



Clean Up Plan Verification and Assessment Report

Glenlyon Recreation Reserve, Sutton Lane, Glenlyon VIC

11 October 2021



Document Information

Clean Up Plan Verification and Assessment Report, Glenlyon Recreation Reserve, Sutton Lane, Glenlyon VIC

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Project Manager: Shin Yi Siew**Project Director:** Kristi Hanson (Environmental auditor appointed pursuant to *Environment Protect Act* 2017)**Disclaimer and Limitations:**

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Verification of Clean Up Plan Summary Statement

I, Kristi Hanson, an environmental auditor (appointed pursuant to the *Environment Protection Act 2017* (Vic.), having:

1. been requested by Hepburn Shire Council (the Council) to conduct an assessment for the verification of a Clean Up Plan in relation to site contamination associated with shooting activities at the Glenlyon Recreation Reserve located at Sutton Lane, Glenlyon, Victoria (the site).
2. having regard to the requirements for development and verification of a Clean Up Plan as stated in the Amended Clean Up Notice (Notice ID 90011425).
3. reviewed the Clean Up Plan developed for the site ('Clean Up Plan – Glenlyon Recreational Reserve', revision 3 dated 7 October 2021, prepared by Kleinfelder Australia Pty Ltd) and ancillary documents.
4. documented my review of the Clean Up Plan in the attached Verification Report ('Clean Up Plan Verification and Assessment Report, Glenlyon Recreation Reserve, Sutton Lane, Glenlyon', revision 0 dated 11 October 2021, prepared by Senversa Pty Ltd).

HEREBY DECLARE that I am of the opinion that:

- The Clean Up Plan (Clean Up Plan – Glenlyon Recreational Reserve', revision 3 dated 7 October 2021) meets the requirements of the Amended Clean Up Notice (Notice ID 90011425) and the intent of relevant EPA policies and guidelines.

The Clean Up Plan Verification and Assessment Report dated 11 October 2021 prepared by the environmental auditor should be read in conjunction with this Summary Statement.

Dated: 11 October 2021

Signed: Kristi Hanson

ENVIRONMENTAL AUDITOR

(APPOINTED PURSUANT TO THE ENVIRONMENT PROTECTION ACT 2017)



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Appendix B: Clean Up Plan dated 7 October 2021

Appendix C: Auditor's derivation of site-specific benzo(a)pyrene TEQ HIL



List of Acronyms

Acronym	Definition	Acronym	Definition
ANZG	Australian and New Zealand Governments	mbgl	Metres below ground level
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation of the Environment	mBTOC	Metres below top of casing
CSM	Conceptual site model	mg/kg	Milligrams per kilogram
CUP	Clean up plan	mg/L	Milligrams per litre
CUSFARP	Clean up so far as reasonably practicable	NEPC	National Environment Protection Council
DELWP	Department of Environment, Land, Water and Planning	NEPM ASC	National Environment Protection (Assessment of Site Contamination) Measure
DSI	Detailed Site Investigation	NHMRC	National Health and Medical Research Council
EIL	Ecological investigation level	NRMMC	Natural Resource Management Ministerial Council
EPA	Environment Protection Authority (Victoria)	PAH	Polycyclic aromatic hydrocarbon
ESL	Ecological screening level	PAN	Pollution abatement notice
GME	Groundwater monitoring event	PPRZ	Public park and recreation zone
HCSM	Hydrogeological conceptual site model	PSCA	Preliminary Soil Contamination Assessment
HIL	Health investigation level	RAP	Remediation Action Plan
HSL	Health screening level	TEQ	Toxicity equivalent quotient
IWRG	Industrial waste resource guideline	TRH	Total recoverable hydrocarbons
LOR	Limit of reporting	UCL	Upper confidence limit
m	Metre	VVG	Visualising Victoria's Groundwater
m²	Square metre	XRF	X-ray fluorescence
m AHD	Metres Australian Height Datum	WMIS	Water Management Information System



1.0 Introduction and Objectives

Hepburn Shire Council (the Council) engaged Kristi Hanson (an environmental auditor appointed pursuant to the *Environment Protection Act 2017*) of Senversa Pty Ltd (Senvversa) to verify a Clean Up Plan (CUP) for Glenlyon Recreation Reserve located at Sutton Lane, Glenlyon VIC 3461 (the site).

The CUP is a requirement of the Amended Clean Up Notice ID: 90011425 (the Notice), issued on 24 May 2021 (provided in **Appendix A**). The Notice requires that the CUP be verified by an EPA-appointed environmental auditor and submitted to the Environment Protection Authority (EPA) by 11 October 2021 (refer to **Section 4.1**).

The Council engaged Kleinfelder Australia Pty Ltd (Kleinfelder) as their current environmental consultant for the site (since 2020). Beveridge Williams & Co Pty Ltd (Beveridge Williams) was their environmental consultant in 2019.

Requirement 3.2 of the Notice is related to an Environmental Management Plan for the ongoing use of the site for shooting activities. It is not related to clean up activities or CUP, therefore this is excluded from the scope of this assessment or verification report.

1.1 Objective

The objective of this report is to document the auditor's assessment and verification of:

- 'Clean Up Plan – Glenlyon Recreational Reserve', revision 3 dated 7 October 2021 (Kleinfelder 2021j). This is hereafter referred to as 'the CUP'.

The scope of the auditor verification of CUP under Requirement 3.1 of the Notice (as agreed with EPA on 12 March 2021) is limited to environmental contamination associated with shooting activities at the premises only (i.e. the scope excludes pollution associated with other non-shooting activities or sources of contamination at the premises). This approach meant that the CUP targets contaminants and clean up activities associated with shooting activities exclusively to meet the intent of the Notice.

The assessment report has been prepared in support of the Verification of Clean Up Plan Summary Statement provided at the beginning of this document.

1.2 Site Information

Details of the verification are listed in **Table 1.1**.

Table 1.1: Summary of Site Information

Item	Detail
Reason for CUP verification	Amended Clean Up Notice ID 90011425
Auditor	Kristi Hanson
Name of person requesting CUP verification	Daniel Owe-Young Project Manager Hepburn Shire Council
Relationship to premises/location	Hepburn Shire Council is the tenant of the site.



Item	Detail
EPA region	North-west
Municipality	Hepburn Shire Council
Dominant – Lot on plan	5~48\PP5324 (Standard Property Identifier)
Additional – Lot on plan(s)	—
Site/premises name	Glenlyon Recreation Reserve
Building/complex sub-unit no.	—
Street/Lot – Lower No.	—
Street/Lot – Upper No.	—
Street Name	Sutton
Street type (road, court, etc.)	Lane
Suburb	Glenlyon
Postcode	3461
Area	216,887 m ²

1.3 Guidance Documents and Correspondence

The key policies and guidelines relevant to the assessment of land and groundwater contamination within Victoria are the following:

- *Environment Protection Act 2017.*
- *Environment Protection Regulations 2021.*
- *Environment Reference Standard (ERS).*
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), Adelaide: National Environment Protection Council (NEPM ASC; NEPC 2013).
- *Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards* (enHealth 2012).
- EPA Publication 668, Hydrogeological Assessment (Water Quality) Guidelines (EPA 2006).
- EPA Publication 669, Groundwater Sampling Guidelines (EPA 2000).
- EPA Publication 1710, Guide for Managing Contamination at Shooting Ranges (EPA 2019)
- EPA Publication 1856, Reasonably Practicable (EPA 2020).
- EPA Publication 1940, Contaminated Land: Understanding Section 35 of the Environment Protection Act 2017 (EPA 2021d).
- EPA Publication 1936, Proposed Methodology for Deriving Background Level Concentrations when Assessing Potentially Contaminated Land (EPA 2021c).



- EPA Publication 1992, Guide to the Environment Reference Standard (EPA 2021g).
- EPA Publication 2001.1, Guidance for the Cleanup and Management of Contaminated Groundwater (EPA 2021h).

Refer to **Section 7.0** for further information on the guidance documents and references.

In addition, the auditor has used the following guidance in conducting her assessment and verification of the CUP:

- 'EPA interim advice to Environmental Auditors – Endorsement of Clean Up Plan', as distributed by email on 22 April 2010 (EPA 2010). This is referred to as EPA interim guidance.

1.4 Assessment Process

The process the auditor completed to verify the CUP generally included:

- Review and comment on a number of reports detailing assessment undertaken at the site (refer to **Section 1.5** and **Section 7.0**).
- Site inspection conducted by the auditor on 1 and 2 March 2021.
- Collection of two soil auditor verification samples (AV01 and AV02) on 2 March 2021.
- Review and comment on draft version of the CUP.
- Attendance of online meetings with the Council and/or Kleinfelder on the following dates:
 - 5 March 2021.
 - 3 May 2021.
 - 2 June 2021
 - 1 July 2021.
 - 17 August 2021
 - 13 September 2021
 - 23 September 2021
- Regular communication with the Council and Kleinfelder.
- Preparation of this assessment report and accompanying Verification of Clean Up Plan Summary Statement.

1.5 Documents Provided

Key environmental reports that were reviewed for this verification are listed in **Table 1.2**. Refer to **Section 7.0** below for the full list of references, including draft reports and work plans.

Table 1.2: Key Environmental Reports

Report Date	Report Title	Reference
22 November 2019	Preliminary Soil Contamination Assessment ¹ (PSCA)	Beveridge Williams 2019
20 January 2021	Detailed Site Investigation ¹ (DSI)	Kleinfelder 2021a
March 2021	Report Hepburn Shire Council Response to EPA Victoria Pollution Abatement Notice (PAN) ID. 90011377.	Hepburn Shire Council 2021
3 September 2021	Glenlyon Recreation Reserve, Hydrogeological Conceptual Site Model (HCSM)	Kleinfelder 2021f
7 September 2021	Glenlyon Recreation Reserve – Desktop Review (draft)	Kleinfelder 2021g



Report Date	Report Title	Reference
7 October 2021	Clean Up Plan - Glenlyon Recreation Reserve	Kleinfelder 2021j

Note:

1. PSCA and DSI reports were prepared prior to the auditor's engagement.



2.0 Site Setting

The discussion presented below is based on information and interpretation provided in Kleinfelder's reports (listed in **Table 1.2**) and the auditor's independent review of the provided information and publicly available data.

2.1 Site Definition

The Glenlyon Reserve (the site) is located at Suttons Lane, Glenlyon approximately 95 km north-west of Melbourne. The site of approximately 21.7 hectare is Crown Land managed by Department of Environment, Land, Water and Planning (DELWP) and is leased by Hepburn Shire Council. It is zoned Public Park and Recreation (PPRZ).

It is used for a variety of recreational activities and includes the following features:

- Oval shaped racecourse in the middle of the site.
- Equestrian facilities (including show jumping course, pony club, mounting yard, dressage area).
- Sports oval which is located inside the racecourse.
- Camping ground located at the southern portion of the site.
- A toilet block, barbecue and pavilion area and children's playground in the central southern portion of the site.
- Clay targeting shooting areas, including a storage shed for shooting activities.

