	206-300 Western Avenue, Melbourne Airport, Victoria, 3045, Australia	Former Landfill. Requires ongoing management	SMO-00004909
Hume City		3061, Australia	Former Landfill. Requires ongoing management	EAN-00007112
Greater Shepparton City	Cosgrove	205 Cosgrove-lemnos Road Cosgrove 3631	Former Landfill. Requires ongoing management	SMO-00003387-2
Whittlesea City	Bundoora	133 Plenty Road Bundoora 3083	Current Service Station. Requires assessment and/or clean up	EAN-00006905
Buloke Shire	Donald	Lot 41 - 45, 22 Napier Street, Donald, Victoria, 3480, Australia	Former petroleum storage site. Requires ongoing management	EAN-00002318-2
Brimbank City	Sunshine North	47 Mcintyre Road Sunshine North 3020	Former Industrial Site. Requires ongoing management	SMO-00004108
Swan Hill Rural City	Swan Hill	5-7 Hastings Street Swan Hill 3585	Former Service Station. Requires assessment and/or clean up	EAN-00002716
Colac Otway Shire	Coragulac	977 Corangamite Lake Rd Coragulac VIC 3249 AU	Former Landfill. Requires ongoing management	EAN-00005595
Latrobe City	Traralgon	130-132 Seymour Street Traralgon 3844	Former Industrial Site. Requires ongoing management	SMO-00004901
Moreland City	Pascoe Vale	41 Derby Street Pascoe Vale 3044	Accidental spill/leak (non-industrial site). Requires assessment and/or clean up	EAN-00003296-2
Darebin City	Thornbury	2 Watt Street, Thornbury, Victoria, 3071, Australia	Former Landfill. Requires ongoing management	EAN-00005366-1
Whitehorse City	Box Hill	14 Federation Street, Box Hill, Victoria, 3128, Australia	Former Landfill. Requires ongoing management	SMO-00004940
Knox City	Ferntree Gully	47 Forest Road Ferntree Gully 3156	Current petroleum storage site. Requires ongoing management	EAN-00003074-1
Melbourne City	Carlton	46-78 Bouverie Street, 185-195 Queensberry Street, Carlton, Victoria, 3053, Australia	Former chemical storage facility. Requires assessment and/or clean up	EAN-00001920-1
Hobsons Bay City	Altona	471 - 513 Kororoit Creek Rd Altona VIC 3018 AU	Current industrial site. Requires assessment and/or clean up	EAN-00002159-1
Moorabool Shire	Bacchus Marsh	Bacchus Marsh, Victoria, Australia	Former Landfill. Requires ongoing management	IMPN-00004584-1
Latrobe City	Traralgon	115 Princes Street, Traralgon, Victoria, 3844, Australia	Current Service Station. Requires assessment and/or clean up	EAN-00001444
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002234
Macedon Ranges Shire	KYNETON	2 Piper Street, KYNETON, Victoria, 3444, Australia	Former Service Station. Requires assessment and/or clean up	EAN-00002360
Hume City	Somerton	70 Cliffords Road Somerton 3062	Former Industrial Site. Requires assessment and/or clean up	EAN-00003588-5
Hobsons Bay City	Altona Meadows	306-316 Queen Street, Altona Meadows, Victoria, 3028, Australia	Current Service Station. Requires ongoing management	EAN-00002117
Hume City	Campbellfield	1-71 Bolinda Road Campbellfield 3061	Former Landfill. Requires ongoing management	EAN-00006435
Mitchell Shire	Seymour	Hume and Hovell Rd Seymour VIC 3660 AU	Former Landfill. Requires ongoing management	SMO-00004490
Monash City	Oakleigh South	1221-1249 Centre Road Oakleigh South 3167	Former Landfill. Requires ongoing management	EAN-00007174
Yarra City	Collingwood	65-69 Keele Street Collingwood 3066	Current Service Station. Requires assessment and/or clean up	EAN-00003956
Whittlesea City	Epping	480 Cooper Street, 335 O'Herns Road and 38 Companion Place, Epping, Victoria, 3076, Australia	Former Landfill. Requires ongoing management	EAN-00004819-1