The Loddon River forms the site boundary along the south-western side. Road access to the site is from Dysart Street to the south of the site, or Sutton Lane located east of the site. A site layout plan is presented in Figure 2 of the CUP provided in **Appendix B**. The middle of the site (racecourse interior) is mainly grassed and flat with more trees and vegetation at the edges of the site (outside of the racecourse).

2.2 Surrounding Land Uses

The surrounding area comprises mixed commercial and residential land uses as follows:

- North – Agricultural land with a small number of rural residential properties.
- East – Agricultural land with a small number of rural residential properties.
- West – Loddon River, public conservation areas and Glenlyon township further to the west.
- South – Public conservation areas, rural residential properties and the Glenlyon Community Dam and Park.

2.3 Site History and Shooting Activities

Based on the site history review conducted by Kleinfelder (2021f and 2021j), the site was indicated to have been used for recreational activities since the late 1800s. Horse racing was reported to occur at the site in 1867 and 1914. No gold mining activity was documented to be conducted at the site although the banks of the Loddon River along the site may have been prospected for gold.

The Daylesford Field and Game Club commenced clay target shooting activities at the site in the late 1970s and shooting ceased in 2020 under the Council's instruction. Other than clay target shooting, no other types of shooting activities were conducted at the site. The shooting events were primarily conducted monthly (first Saturday of the month).



Based on the information provided by the Daylesford Field and Game Club (Appendix B of Kleinfelder 2021j), shooting occurred from the eastern portion of the site (now equestrian area) prior to 1983 and the shooting was towards the centre of the site. In 1983, the Daylesford Field and Game Club relocated to the southwest portion of the reserve and still continued to shoot inwards.

The clay target shooting was conducted at six 'firing' areas surrounding the racecourse and the clay targets were launched into the centre of the Glenlyon Reserve as shown in **Figure 2-1**.

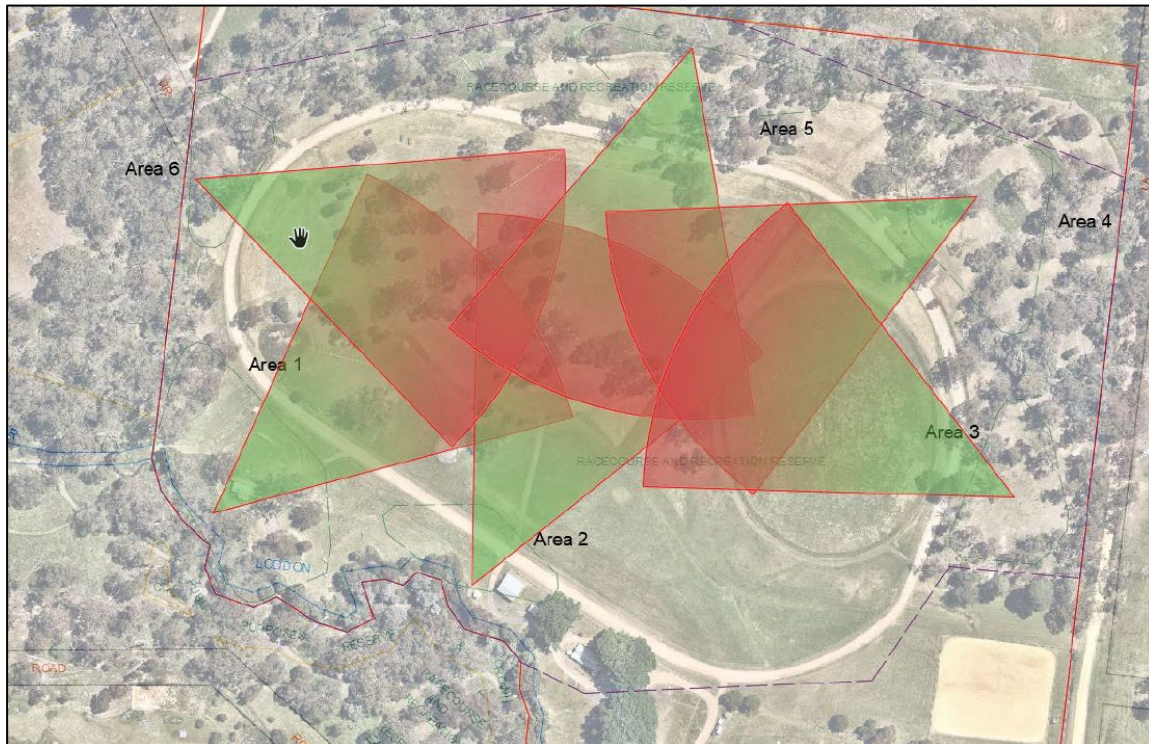


Figure 2-1: Estimated shot fall zones from the six shooting areas (Source: Figure 4-3 Beveridge William 2019)

Under the previous licence (valid from 1 July 2016 for three years) for clay shooting issued to the Daylesford Field and Game Club by the Glenlyon Recreation Reserve Special Committee, the shooting and fall out of targets were also 'allowed' in the western half of the site and were prohibited in the following eastern and southern areas of the site as shown in **Figure 2-2**:

- Dressage field along the eastern site boundary.
- Portion of the land within the racecourse used for sports, including the cricket oval.
- Barbecue/shelter area and children's playground.

The auditor notes that prior to the commencement of this license, shooting activities (and targets fall out) did occur over the areas marked as prohibited in **Figure 2-2**.

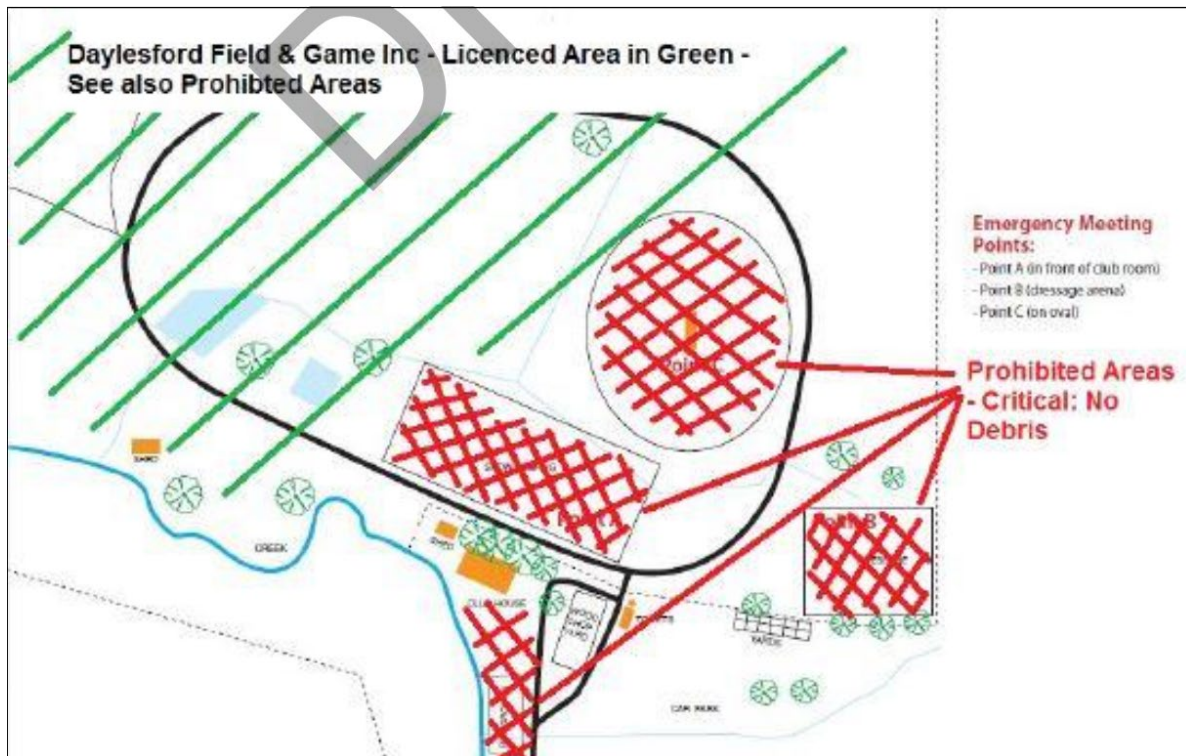


Figure 2-2: Licenced area for clay target shooting (Source: Appendix B of Kleinfelder 2021j)

The Daylesford Field and Game Club indicated that from around 2015 onwards, 'eco-friendly' targets (i.e. polycyclic aromatic hydrocarbon [PAH] free targets) were used at the site instead of previous targets made with petroleum-pitch. Shot gun pellets were contained within shot gun wads and were primarily made of lead. The Daylesford Field and Game Club also stated that they conducted the following clean up of shooting debris after each shooting event:

- Fragments of clay targets and wads were raked and collected for off-site disposal. This was done manually by hand or using with yard machines (motorised rakes).
- Empty cartridges were also collected for off-site disposal.

2.4 Topography and Drainage

As indicated in **Figure 2-3**, the site is located in a flood plain of the Loddon River at the edge of the Victorian West Central Highlands.

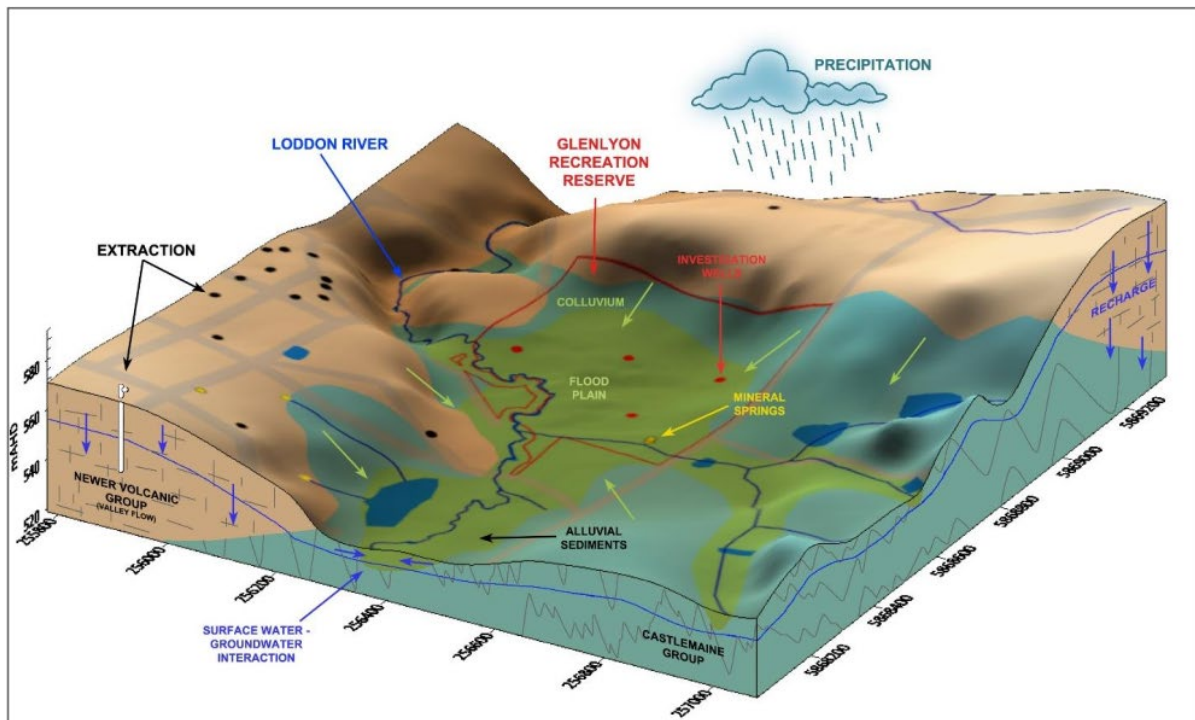


Figure 2-3: Environmental setting of the site (Kleinfelder 2021j)

The north-western, northern and north-eastern edges of the site are higher than the middle of the site where the topography is relatively flat (i.e. the racecourse/oval). The site then slopes gently south-west towards Loddon River. The elevation of the site ranges from approximately 560 mAHN (north-eastern corner) to 530 mAHN (south-western site boundary along Loddon River).

There is an unnamed tributary to the Loddon River present at the site including a creek through the camping ground near the southern site's boundary. The Glenlyon Community Dam is located approximately 150 m south of the site (i.e. upstream).

Based on the site's topography, overland surface runoff collects in the middle 'flatter' portion of the site from the elevated western, northern and north-eastern edges. The runoff from the interior of the racecourse collects in a drainage soak located in the western portion of the site (refer to Figure 2 of the CUP provided in **Appendix B**). This drainage soak then drains to an open earthen spoon drain which discharges into the Loddon River.

2.5 Geological Setting

As indicated above, the site is located on Loddon River's flood plain and the main geology at the site is Quaternary alluvial sediment (shown as olive green in **Figure 2-3**) comprising unconsolidated terrace/alluvial gravels, sands and silts, overlying the Castlemaine Formation. Elsewhere along higher ground, the site is underlain by:

- Ordovician Castlemaine Formation – thickly bedded marine sandstone, mudstones and shales (shown as teal-green in **Figure 2-3**).
- Upper Tertiary/Quaternary Newer Volcanic Group – olivine tholeiite and various types of basalt (shown as light brown in **Figure 2-3**).

The sediment at the site is likely to derive from Loddon River (alluvial) and surrounding Castlemaine Formation and Newer Volcanic Group rocks at higher ground (colluvial).

The soil profiles encountered at the site comprised silt and silty clay with subangular to rounded gravel with minor quartz fragments. This is consistent with the regional geology.



2.6 Hydrogeological Setting

2.6.1 Regional Hydrogeology

A review of the DELWP Groundwater Resource Reports¹ for this site conducted by the auditor indicated that the water table is expected to be less than 5 m deep in the shallow Quaternary alluvial aquifer and deeper than 5 m for the Castlemaine Formation bedrock aquifer. There are three main aquifers beneath the site as listed in **Table 2.1**.

Table 2.1: Salinity of Regional Aquifers

Aquifer	Inferred Groundwater Salinity (mbgl)
Quaternary alluvial	501 to 1,000
Upper Tertiary/Quaternary Basalt	1,001 to 3,500
Palaeozoic Bedrock (Castlemaine Formation)	501 to 1,000

Source: DELWP Groundwater Resource Reports¹

The site is located within the Daylesford Mineral Spring region. The site is located within Central Victorian Mineral Groundwater Management Area.

Regional groundwater is expected to flow towards the south-west, consistent with topography.

It is noted that the inferred salinities listed above differ slightly from those presented by Kleinfelder, but the differences are not considered material to the interpretation of the site condition and/or verification of the CUP.

2.6.2 Site Hydrogeology

Four on-site groundwater monitoring bores were installed to depths of 5 to 7 m in the shallow alluvial aquifer by Kleinfelder (2021a). MW01 was screened from 2.5 to 7 mbgl whereas MW02, MW03 and MW04 were screened from 2 to 5 mbgl.

The gauging data from April 2020 and July 2021 GMEs are summarised in **Table 2.2**. As illustrated in **Figure 2-4**, the groundwater in the alluvial aquifer was inferred to flow towards the west, south-west towards Loddon River.

Table 2.2: Summary of Groundwater Gauging Data

	April 2020		July 2020	
	mBTOC	mAHD	mBTOC	mAHD
Minimum	0.70 (MW02)	524.13 (MW01)	0.00 (MW02)	529.66 (MW01)
Maximum	5.96 (MW01)	531.96 (MW03)	0.62 (MW04)	533.99 (MW03)

¹ DELWP Groundwater Resource Reports online portal (<https://www.water.vic.gov.au/groundwater/groundwater-resource-reports>) accessed on 18 August 2021.

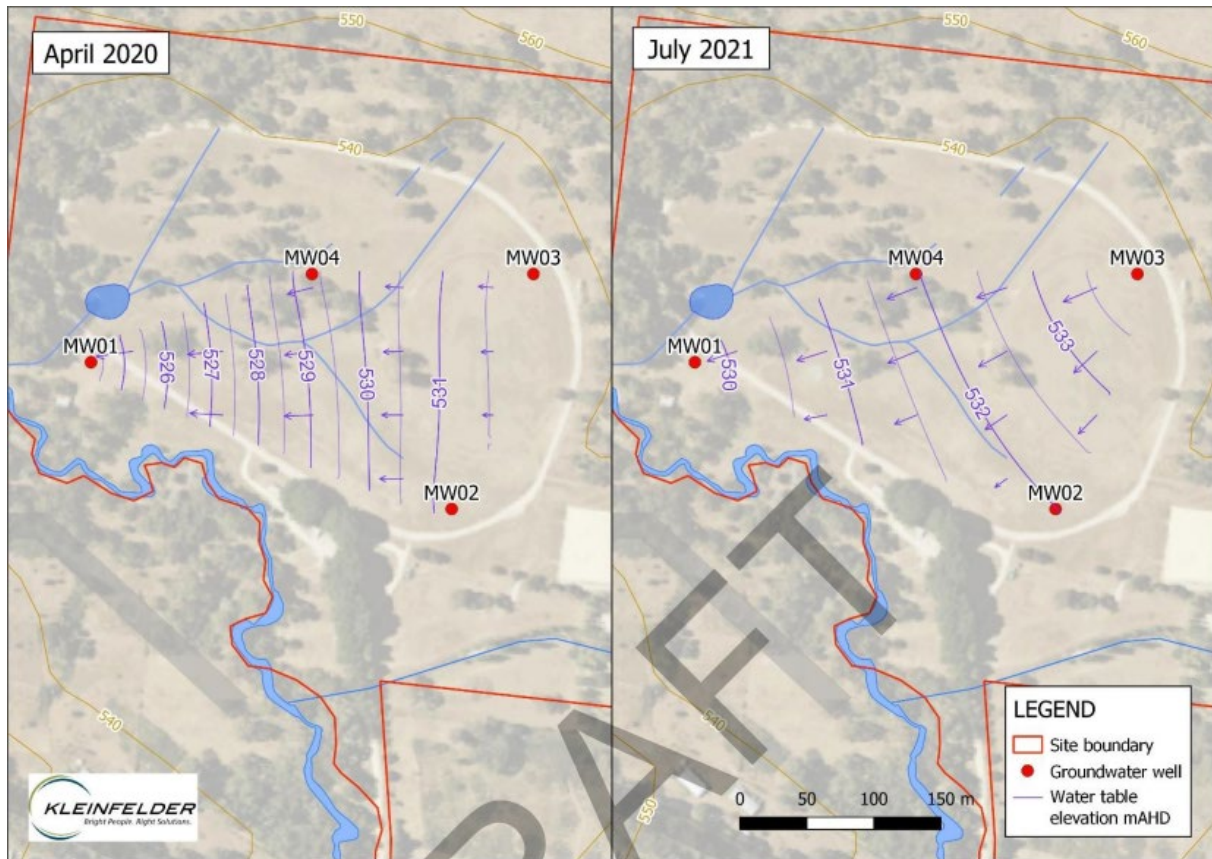


Figure 2-4: Groundwater inferred contour plans (Kleinfelder 2021j)

Furthermore, based on the field electrical conductivity measured, groundwater beneath the site is defined as segment A1 in accordance with Table 5.2 of the Environmental Reference Standard.

2.6.3 Registered Groundwater Bores

The CUP (Kleinfelder 2021j) stated that there were 116 registered groundwater bores within 2 km radius of the site, however 118 bores were listed in Table 2.4 of the CUP. Typically, the bores in the basaltic aquifer are installed from 7 to 62 mbgl and the bores in the Castlemaine Formation are even deeper from 59 to 92 mbgl. Kleinfelder noted that the preferred aquifer for domestic and stock use was the basaltic aquifer. There was no registered bore installed within the alluvial aquifer within the 2 km radius of the site.

The DSI (Kleinfelder 2021a) reported that there are two registered mineral spring bores present on-site, however Shugg (2004) thesis stated that there were three mineral spring bores on-site:

- Recreation Reserve Rotunda Hand Pump (Bore 65274)
- Glenlyon 4 Spout (Jet) bore² in the car park (Bore 65278) – constructed in 1981 (260 m deep).
- Taurina Mineral Water Bore (Bore 65300) – appeared to be a mineral spring bore extracted for commercial purpose.

² This bore is listed as Bore 65272 in the HCSM, which is inconsistent with Shugg (2004) thesis, which states that this is Bore 65278. However, bore 65278 does not currently exist in the WMIS or VVG databases, and bore 65272 is mapped in these databases as off-site on the western bank of Loddon River (WMIS and VVG accessed on 29 September 2021).



A review of DELWP Water Management Information System (WMIS) online portal (<https://data.water.vic.gov.au/>) and Visualising Victoria's Groundwater (VVG) online portal (<https://www.vvg.org.au>) conducted on 29 September 2019 by the auditor has confirmed that Bore 65274 and Bore 65300 are located on-site however, no site location information or plan was available for Bore 65278 to confirm its existence and/or location.



3.0 Site Condition

The discussion presented below is based on information and interpretation provided in Kleinfelder's reports (listed in **Table 1.2**) and the auditor's independent review of the provided information.