Municipality	Suburb	Address	Issue	Notice Number
Colac Otway Shire	Colac	2-34 Bruce Street Colac 3250	Former Landfill. Requires ongoing management	SMO-00003495-2
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002228
Darebin City	Northcote	24 Leinster Grove Northcote 3070	Former chemical storage facility. Requires assessment and/or clean up	EAN-00005720
Boroondara City	Hawthorn East	18 Symonds Street, Hawthorn East, Victoria, 3123, Australia	Former Landfill. Requires ongoing management	EAN-00003277-1
Whittlesea City	Wollert	240w Bindts Rd, Wollert, Victoria, 3750	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00005031-1
Maribyrnong City	Yarraville	1-3 High St, Yarraville, Melbourne, Victoria, 3013	Former Industrial Site. Requires ongoing management	SMO-00004598
Wodonga City	Wodonga	3437 Beechworth-wodonga Road Wodonga 3690	Former Landfill. Requires ongoing management	EAN-00001589-2
Hobsons Bay City	Spotswood	144-150 Hall Street Spotswood 3015	Former Industrial Site. Requires assessment and/or clean up	EAN-00003390
Moira Shire	Yarrawonga	81 Channel Road, Yarrawonga, Victoria, 3730, Australia	Former Landfill. Requires ongoing management	SMO-00004074-1
Brimbank City	Sunshine North	323a St Albans Road Sunshine North 3020	Former Industrial Site. Requires ongoing management	SMO-00004576
Brimbank City	Kealba	22 Sunshine Avenue Kealba 3021	Former Landfill. Requires assessment and/or clean up	EAN-00003927-1
Moreland City	Brunswick	225 Barkly St, Brunswick, Melbourne, Victoria, 3056, Australia	Former Industrial Site. Requires ongoing management	EAN-00004275
Merri-bek City	Glenroy	213 Glenroy Road, Glenroy, Victoria, 3046, Australia	Current Service Station. Requires assessment and/or clean up	EAN-00006946
Surf Coast Shire	Anglesea	205 Coalmine Road Anglesea 3230	Former Industrial Site. Requires assessment and/or clean up	EAN-00003349
Melbourne City	Carlton	291 Nicholson Street Carlton 3053	Current Service Station. Requires assessment and/or clean up	EAN-00004683
	Northcote	24 Leinster Grove Northcote 3070	Former chemical storage facility. Requires assessment and/or clean up	EAN-00005867
Latrobe City	Traralgon	180 Argyle Street Traralgon 3844	Former petroleum storage site. Requires assessment and/or clean up	EAN-00006725
Bayside City	Sandringham	20 Wangara Road Sandringham 3191	Former Landfill. Requires assessment and/or clean up	EAN-00005693
Greater Geelong City	Corio	232-244 Princes Highway Corio 3214	Former petroleum storage site. Requires ongoing management	EAN-00002724
Yarra Ranges Shire	Warburton	3375 Warburton Highway Warburton 3799	Former petroleum storage site. Requires assessment and/or clean up	EAN-00006102-1
Kingston City	Heatherton	16 Ball Road, Heatherton, Victoria, 3202, Australia	Former Landfill. Requires assessment and/or clean up	EAN-00004367
Baw Baw Shire	Longwarry	31 Mackey St Longwarry VIC 3816 AU	Current industrial site. Requires ongoing management	IMPN-00001913-3
Darebin City	Northcote	24 Leinster Grove Northcote 3070	Former chemical storage facility. Requires assessment and/or clean up	EAN-00005230
Hume City		3061, Australia	Former Landfill. Requires ongoing management	EAN-00006860
Whittlesea City	Epping	215 Cooper Street Epping 3076	Former Landfill. Requires ongoing management	SMO-00003563-1
Brimbank City	Keilor	Brimbank Park, Horseshoe Bend Rd, Keilor, Melbourne, Victoria, 3036, Australia	Industrial waste has been dumped at the site. Requires ongoing management	EAN-00001328-3
Mitchell Shire	Kilmore	Wallders Rd, Kilmore, Victoria, 3764, Australia	Former Landfill. Requires ongoing management	EAN-00002944-2
Hobsons Bay City	Altona Meadows	Bay Trail, Altona Meadows, Melbourne, Victoria, 3028, Australia	Former Landfill. Requires ongoing management	SMO-00004257
Brimbank City	BROOKLYN	84-92 Jones Road, 124 Jones Rd, 159 Bunting Road,, BROOKLYN, Victoria, 3012, AU	Current landfill. Requires assessment and/or clean up	EAN-00001233
Yarra Ranges Shire	Upwey	84 Main Street Upwey 3158	Former Service Station. Requires assessment and/or clean up	EAN-00004387-1
Bayside City	Brighton	PC363249 - 90 Outer Crescent, Brighton, Victoria, 3186, Australia	Former Industrial Site. Requires assessment and/or clean up	EAN-00003536
Moyne Shire	Allansford	5331 Great Ocean Rd Allansford VIC 3277 AU	Current industrial site. Requires ongoing management	EAN-00003332
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002233