3.1 Investigations Undertaken

3.1.1 Assessment Consultant Investigations

As detailed in the site reports listed in **Table 1.2**, the main site investigation activities conducted at the site were:

- Preliminary soil assessment conducted in June to October 2019 (Beveridge Williams 2019) comprising:
 - Desktop review of site settings/history, including historical aerial photographs.
 - Screening of surface soils at 104 locations using a hand-held X-ray fluorescence (XRF) analyser.
 - Sampling of 30 surface soil samples and analysis for metals, PAHs and other contaminants.
- Detailed site assessment conducted in April 2020 (Kleinfelder 2000b and 2021a) comprising:
 - 101 targeted and grided soil bores (with surface and sub-surface sampling) (to supplement the sampling conducted in 2019).
 - Groundwater investigation with four soil bores were converted into groundwater monitoring bores (MW01 to MW04). All four groundwater monitoring bores were then sampled.
 - Surface water sampling within the Loddon River:
 - SW01 where the open spoon drain from the soak joins the river.
 - SW02 where the unnamed tributary at the southern portion of the site joins the river.
 - Sediment (SD01 and SD02) adjacent to the Loddon River (co-located with surface water sampling locations SW01 and SW02).
 - A grab sample 'MS01' taken from an on-site mineral spring bore (described by Kleinfelder as the 'Glenlyon 4 Spout (Jet) bore).
 - A grab sample 'Dam' taken from Glenlyon Community Dam located south of the site.
 - Extra soil sampling was conducted in January 2021, where 14 off-site locations within adjoining properties to the north, west and east of the site were sampled (SB01 to SB14).
- Second groundwater monitoring event (GME) conducted at MW01 to MW04 in July 2021. This was reported in Section 3.2.2 of the CUP.
- Development of a hydrogeological conceptual site model (HCSM; Kleinfelder 2021e and 2021f).
- Data gap analysis / desktop review report, where all existing environmental data was reviewed and the Daylesford Field and Game Club were consulted about their shooting practices (Kleinfelder 2021b-c, 2021g).

The CUP was prepared based on the results and outcomes of these preceding works. All sampling locations are shown in Figures 3 to 5 of the CUP (provided in **Appendix B**) and analytical results are presented in the following tables within the CUP (provided in **Appendix B**):

- Soil and sediment sampling program – Table 1 to 13.
- Groundwater sampling program – Table 15 to 21.
- Surface sampling program – Table 22 to 25.



The auditor considers the scope and methodology of the previous investigations were adequate and appropriate to characterise contamination at the site due to historical shooting activities. However, the following key data gaps were identified:

- Soil sampling conducted by the previous assessment consultants did not target soils within natural drainage lines at the site, or within the soak which receives the majority of the surface water drainage from the oval/racecourse area. The previous investigations therefore did not confirm whether higher contaminant concentrations may be present in these drainage features (due to mobilisation from soils via storm/surface water runoff). This data gap was addressed by the auditor verification sampling as discussed in **Section 3.1.2** below.
- The surface water and sediment sampling locations in the Loddon River were not well documented by the assessment consultant, i.e. it was unclear specifically where in the river the samples were collected. The water samples were also not collected during a period when surface water was draining from the site into the river, thus would not have detected contaminant migration from the site during periods of rainfall and associated runoff. This data gap is addressed by the Clean Up Plan (see **Section 4.0**).

3.1.2 Auditor Verification Sampling

The auditor collected two auditor verification surface soil samples associated with surface water drainage areas on-site at or near the soak on 2 March 2021:

- Sample AV01 was collected from the drainage line leading into the soak (bare ground near a wooden horse jump barrier).
- Sample AV02 was collected at deepest point of the drainage soak (while the soak was dry).

These samples were targeted to assess whether contaminant concentrations in sediment drainage lines and water accumulation points were higher than those in soils across the broader site (since Kleinfelder had not specifically targeted surface water drainage lines in their investigations).

Lead concentrations of both verification samples were below both the National Environment Protection (Assessment of Site Contamination) Measure (NEPM ASC) guideline values for recreational land use:

- Health investigation level C (HIL-C) for public open space.
- Ecological investigation level (EIL) for urban residential/public open space.

The total PAH, benzo(a)pyrene and benzo(a)pyrene toxicity equivalent quotient (TEQ) results were also below ecological and human health criteria, namely:

- HIL-C for public open space.
- Ecological screening level (ESL) for urban residential/public open space (fine/course soil).

3.2 Current Condition of the Site

3.2.1 Soil

Table 3.1 presents a summary of soil concentrations above the land environmental quality objectives applicable for the site (for recreational land use as per the ERS).

Table 3.1: Soil Results Exceeding Adopted Guidelines

Chemical	Concentration Range ¹ (mg/kg)	Sampling Location/s with Concentration above Criterion ¹ (mg/kg)	Soil Guideline Exceeded and Criterion (mg/kg)	Environmental Value
Lead	10 to 1100	SS28 (1,100), SS29 (710)	600 (NEPM HIL-C Recreational)	Human Health



Chemical	Concentration Range ¹ (mg/kg)	Sampling Location/s with Concentration above Criterion ¹ (mg/kg)	Soil Guideline Exceeded and Criterion (mg/kg)	Environmental Value
		SS28 (1,100)	1100 (NEPM EIL urban residential and public open space)	Land dependent ecosystems and species
Total PAH	<0.5 to 780	SS15 (780)	300 (NEPM HIL-C Recreational)	Human Health
Benzo(a)pyrene TEQ	<0.5 to 210	SS01 (5.9), SS03 (3.5) SS04 (3.6), SS11 (19) SS13 (14), SS15 (120) SS17 (21), SS27 (25) SS28 (5), SS29 (48) OG26_0.1 ² (20) OG42_0.1 (4.2)	3 (NEPM HIL-C Recreational)	Human Health
Benzo(a)pyrene	<0.5 to 76	SS15 (76)	33 (CRC CARE 2017 ³ , 85% species protection, high reliability, urban residential and public open space)	Land dependent ecosystems and species
Total Recoverable Hydrocarbon (TRH) >C16-C34	<50 to 2,200	SS11 (580) SS15 (2,200)	300 (NEPM EIL urban residential and public open space, coarse soil)	Land dependent ecosystems and species
		SS15 (2,200)	1,300 (NEPM EIL urban residential and public open space, fine soil)	
Arsenic	<2 to 180	SS27 (150) MW01_0.1 (180) PV03_0.1 (180)	100 (NEPM EIL urban residential and public open space)	Land dependent ecosystems and species

Notes:

1. Soil concentrations from PSCA and DSI including blind (intra-laboratory) and split (inter-laboratory) duplicate samples.
2. 20 mg/kg reported for QC08_07042020, blind duplicate of primary sample OG26_0.1.
3. CRC CARE (2017) *Risk-based management and remediation guidance for benzo(a)pyrene*, CRC CARE Technical Report no. 39. This criterion has been derived in a manner consistent with the NEPM ASC based on additional and more recent ecotoxicity information, and is considered a more appropriate objective than the NEPM ASC low reliability ESL.

All results not listed or discussed were below the environmental quality objectives.

Figure 6 and 7 of the CUP provided as **Appendix B** show the sampling locations with lead and benzo(a)pyrene results above the adopted criteria. As shown in the figures, all samples listed in **Table 3.1** were located at the surface (0 to 0.1 mbgl) at the oval/racecourse and target launch areas on-site. The results of samples collected at depth (between 0.4 to 1.0 mbgl) were:

- 11 to 50 mg/kg lead.
- Less than laboratory limit of report (LOR) for PAH compounds.
- <100 mg/kg TRH >C16-C34.



This indicated that lead, PAH and TRH compounds (contamination associated with shooting activities) were not measured above the adopted criteria at depth below 0.1 mbgl on-site.

TRH >C16-C34 above the Tier 1 ESL (fine and coarse soil) was reported in SS11 and SS15 and only SS15 exceeded the ESL for fine soil, which is considered applicable because silts and/or silty clays were the dominant soil type logged at the site. SS15 also recorded the highest PAH concentrations at the site and both the PAH and TRH results are considered likely to be associated with clay target fragments present in the samples, rather than reflective of PAH or TRH adsorbed to soil particles (refer to discussion below).

Arsenic (150 and 180 mg/kg) was recorded slightly above the ecological investigation level (100 mg/kg) in three samples with no clear spatial pattern across the site. These concentrations were likely to be naturally occurring as the site is located in a gold-mining region where arsenopyrite is typically common. The geometric mean of the arsenic concentrations on-site was calculated to be 3 mg/kg and this was lower than arithmetic mean of 45 mg/kg reported for sandstone (Castlemaine Formation) from the Daylesford area (Shugg 2004). The HCSM (Kleinfelder 2021f) surmised that the weathering of sulfides present in the Castlemaine Formation was likely to result in soil elevated with arsenic, copper, lead and zinc.

The concentrations of lead were plotted against arsenic, copper, nickel and zinc measured in the shallow (0 to 0.1 mbgl) and deeper (0.4 to 1.0 mbgl) soil samples on-site in **Figure 3-1**. It is evident that the concentrations of arsenic, nickel, copper and zinc were not correlated to lead. This suggests that arsenic, copper, nickel and zinc in the soil are unlikely to be associated with lead shot used in the shooting activities conducted at the site.

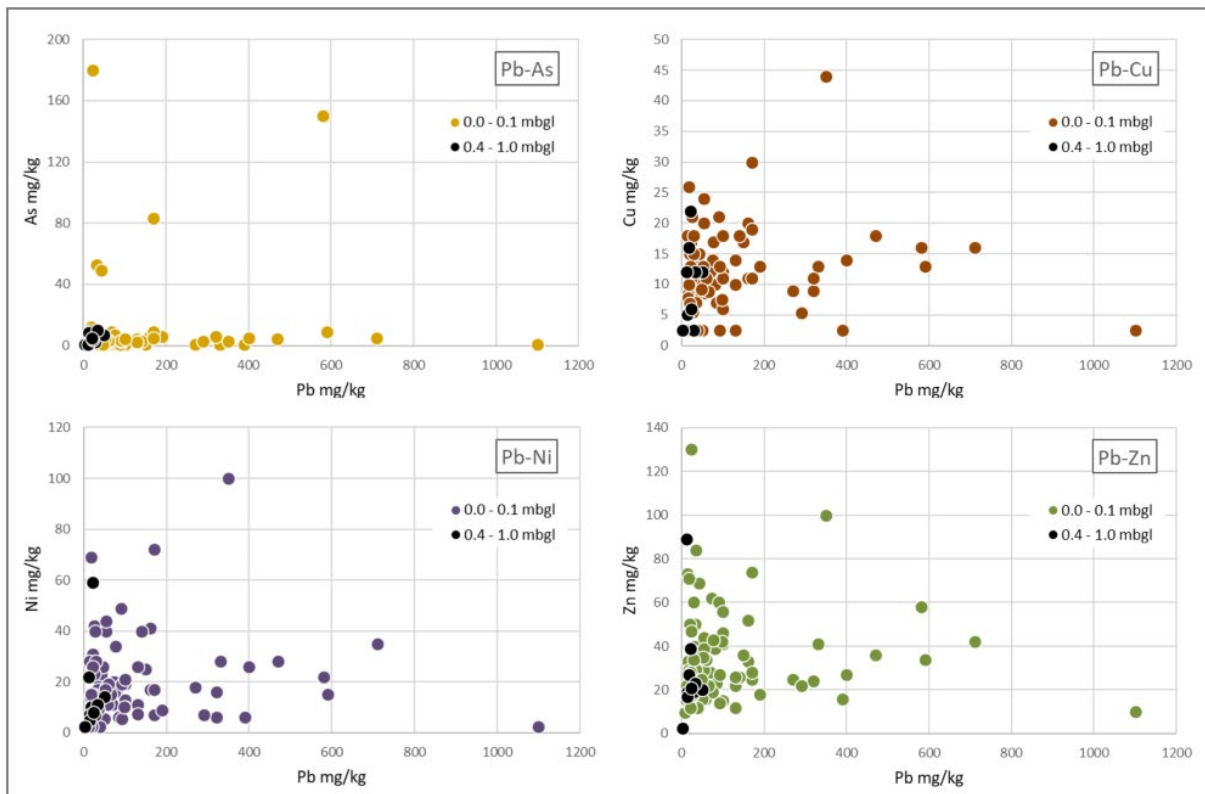


Figure 3-1: Chart of lead soil concentrations plotted against arsenic, copper, nickel and zinc soil concentrations (Kleinfelder 2021j).



The distribution of lead, PAHs (as indicated by benzo(a)pyrene TEQ) and TRH concentrations in site soils was variable, with isolated elevated values in multiple locations across the site. For example, SS15 (surface sample collected in 2019 by Beveridge Williams) reported the highest PAH and TRH concentrations at the site, but adjacent samples were below laboratory limits of reporting (LORs). These results / spatial patterns are consistent with those typically seen at sites impacted by shooting activities, where results in any collected soil sample are strongly affected by the presence or absence of residual clay target fragments and/or lead shot pellets.

The results with significantly elevated lead, PAH and TRH concentrations are therefore considered to reflect soil samples with entrained clay target fragments and/or lead shot pellets, and thus may not be representative of contamination which has leached from these materials and adsorbed to soil particles.

Consistent with the approach discussed in Schedule B1 of the NEPM ASC, Kleinfelder (2021j) calculated summary statistics for lead, TRH >C16-C34, total PAH, benzo(a)pyrene and benzo(a)pyrene TEQ in the surface samples from the oval/racecourse and target launch areas to assess whether average concentrations to which receptors are exposed across these areas are likely to exceed relevant health and/or environmental objectives. The statistical evaluation (presented in Table 3.2 of the CUP) indicated that:

- The lead, benzo(a)pyrene and TRH >C16-C34 results were below relevant objectives when compared to a range of summary statistics relevant to average exposure across the site³.
- Total PAH metrics were predominantly below relevant NEPM ASC recommendations. While the result in one location (SS15; 780 mg/kg) slightly exceeded 250% of the HIL-C ($300 \times 2.5 = 150$ mg/kg), the overall results are not considered to indicate unacceptable levels of exposure on average.
- Some benzo(a)pyrene TEQ metrics exceeded relevant NEPM ASC recommendations, specifically:
 - Standard deviation value was higher than 50% of HIL-C
 - Arithmetic mean and 95% UCL_{average} were above HIL-C.
 - Concentrations in multiple samples were above 250% of HIL-C.

Carcinogenic PAH (as indicated by benzo(a)pyrene TEQ) was therefore the only contaminant for which the Tier 1 screening process indicated a potentially unacceptable risk to human health and/or the environment. This risk is further discussed in **Section 3.2.5**.

In terms of the environmental value of aesthetics, the CUP indicated that only small quantities of shooting debris (such as shooting wads, clay target fragments) were observed during the site investigations conducted. During the auditor's site inspection in March 2021, clay target fragments were observed on the surface of the drains, drainage soak and overall ground in the target fall out areas, however, the fragments were not starkly obvious and observed wads were rare. Overall, the aesthetics of the ground surface and general site condition are considered acceptable in the context of ongoing recreational use as a community parkland and for horse racing / equestrian activities.

In summary, the Tier 1 screening against relevant objectives indicated that environmental values of the land environment are maintained with the possible exception of:

- Human health (due to identified benzo(a)pyrene TEQ concentrations in shallow soils only within the oval/racecourse and target launch areas of the site).

The risk to on-site human receptors posed by benzo(a)pyrene TEQ contamination in shallow soils therefore warrants further assessment. This further assessment is included as part of the CUP.

³ The NEPM ASC (Schedule B1) suggests that the maximum and 95% UCL of the arithmetic mean contaminant concentration should be compared to relevant Tier 1 screening criteria, but also that, to assess the implications of localised elevated values (hotspots), the standard deviation should be less than 50% of the screening level and no single value should exceed 250% of the screening level.



3.2.2 Groundwater

Table 3.2 presents a summary of groundwater concentrations above the groundwater environmental quality objectives applicable for the site (as per the ERS for Segment A1). All results not listed or discussed were below the environmental quality objectives.

Table 3.2: Groundwater Results Exceeding Adopted Guidelines

Chemical	Concentration Range ¹ (mg/L)	Bore/s with Concentration above Criterion ¹	Groundwater Guideline Exceeded and Criterion (mg/L)	Environmental Value
Copper	0.005 to 0.015	MW01, MW02, MW03, MW04	0.0014 (ANZG 2018, Freshwater 95%)	Water dependent ecosystems & species
Nickel	0.012 to 0.16	MW01, MW02, MW03, MW04	0.011 (ANZG 2018, freshwater 95%)	Water dependent ecosystems & species
		MW02 (April 2020 only), MW03, MW04 (April 2020 only)	0.02 (NHMRC & NRMCC 2011)	Potable water supply (desirable)
Zinc	0.034 to 0.135	MW01, MW02, MW03, MW04	0.008 (ANZG 2018, freshwater 95%)	Water dependent ecosystems & species

Notes:

1. Groundwater concentrations from April 2020 and July 2021 including blind (intra-laboratory) and split (inter-laboratory) duplicate samples.

Lead and hydrocarbons (TRH and PAH compounds), which are the main contaminants of concern associated with shooting activities, were all measured below the relevant objectives for applicable environmental values. This indicates that groundwater at the site has not been impacted by shooting activities.

Lead results were all below the LOR of 0.001 mg/L except for MW04 (July 2021) which reported 0.003 mg/L. The detected lead concentration in MW04 suggests that some minimal leaching may have occurred from overlying soils, however the extent of this appears to be minimal and has not resulted in groundwater concentrations above adopted criteria. It is also noted that the groundwater standing level in MW04 in July 2021 (approximately 0.6 mbgl) was significantly shallower than in April 2020 (approximately 3.2 mbgl).

Copper, nickel and zinc concentrations exceeded the adopted objectives for water dependent ecosystems and species in the four on-site bores screened within the alluvium. Nickel also exceeded the objective for potable water supply in three of the four bores.

The copper, nickel and zinc concentrations did not exhibit a spatial pattern and were variable both temporally and spatially.

Kleinfelder (2021f) prepared an HCSM which concluded that these elevated metals (copper, nickel and zinc) in the alluvial aquifer were naturally occurring rather than associated with shooting related (or other) site contamination sources. While some of the information within the HCSM is not presented in a clear or logical manner, the HCSM does present several lines of evidence to support this conclusion, including:

- The dominant sediment source to the site flood plain was hydrothermally altered Castlemaine formation.
- The Castlemaine formation has elevated metal concentrations compared to soil derived from other Victorian rock types (Lower Silurian sediments, basalt).



- The concentration ranges of copper, nickel and zinc reported in site soils are consistent with (and predominantly lower than) average concentrations reported in the Castlemaine sandstone formations, and were not elevated above relevant health and or ecological based screening levels.
- Copper, nickel and zinc concentrations in site soils showed no correlation with lead concentrations (**Figure 3-1**), indicating that lead shot derived from shooting activities is not likely to be contributing to their concentrations in soil (and subsequently groundwater).

While not evaluated in the Kleinfelder HCSM, the auditor also notes that:

- copper, nickel and zinc concentrations did not correlate with benzo(a)pyrene or PAH concentrations in soils, indicating that these metals are also unlikely to be associated with clay targets used in shooting activities.
- the observed spatial and temporal variability of copper, nickel and zinc in site groundwater are not consistent with a site source, i.e. concentrations were either variable across the site or were marginally higher in up- and cross-gradient wells MW02 and MW03.

Overall, the auditor considers that the literature review, data analysis of local geology and hydrogeology and CSM presented in the HCSM is consistent with the methodology recommended in EPA (2021c) guideline titled 'Proposed Methodology for Deriving Background Level Concentration When Assessing Potentially Contaminated Land' (Publication 1936), and provides sufficient lines of evidence to support the stated conclusion that the reported copper, nickel and zinc concentrations in alluvial aquifer are likely to be natural and not associated with shooting or other site activities.

While groundwater contains copper, nickel and zinc at concentrations above the adopted objectives for the environmental values of water dependent ecosystems and species and potable water supply, however these are considered to be naturally occurring and hence not contamination associated with the shooting activities conducted at the site.

The environmental values of the groundwater environment are therefore considered to be maintained and risks to groundwater-related receptors from shooting activities conducted at the site are considered to be low and acceptable.

3.2.3 Surface Water

All concentrations measured from the two surface water samples (SW01 and SW02) collected at the Loddon River were less than:

- LOR for metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc) and PAH compounds.
- adopted criteria for anions and cations.

However, the auditor notes that the sampling of SW01 and SW02 was conducted while surface water from the site was not discharging into the river. Therefore, there is insufficient data to confirm that surface water transport of contaminants is not occurring during rainfall events.

While they are not surface water samples, the results from the two auditor verification samples (discussed in **Section 3.2.1** above) provide an indication that metals and PAH concentrations in drainage lines on the site are low, and therefore that the potential for contamination associated with surface run-off on-site is low. Furthermore, groundwater (which is inferred to discharge into Loddon River) has not reported any contamination. Overall, the soil, groundwater and surface water data collected to date suggest that shooting activities on-site have not resulted in contamination of the downstream surface water receptor (Loddon River) for the site.

However, given that only one surface water monitoring event has been conducted, adopting the conservative approach, additional surface water sampling (to be conducted when water is flowing within the open spoon drain and unnamed tributary) is to be conducted in Stage 2 of the CUP.



In summary, the environmental values of surface water (Loddon River) are not indicated to be adversely affected by shooting activities and the associated risk to surface water or receptors exposed to surface water are considered likely to be low and acceptable.

However, additional sampling of surface water from Loddon River when surface water is discharging from the site is recommended to confirm these conclusions. This activity has been included in the CUP.

3.2.4 Sediment

The auditor notes that Kleinfelder assessed sediment results against human health and ecological guideline values for soil, instead of guideline values for sediment. Therefore, the auditor conducted her own review of the sediment results.