Municipality	Suburb	Address	Issue	Notice Number
Moreland City	Brunswick	106 Dawson St, Brunswick, Melbourne, Victoria, 3056	Former Industrial Site. Requires assessment and/or clean up	EAN-00004399
Brimbank City	BROOKLYN	84-92 Jones Road, 124 Jones Road, 159 Bunting Road, BROOKLYN, Victoria, 3012, Australia	Current landfill. Requires assessment and/or clean up	EAN-00001607
Hume City	Campbellfield	1735-1739 Sydney Road Campbellfield 3061	Current industrial site. Requires assessment and/or clean up	EAN-00004125
	Spotswood	18 Drake St, Spotswood, Melbourne, Victoria, 3015	Former petroleum storage site. Requires assessment and/or clean up	EAN-00004155
Brimbank City	Brooklyn	454-460 Somerville Road Brooklyn 3012	Former Industrial Site. Requires assessment and/or clean up	EAN-00004434
Wangaratta Rural City	North Wangaratta	27 Detour Road, North Wangaratta, Victoria, 3678, Australia	Gun, pistol or rifle range. Requires ongoing management	SMO-00004705
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002231
Moreland City	Pascoe Vale	41 Derby Street Pascoe Vale 3044	Accidental spill/leak (non-industrial site). Requires assessment and/or clean up	EAN-00003253-2
Yarra City	Richmond	3-21 Kent St Richmond VIC 3121 AU	Former Industrial Site. Requires ongoing management	EAN-00001064-1
Maroondah City	Bayswater North	2-18 Canterbury Road Bayswater North 3153	Former Industrial Site. Requires assessment and/or clean up	EAN-00002325-5
Bayside City	Brighton	322 New Street Brighton 3186	Former Industrial Site. Requires ongoing management	EAN-00003924
	Bullengarook	531 Hobbs Road Bullengarook 3437	Former Landfill. Requires ongoing management	SMO-00004256-1
Wellington Shire	Sale	127-141 Foster Street Sale 3850	Current Service Station. Requires assessment and/or clean up	EAN-00001241
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002227
Latrobe City	Morwell	Morwell-Maryvale Rd, Maryvale, Morwell, Victoria, 3840, Australia	Former Landfill. Requires ongoing management	SMO-00004632-1
Glen Eira City	McKinnon	94-100 Mckinnon Road Mckinnon 3204	Current Service Station. Requires assessment and/or clean up	EAN-00006318-1
Mildura Rural City	Mildura	Lots 1-3 and Lots 10-14, 211 Etiwanda Avenue, Mildura, Victoria, 3500, Australia	Former Landfill. Requires ongoing management	IMPN-00002782
Latrobe City	Hazelwood	Brodribb Rd Hazelwood VIC 3840 AU	Former Industrial Site. Requires assessment and/or clean up	EAN-00002230
Hobsons Bay City	Altona North	40-68 Kyle Road Altona North 3025	Contaminated soil is retained and managed onsite. Requires assessment and/or clean up	EAN-00006727
Frankston City	Frankston North	300n Centenary Park Drive Frankston North 3200	Former Landfill. Requires ongoing management	EAN-00005294
Glen Eira City	Bentleigh	58 Patterson Road Bentleigh 3204	Former Service Station. Requires ongoing management	EAN-00004112-1
Hume City	Campbellfield	34 Merri Concourse Campbellfield 3061	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00003646
Hume City		Crown Allotment 2001 Parish of Will-will-rook [standard parcel identifier: 2001\PP3831], Victoria, 3049, Australia	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00005742-1
Nillumbik Shire	Kangaroo Ground	105 Graham Road Kangaroo Ground 3097	Former Landfill. Requires ongoing management	EAN-00004433
Yarra Ranges Shire	Coldstream	70 Station Street Coldstream 3770	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00003610-2
Maribyrnong City	Footscray	200 Whitehall Street Footscray 3011	Current industrial site. Requires assessment and/or clean up	EAN-00003098-2
Brimbank City	Brooklyn	52-60 Market Road Brooklyn 3012	Former Landfill. Requires ongoing management	EAN-00001309-6
Maribyrnong City	Yarraville	2a Francis Street Yarraville 3013	Former chemical storage facility. Requires assessment and/or clean up	EAN-00003503-1
Bayside City	Brighton	133 Esplanade, Brighton, Melbourne, Victoria, 3186, Australia	Contaminated soil is retained and managed onsite. Requires ongoing management	EAN-00004258-1
Hobsons Bay City	Newport	5/92-100 Champion Road, Newport, Victoria, 3015, Australia	Current petroleum storage site. Requires assessment and/or clean up	EAN-00004462-1
Ballarat City	Ballarat	3350, Australia	Former Landfill. Requires ongoing management	EAN-00003859
Darebin City	Thornbury	263-265 Darebin Road Thornbury 3071	Current petroleum storage site. Requires ongoing management	EAN-00007176
Moorabool Shire	Ballan	6511 Western Freeway Ballan 3342	Current Service Station. Requires ongoing management	EAN-00006752-2