The two sediment samples SD01 and SD02 reported concentrations below LOR or below the adopted ecological and human health guideline values for sediment with the exception of:

- Sample QC28_09042020 (split duplicate of SD01) which measured arsenic above the ANZG (2018) default guideline value of 20 mg/kg.

As indicated in **Table 3.3**, the arsenic concentration measured at QC28_09042020 is inconsistent with the arsenic concentrations measured in other sediment samples at the site.

Table 3.3: Arsenic concentrations measured in sediment

Sample ID	Arsenic Concentration (mg/kg)
Default ecological guideline value (ANZG 2018)	20
SD01 (primary sample)	7.8
QC27_09042020 (blind duplicate)	3.6
QC28_09042020 (split duplicate)	35
SD02 (primary sample)	2.3

The elevated arsenic concentration in the split duplicate sample is potentially not representative and may be due to either heterogeneity within the sediment sample and/or laboratory analytical differences between the primary and secondary laboratory. However, there is no indication of widespread arsenic contamination at the site due to shooting activities at the site based on the following lines of evidence:

- Elevated arsenic levels in soil on-site were not measured at the site, especially in the targets fall out zones.
- All surface water arsenic concentrations were below LOR (<0.001 mg/L).
- All groundwater arsenic concentrations were below relevant groundwater objectives.

In summary, sediment within the (Loddon River) is not indicated to be contaminated due to shooting activities at the site.

3.2.5 Risk posed by contamination

Table 4.1 of CUP (provided in **Appendix B**) presents a qualitative risk evaluation based on the CSM (source-pathway-receptor linkages) developed by Kleinfelder for the site. The risk to all identified receptors is considered low and acceptable with the exception of:



- On-site recreational site users (current and future) due to direct contact exposure (dermal contact, dust inhalation and incidental ingestion) to carcinogenic PAHs (as indicated by benzo(a)pyrene TEQ) in soil. This was assessed by Kleinfelder to be associated with a “*Potentially acceptable risk (subject to further risk assessment)*”.

In addition, the risk to on-site and off-site receptors for the pathway of discharge to and migration in surface water was assessed “*likely acceptable*” based on the analytical results of the two surface water samples collected at the Loddon River. However, it was acknowledged that the sampling was conducted when surface water was not discharging from the site, and therefore, further sampling is proposed in CUP (refer to **Table 5.1** of the CUP). The auditor supports this approach for further confirmatory sampling to show that the risk for surface water is low and acceptable.

The auditor agrees with the risk conclusions presented in the CUP, in particular that the risks posed by site contamination associated with shooting activities are predominantly low and acceptable, except for one land environmental value listed **Table 3.4**.

Table 3.4: Summary of Impacted Environmental Value and Associated Risk

Medium	Applicable Environmental Value	Environmental Value Adversely Affected?	Nature of Risk or Potential Risk
Soil	Human health (for land environment)	On-site: Potentially Off-site: No (site-derived soil contamination has not been reported off-site).	Overall, the risk to human health (for on-site recreational users) is considered likely to be acceptable, however, there is a small degree of uncertainty due to the benzo(a)pyrene TEQ levels associated with clay target fragments measured on-site. The auditor notes that the overall, the PAH and TRH concentrations measured within the soil that were not influenced by clay target fragments, were not found to be elevated. Benzo(a)pyrene TEQ concentrations in soil are up to 40 times higher than the NEMP ASC HIL. The actual risk to human health posed by this contamination is considered likely to be low based on: - The relatively small proportion of locations where exceedances were reported across the site. - The expected very low bioaccessibility (and hence bioavailability) of PAHs from clay targets (see discussion below). - The low frequency and duration of receptor exposure at the site relative to that assumed in derivation of the adopted objective (NEPM ASC HIL).

A limited literature review was conducted by Kleinfelder (2021j) to ascertain the likely bioaccessibility of PAHs in site soils given the nature of the source being clay target fragments. This review identified a recent study which examined the in vivo (in mice) oral and dermal bioaccessibility of PAHs at two former US Department of Defence shooting ranges (Forsberg *et al.* 2021). The mean relative bioavailability (i.e. bioavailability from soil relative to that in a solvent matrix) for benzo(a)pyrene ranged from 8% to 14% (relative oral bioavailability) and 0.58 to 1.3% (dermal absorption fraction). These values are consistent with those reported for other soils contaminated from pyrogenic PAH sources, and are considered likely to be reasonable estimates of PAH bioaccessibility in site soils. These bioavailability estimates are also significantly lower than those assumed in the derivation of the NEPM ASC HILs (100% relative oral bioavailability and 6% dermal absorption fraction).

Based on this and other literature which indicates that both bioavailability and toxicity of PAHs from clay targets are likely to be very low, the CUP recommends a more detailed assessment of human health risks, including derivation of a site-specific HIL based on literature values in the first instance.



The auditor agrees that this further refinement of risk assessment should be completed in order to more robustly establish the nature and extent of risks posed, and whether there are drivers for further clean up and/or management of the PAH contamination.

The auditor has also independently assessed the likely impact of the literature bioavailability values on derivation of a site-specific benzo(a)pyrene TEQ HIL by:

- Utilising the HIL derivation spreadsheets provided in the ASC NEPM toolbox (<http://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox>).
- Reducing the oral bioavailability from 100% to 14% (the upper range of values indicated in literature studies).
- Reducing the dermal bioavailability (dermal absorption fraction) from 6% to 1% (the upper range of values indicated in literature studies).

The above modifications (see **Appendix C1**) resulted in site-specific HILs for benzo(a)pyrene TEQ of:

- **20 mg/kg** (where children are exposed from birth); or
- **60 mg/kg** (where early life exposure adjustments are not made).

If the exposure frequency is also reduced to two times per week (104 days/year; **Appendix C2**), which is considered likely to be protective of most receptors at the site based on current usage patterns, the site-specific HILs are further increased to:

- **70 mg/kg** (where children are exposed from birth); or
- **200 mg/kg** (where early life exposure adjustments are not made).

The average expected exposure concentrations of benzo(a)pyrene in site soils (i.e. average and 95% UCL concentrations of 3.7 mg/kg and 10.6 mg/kg, respectively as listed in Table 3.1 of the CUP) are below even the most conservative of the above adjusted HILs, and the concentration in only one location exceeds the above adjusted HILs.

These derivations will require more rigorous evaluation, justification and documentation (as outlined in the CUP). However, the auditor's independent calculations support the conclusion that health risks due to benzo(a)pyrene TEQ in site soils are likely to be low and acceptable, and therefore that the human health environmental value of land may already be maintained.



4.0 Assessment of Clean Up Plan

4.1 Clean Up Notice Requirements

The general contents and structure of the CUP have been assessed to ensure they meet the specific requirements of the Notice. A summary of the auditor's assessment of how the specific requirements of the Notice have been met is provided in **Table 4.1**

Table 4.1: Amended Clean Up Notice Requirements

Clean Up Notice Requirement	Relevant Section of CUP	Auditor's Comments
3.1 By 11 October 2021, you must supply to EPA a clean up plan, verified by an EPA appointed auditor, to restore beneficial use to the extent practicable, which includes:	All	This report is the auditor's verification of the CUP.
3.1.a) Information about background groundwater quality and beneficial use, presented in a Conceptual Site Model as per the National Environment Protection (Assessment of Site Contamination) Measure 1999.	3.3.3	The CUP presented information from the HCSM (Kleinfelder 2021f) completed in September 2021. As discussed in Section 3.2.2, the auditor agrees, based on the lines of evidence presented in the HCSM and other considerations, that <i>"the elevated concentrations of dissolved metals (including copper, nickel and zinc) reported in groundwater are considered to be background and not associated with historical clay target shooting activities at the site"</i> (page 21 of the CUP).
3.1.b) Clean Up Goals	5.1	The clean up goal is to restore environmental values which were impacted by historical clay target shooting activities at the site to the extent reasonably practicable. This is in line with the requirement of the Notice and in line with relevant EPA policy and guidelines.
3.1.c) Removal or remediation of contaminants on the premises.	5.2 and Table 5.1	Based on the work completed to date, the CUP has not identified any contamination at the site that warrants active remediation. The clean up strategy is a staged approach (Stage 1 to 4, with Stage 1 already being implemented by the Council) and the need for removal or remediation of contaminants at the site is to be assessed in Stage 4 (pending the results from Stage 2 and 3). The auditor concurs with the CUP that active remediation is not currently indicated to be required and supports the staged approach to evaluate whether removal or remediation of contaminants is required in the future.



Clean Up Notice Requirement	Relevant Section of CUP	Auditor's Comments
3.1.d) details of contingency plans and associated monitoring programs and reporting dates	5.2 and Table 5.1	Triggers and contingency measures are presented in Stage 3 of the clean up plan and are considered to be appropriate for the clean up activities (primarily further sampling and risk assessment) proposed. Based on the work completed to date (i.e. implementation of Stage 1), the CUP has indicated that monthly visual monitoring is currently in place. This is monitoring to maintain the temporary precautionary risk management (i.e. fencing and signage) and whether any repairs are required. Depending on the outcomes of Stage 2 and 3, the need for any future monitoring program will be assessed in Stage 4 (if required). This may be monitoring associated with remediation works and/or ongoing monitoring post-remediation (i.e. to monitor residual risk). The auditor supports the staged approach to evaluate whether any monitoring of contaminants is required in the future. The reporting requirements for Stage 1 to 4 and their tentative reporting dates are presented in Table 5.1 of the CUP. The reporting requirements and their dates are considered to be appropriate and reasonable for the works proposed.
3.1.e) the date(s) by which requirements (a) to (d) above will be completed or specified (as the case may be).	5.2 and Table 5.1	The reporting requirements for Stage 1 to 4 and their tentative reporting dates are presented in Table 5.1 of the CUP. The reporting requirements and their dates are considered to be appropriate and reasonable for the works proposed.
3.1.f) anticipated completion date of clean up.	5.2 and Table 5.1	Table 5.1 of the CUP provides the completion date for Stage 1 and anticipated completion dates for the Stage 2 and 3. As it is not yet established whether Stage 4 is required, the anticipated completion date of all clean up activities could not be specified at this stage. If active remediation or further management actions are required at the site, the anticipated completion date will be detailed in the Remediation Action Plan. The anticipated completion dates for Stage 2 and 3 are considered appropriate and reasonable for the works proposed.

In summary, the auditor is satisfied that the CUP includes the elements required by the Notice.

4.2 Review of Clean Up Strategy

In verifying the overall approach to clean up as presented in the CUP, the auditor has:

- Reviewed the available environmental assessment reports provided to the auditor (see **Section 1.5**) and the CUP (Kleinfelder 2021j).
- Reviewed the clean up drivers and goal presented in the CUP, including the human health and environmental risks posed by the identified contamination associated with historical shooting activities.
- Considered whether the proposed strategy may reasonably meet the requirements and objectives of the Amended Clean Up Notice ID. 90011425.

In summary, the auditor considers the staged strategy in the CUP for addressing contamination associated with historical shooting activities to be practicable and proportionate to the risk profile for the site condition. It is noted that clay target shooting has currently ceased at the site and if it is to occur in the future, the contamination associated with future shooting activities are to be managed via an Environmental Management Plan.



4.3 Compliance with EPA Interim Guidance

This section details the review of compliance of the CUP against the requirements of EPA interim guidance (EPA 2010). A summary of the auditor's review is presented in **Table 4.2**.

Table 4.2: CUP Compliance with EPA Interim Guidance

Item	Requirement for Auditor Endorsement	Complies?	Relevant Section of CUP	Auditor Comment
1	The content of the CUP includes all elements specified in the clean up notice.	Yes	All	The CUP is considered to meet the requirements of the Notice (refer to Table 4.1 above).
2	That the works, actions, roles and responsibilities, information, contingency arrangements and monitoring contained within the clean-up plan provide clear direction of the tasks and approach required to execute and complete the clean-up.	Yes, partially	5	The CUP contains discussion on the tasks, contingency measures required for each stage of the clean up activities proposed. It is noted that stakeholders' roles and responsibilities are not clearly stated in the CUP. However, it is clear the Council is the duty holder in control or management of the site who has ultimate responsibility for ensuring that the stated actions are performed.
3	The approach specified in the CUP, if aggressively implemented, will satisfy the objective of restoring beneficial uses (i.e. environmental values ¹). Should the restoration of beneficial uses (i.e. environmental values ¹) not be possible, then the auditor must be satisfied that the CUP applies the principles of clean-up to the extent practicable (i.e. clean up so far as reasonably practicable ² [CUSFARP]).	Yes	5	Overall, applicable environmental values of land, groundwater and surface water are considered likely to be maintained at the site (noting that further works are required to further assess the human health environmental value of the land environment, and to confirm potential impacts on the surface water environment). These further works are proposed as part of Stage 2 clean up program. In summary, the staged approach specified in the CUP is considered commensurate with the risks posed by contamination at the site and consistent with the clean up goal of restoring (or maintaining) environmental values which were detrimentally impacted by historical clay target shooting activities.
4	The implementation of CUP will not adversely impact on any third parties (e.g. Local Water Authority via the discharge contaminated groundwater into sewer drains).	Yes	5	The clean up strategy proposed in the CUP has not indicated adverse impact on third parties. It is noted that shooting activities ceased at the site in 2020.
5	The auditor must not make an endorsement provisional upon some future action, study, or assessment or make endorsement subject to approval by EPA.	Yes	5	While the CUP includes further assessment and risk characterisation of the site, the auditor considers these activities to be commensurate with the risk profile indicated by the available data, and consistent with the definition of 'clean up' as per in section 3 of the <i>Environment Protection Act 2017</i>, which includes: (a) "to investigate and assess the nature and extent of pollution or waste, including any harm or risk of harm to human health and the environment arising from the pollution or waste"



Item	Requirement for Auditor Endorsement	Complies?	Relevant Section of CUP	Auditor Comment
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Note:

1. With the commencement of *Environment Protection Act 2017* on 1 July 2021, the concept of 'beneficial uses' is replaced by 'environmental values' in accordance with the ERS.
 2. Clean up so far as reasonably practicable (CUSFARP) as specified in EPA guideline titled 'Guidance for the cleanup and management of contaminated groundwater', Publication 2001.1 (EPA 2021h).
-



5.0 Conclusion

This report documents the auditor's assessment and verification of the following clean-up plan (CUP):

- *Clean Up Plan – Glenlyon Recreational Reserve*, revision 3 dated 7 October 2021, prepared by Kleinfelder Australia Pty Ltd.

A summary of the auditor's opinions and conclusions based on an assessment of the CUP are as follows:

- The contents of the CUP meet the requirements of the Amended Clean Up Notice ID: 90011425.
- The CUP is considered to provide an appropriate staged strategy for the assessment and clean up of the contamination associated with historical clay target shooting activities at the Glenlyon Recreation Reserve in the context of ongoing use as a recreational reserve.
- Commensurate with the risks identified by Kleinfelder, the auditor is satisfied that implementation of the CUP:
 - Is a practicable approach to clean up consistent with the duty to manage contaminated land so far as reasonably practicable, as outlined in the *Environment Protection Act 2017* and EPA Publications 1856, 1940 and 2001.1.
 - Will manage potential risks to human health and the environment associated with the identified site-derived contamination associated with historical clay target shooting activities.

The auditor's 'Verification of Clean Up Plan Summary Statement' is provided at the front of this report.



6.0 Uncertainties and Limitations

In drawing conclusions and conducting the verification, the environmental auditor used reasonable care to avoid reliance upon data and information that may be inaccurate but has not independently verified all information on which it has relied. The environmental auditor's conclusions presented in this report are therefore limited by and rely upon the information made available to her and on her own observations as part of the assessment process. These conclusions may be different if the information upon which they are based is determined to be false, inaccurate or incomplete.



7.0 References

Legislation and Regulations

State of Victoria, *Environment Protection Act 2017*.

State of Victoria, *National Environment Protection Council (Victoria) Act 1995*.

State of Victoria, *Environment Protection Regulations 2021*, S.R. No. 47/2021 (25 May 2021).

State of Victoria, *Environment Reference Standard*, Victoria Government Gazette No. S245 (26 May 2021).

General References

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Appendix A: Amended Clean Up Notice ID. 90011425

AMENDED CLEAN UP NOTICE

Mr. Bruce Lucas
HEPBURN SHIRE COUNCIL
76 Vincent ST
DAYLESFORD VIC 3460

TO: HEPBURN SHIRE COUNCIL

ADDRESS: 76 Vincent ST, DAYLESFORD VIC 3460

PREMISES: Crown Allotment 5, Section 48 Township Glenlyon, Parish of Glenlyon,
Suttons Lane, GLENLYON VIC 3461

LEGAL REFERENCE: EP Act 1970 s.62A(1) Clean up and ongoing management measures required

Who we are: Environment Protection Authority (EPA) Victoria is an independent statutory authority established under the *Environment Protection Act 1970* (the EP Act). Our purpose is to protect and improve our environment by preventing harm to the environment and human health.

Why we amend remedial notices: EPA may revoke or amend any requirement in a remedial notice if EPA is satisfied that the circumstances of the case justify such action.

What you are required to do: Section 62A(1) of the EP Act requires you to comply with the requirements in this notice with one or more actions to prevent or remedy an actual or likely non-compliance. You must comply with all other requirements in the original notice that have not been amended.

Under section 60A(1), you must notify any person proposing to take control of your premises of this notice and your progress towards compliance with this notice.

When you are required to act: You should already be acting to comply with the original notice identified above. *New or amended requirements take effect immediately.* When EPA is satisfied that all requirements in this notice have been complied with this notice will be revoked.

What happens if you do not comply: If found guilty of contravening a requirement of this notice, you may be ordered to pay a fine of up to 2400 penalty units (\$396,528).

Review rights: You may apply in writing to the Supreme Court of Victoria within 60 days of the date of this notice for a review. For further information on how to apply contact the Supreme Court of Victoria on (03) 9603 9300.

For the purpose of this notice 'You' means the recipient of this notice and 'Premises' means the site at the premises address, as identified above.



Ryan Straub

DELEGATE OF THE ENVIRONMENT PROTECTION AUTHORITY

DATE OF ISSUE: 24/05/2021

NOTICE STRUCTURE

1 EPA OBSERVATIONS

This section details what was observed during the inspection. It also summarises the information relevant to the amendment.

2 REASONS FOR VIEW FORMED

This section interprets the observations and articulates why the authorised officer believes

- a) a clean up notice should be issued in accordance with section 62A of the EP Act, and
- b) justification exists to amend this notice.

3 REQUIREMENTS - WHAT OUTCOMES ARE REQUIRED TO COMPLY?

Considering the view that has been formed, this section lists the notice requirements to address the environmental risk(s) or impact(s), highlighting any changes made to original notice requirements.

4 AN EXAMPLE OF HOW YOU CAN COMPLY

This section provides an example or amended example of how you may achieve compliance with the requirements of this and the original notice.

1 EPA OBSERVATIONS

Observations relating to the original notice

1.1 On 31 January 2020, EPA served Clean up Notice 90010886 on Hepburn Shire Council to require the assessment of the extent and level of contamination of groundwater, surface water and soil on and from the Glenlyon Recreation Reserve located at Suttons Lane, GLENLYON ("the premises").

1.2 On 14 March 2020 at approximately 1000 hours, EPA attended the premises to check compliance with requirement 3.1 of 90010886 which required action to identify imminent risk to human health or the environment including restriction of contaminated areas and signage to prevent access from the public. During the inspection, the officer:

1.2.1 Observed at the entrance of the premises, signage with a map of the premises and a sign with information regarding potential contamination of the site and warning the community to stay clear of the marked areas.

1.3 On 27 May 2020, EPA received a document titled 'Detailed Site Investigation, Glenlyon Recreation Reserve, Suttons Lane, Glenlyon VIC 3461, Kleinfelder Project Number: 20204153.001A' and dated 25 May 2020. An EPA officer assessed the report and noted that;

1.3.1 the DSI involved a limited historical review and field works that included the installation of four groundwater monitoring wells, soil sampling from 104 soil bores, groundwater sampling, surface water and sediment sampling.

1.3.2 the soil sampling found concentrations of arsenic above the adopted ecological investigation levels ("EILs") for public open space (100 mg/kg) at two soil sample locations, which included within the racecourse (MW01_0.1 – 180 mg/kg) and the pavilion (PV03_0.1 – 180 mg/kg).

1.3.3 the concentrations of lead in soil samples were reported below the Health investigation level C ("HIL C") as per the National environment protection (assessment of site contamination) measure 1999 ("NEPM").

1.3.4 elevated concentrations of fluoride was reported in one soil sample at the proposed fence line (510 mg/kg) compared with NEPM HIL C.

1.3.5 the concentrations of Benzo(a)Pyrene Toxic Equivalence Quotient (BaP TEQ) exceeded the HIL C for soil in public open space, as per NEPM (4 mg/kg) in two soil samples (4.2 mg/kg and 20 mg/kg), one sample was located in the north-east portion and one sample was located in the south-west portion of the racecourse.

1.3.6 based on the water table elevation contours the potential groundwater flow was reported to be in a westerly direction toward, or parallel with the Loddon River.

1.3.7 groundwater Segment A1 was conservatively adopted as the beneficial use segment.

1.3.8 concentrations of copper, nickel and zinc exceeded the water dependent ecosystems and species criteria in all four groundwater samples as per the NEPM.

1.3.9 concentrations of nickel in groundwater sampled from groundwater monitoring wells MW02, MW03 and MW04 exceeded the drinking water criterion as per the NEPM.