Municipality	Suburb	Address	Issue	Notice Number
Darebin City	Preston	22-26 Plenty Road Preston 3072	Current Service Station. Requires assessment and/or clean up	EAN-00006836
Darebin City	Preston	73 Gower Street Preston 3072	Illegal dumping. Requires assessment and/or clean up	EAN-00003114
Greater Dandenong City	Springvale South	81-143 Clarke Road Springvale South 3172	Former Landfill. Requires ongoing management	EAN-00004446-3
Brimbank City	Keilor	94a Green Gully Road, Keilor, Victoria, 3036, Australia	Industrial waste has been dumped at the site. Requires ongoing management	EAN-00001326-3
Hume City	Mickleham	20 Farleigh Court Mickleham 3064	Industrial waste has been dumped at the site. Requires assessment and/or clean up	EAN-00004653-1
Melbourne City	Port Melbourne	224 - 260 Lorimer St Port Melbourne VIC 3207 AU	Current industrial site. Requires assessment and/or clean up	EAN-00001634-1
Manningham City	Doncaster East	1100 Doncaster Road Doncaster East 3109	Current Service Station. Requires assessment and/or clean up	EAN-00002043-4
Greater Shepparton City	Cosgrove	200 Cosgrove-Lemnos Rd Cosgrove VIC 3631 AU	Former Landfill. Requires ongoing management	SMO-00004449
Latrobe City	Morwell	412 Commercial Road Morwell 3840	Former Industrial Site. Requires assessment and/or clean up	EAN-00004968-1
Melbourne City	West Melbourne	369-381 William Street, West Melbourne, Victoria, 3003, Australia	Former petroleum storage site. Requires assessment and/or clean up	EAN-00006053
Moreland City	Fawkner	1126 Sydney Road Fawkner 3060	Current industrial site. Requires assessment and/or clean up	EAN-00001070-4
Wellington Shire	Sale	2-14 Mcmillan Street, Sale, Victoria, 3850, Australia	Former Industrial Site. Requires assessment and/or clean up	EAN-00001803-6
Moorabool Shire	Ballan	6511 Western Freeway Ballan 3342	Current Service Station. Requires ongoing management	EAN-00006753

Appendix E. Proposed Project Hazardous Substances Register

Chemical List	
	General Chemical (Cleaning Offices and Lunch rooms)
Lines and Substation (construction and operational phase)	Dishwashing detergent
	Surface cleaning Spray
	Fly Spray
	Hand sanitising Gel
	Floor Detergent
	Industrial Hand Wash
	Substation
Substation Construction	Alminox
	Shellite (X55)
	Toluene
	Transformer Mineral Oil
	Kerosene
	Unleaded Fuel
	Diesel
	Engine Lube oils
	Grease (machine lubrication)
	Paints (Building)
	Paint (Galvanising repair)
	Construction Adhesive
	Silicon Sealants
	Lub spray WD40
	Oxy
	Acetylene
	Mig mix Welding Gas
	Argon welding gas
	SF6
	Petroleum Gel
	Form Release Agent
	Concreete curing compound
	Bentonite
	Nitrogen Gas
	Line Works
Line Construction	Alminox
	Unleaded Fuel
	Diesel
	Engine Lube oils
	Grease (machine lubrication)
	Paint (Galvanising repair)
	Construction Adhesive
	Silicon Sealants
	Lub spray WD40
	Oxy
	Acetylene
	Mig Welding Gas
	Form Release Agent
	Concreete curing compound
	Bentonite

Note
General operation of the Substions and line does not require the use of Chemical other than for vehicles associated with inspections
Breakdowns or repair works during the operational phase may require some of the chemicals associed with construction works and will be dependant on the nature of the failure.

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