1.3.10 read that potential exposure pathways on-site include dermal contact, incidental ingestion and inhalation of dust from impacted soils e.g. on-site users, visitors, intrusive workers or construction workers, dermal contact or ingestion of impacted groundwater for potential intrusive workers was considered unlikely and residual exposure risks can be managed under a Construction Environmental Management Plan (CEMP) if required.

1.3.11 concentrations of copper, nickel and zinc in on-site groundwater exceeded the Water Dependent Ecosystems and Species (WDES) criteria and the drinking water criteria, however as concentrations of these metals were not elevated in soil, the concentrations were considered to be background concentrations in groundwater.

1.3.12 concentrations of nickel exceeded the Drinking Water criterion at groundwater monitoring wells MW02, MW03 and MW04.

- 1.3.13 groundwater was not sampled in a background location on/from the premises.
- 1.3.14 concentrations of total metals were reported below the laboratory LOR in all surface water samples.
- 1.3.15 concentrations of PAHs were reported below the laboratory LOR in surface water samples SW01 and SW02.
- 1.3.16 the findings of the delineation investigation confirmed the PAH contamination are restricted to the racecourse area, with no exceedances reported in other areas of the Site where soil sampling was completed.
- 1.3.17 based on the findings of the investigations completed at the Site, the PAH compound contamination is considered likely to be associated with clay target shooting activities.

Observations relating to the amendment

- 1.3.18 On 19 May 2021 , EPA received an application to amend from HEPBURN SHIRE COUNCIL to extend the timeframes for Clean Up Notice (CUN) 90011425. The EPA Officer:
- 1.3.19 Read in the application, the type of amendment sought was extension of compliance dates.
- 1.3.20 Read in the application, works have been delayed due to Council elections, the Christmas break and COVID-19.
- 1.3.21 Observed in the application a timeline detailing works undertaken thus far.
- 1.3.22 Read in the application, evidence of Council's intent to comply with the notice has been demonstrated by the works undertaken to comply with the previous PAN.
- 1.3.23 Read in the application, extension to timeframes will not have any further long term environmental impacts to the site as shooting has been temporarily suspended.

2 REASONS FOR VIEW FORMED

Reasons for serving the remedial notice

EPA has confirmed that you occupy a premises where shooting activities have resulted in contamination of soil with Polycyclic Aromatic Hydrocarbons above the Health Investigation Levels set out in Schedule B1 of the National Environment Protection Measure 1999 for recreational land.

Groundwater at the site contains elevated metals including copper, nickel and zinc which may be indicative of background groundwater quality.

Further action is required to restore beneficial uses to an extent practicable and to minimise the environmental risk from ongoing shooting activities.

In order to address this, you must take the clean up and ongoing management measures listed in this notice.

Reasons for amendment

EPA has taken into consideration the application and has made a decision to amend the current remedial notice with revised timeframes to allow further opportunity to achieve compliance.

On the basis of the information previously stated, I have formed a view that the circumstances of your case have led me to

- extend the period if any for compliance with a requirement specified in the notice



Ryan Straub
AUTHORISED OFFICER
EPA North West
EPA Victoria

DATE OF ISSUE: 24/05/2021

3

REQUIREMENTS - WHAT OUTCOMES ARE REQUIRED TO COMPLY?

General Requirements

3.1 By 11 October 2021, you must supply to EPA a clean up plan, verified by an EPA appointed auditor, to restore beneficial use to the extent practicable, which includes:

- a) information about background groundwater quality and beneficial use, presented in a Conceptual Site Model as per the National Environment Protection (Assessment of Site contamination) Measure 1999.
- b) clean up goals.
- c) removal or remediation of contaminants on the premises.
- d) details of contingency plans and associated monitoring programs and reporting dates.
- e) the date(s) by which requirements (a) – (d) above will be completed or specified (as the case may be).
- f) anticipated completion date of clean up.

3.2 By 23 December 2021, you must supply to EPA for approval an Environmental Management Plan for the ongoing use of the premises for shooting activities, to ensure the shooting activities at the premises do not pose any unacceptable environmental risks.

Reporting Requirements

3.3 By 23 December 2021, you must, in writing to the authorised officer listed on page 5 of this notice, provide a final report that:

- a) specifies how the process, activity, or use has been carried on or will be carried on, modified or controlled to achieve compliance with the notice requirements,
- b) includes a copy of the auditor approved clean up plan, and;
- c) is signed by your managing director, most senior executive, or a person authorised to speak on behalf of the notice recipient.

4

AN EXAMPLE OF HOW YOU CAN COMPLY

One way of achieving compliance with this notice would be to:

4.1 By the date specified in requirement 3.1, engage a suitably qualified person to create a clean up plan for the premises that is submitted to EPA for approval and that addresses the following:

- a) confirmation of the background groundwater quality, presented in a conceptual site model ("CSM") for the site. The CSM should be prepared in accordance with the National Environment Protection (Assessment of Site contamination) Measure 1999 and include on-site sampling data, geological information, hydrogeological information, and observations of the site's setting, use and receptors. If possible, prepare the CSM in pictorial-type form.
- b) clean up goals and clear justification for each, including derivation of site specific goals (if required).
- c) analysis and selection of best remediation option and implementation plan and classification of waste to be removed from site.
- d) contingency planning, groundwater and/or vapour monitoring program.
- e) timelines for all works and reporting requirements (including regular review of chosen remediation technology).
- f) completion date of clean up and how this is going to be measured.

4.2 By the date specified in requirement 3.2, engage a suitably qualified person to prepare an Environmental Management Plan for the ongoing use of the premises for shooting activities, to ensure that no unacceptable environmental risks are promoted by the shooting activities, and provide to EPA. The plan must be based on scientific evidence, include best practice options and includes, but it not limited to:

- a) consideration of the use of alternative materials.
- b) risk assessment/register of all actual or likely environmental impacts resulting from the premises operation.
- c) maintenance and cleaning plan for all impacted areas, including removal and disposal of the collected material.
- d) monitoring and sampling methods pertinent to all processes and activities conducted at the premises.
- e) a stakeholder/sensitive receptor map identifying sensitive receptors in relation to the premises, including distances and directions.
- f) regular review and updating of monitoring processes.

4.3 By the date specified in requirement 3.3, provide a signed cover letter briefly outlining the works completed to provide to EPA an Environmental Management Plan and an EPA verified Clean up Plan for the premises.



Appendix B: Clean Up Plan dated 7 October 2021

Clean Up Plan – Glenlyon Recreation Reserve

Suttons Lane, Glenlyon, Victoria 3461

Clean Up Notice ID: 90011425

20220348.001A

7 October 2021



Level 1, 95 Coventry Street,
South Melbourne, VIC 3205

Phone: +61 3 9907 6000



Clean Up Plan – Glenlyon Recreation Reserve

Suttons Lane, Glenlyon, Victoria 3461

Clean Up Notice ID: 90011425

Kleinfelder Project: 20220348.001A

Kleinfelder Document: MLB21R130509

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APPENDICES

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Appendix B:	Daylesford Field and Game Club Questionnaire
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Appendix D:	July 2021 Data



1 INTRODUCTION

Kleinfelder Australia Pty Ltd (Kleinfelder) was engaged by Hepburn Shire Council (Council) to prepare a clean up plan (CUP) for the Glenlyon Recreation Reserve located at Suttons Lane, Glenlyon, Victoria (Site). The Site location is shown on **Figure 1** (attached).

1.1 REGULATORY CONTEXT

An amended clean up notice (CUN) - notice ID: 90011425 was issued to Council on 24 May 2021 by the Environment Protection Authority Victoria (EPA), which requires an auditor-verified clean up plan (CUP) to be submitted to the EPA for the Site by 11 October 2021. The CUN is provided in **Appendix A**.

The reporting requirements of the CUN are as follows:

3.1 - *“By 11 October 2021, you must supply to EPA a clean up plan, verified by an EPA appointed auditor, to restore beneficial use to the extent practicable, which includes:*

- (a) Information about background groundwater quality and beneficial use, presented in a Conceptual Site Model as per the National Environment Protection (Assessment of Site Contamination) Measure 1999.*
- (b) Clean up goals.*
- (c) Removal or remediation of contaminants on the premises.*
- (d) Details of contingency plans and associated monitoring programs and reporting dates.*
- (e) The date(s) by which requirements (a) – (d) above will be completed or specified (as the case may be).*
- (f) Anticipated completion date of clean up.*

In addition to the requirements of the CUP, EPA has also requested an Environmental Management Plan be submitted by 23 December 2021 for the ongoing use of the Site for shooting activities, to ensure the shooting activities do not pose any unacceptable environmental risks at the Site.

This report provides a CUP to address reporting requirement 3.1 of the CUN. The CUP was developed based on Site conditions up to and including July 2021.

The Council appointed Ms. Kristi Hanson of Senversa Pty Ltd as the Auditor (appointed pursuant to Environmental Protection Act 2017) for the CUP verification.



2 BACKGROUND INFORMATION

2.1 SITE DESCRIPTION

Site details are summarised in **Table 2.1** below.

Table 2.1: Site Details

Item	Details
Site Address	Suttons Lane, Glenlyon VIC 3461
Standard Parcel Identifier	5~48\PP5324
Site Use	Local recreation reserve
Site Area	21 hectares (approximately)
Site Zoning	Public Park and Recreation (PPRZ)
Local Council	Hepburn Shire
Site Features	An oval shaped racecourse circling an area of approximately 8.1 hectares encompassing a sports oval (the Des Leonard Oval), surrounded by a sports pavilion, toilet block, storage shed, barbeque and children's playground areas, camping and horse-riding/equestrian facilities.

2.2 SITE HISTORY

In 1846 Richard Babington and John Carpenter purchased the land comprising the future Glenlyon township, and on a 1857 survey plan¹, Glenlyon is shown as a series of subdivided allotments with a small number of structures. The 1873 *Shippers and Importers Directory*² notes that the population was 203 and that the area was principally used for farming. The recreation reserve (i.e. the Site) is not shown on the 1857 plan, although the reserve was being used for horse racing in 1867 and “racing and sports days” in 1914³.

Multiple editions of the *Shippers and Importers Directory*, note that there were “low-quality diggings” (referring to alluvial gold) near Glenlyon. During historical alluvial gold mining sediments along stream banks were typically mined using picks, shovels and panning, with mercury used to amalgamate gold particles. While the banks of the Loddon River and the Site were likely prospected for gold Glenlyon is not located in a historical alluvial gold mining area⁴.

The historical review indicates that there have not been substantial changes in the reserve layout since 1946 (**Figure 2.1** below). Some minor changes included the removal of a small structure, the racecourse surface has likely been up-graded and the pony club infrastructure installed, including the dressage arena (**Figure 2.2** below).

The Local⁵ indicates that the Daylesford Field and Game Club (the Club) commenced monthly clay target shooting competitions/practice at the Site since 1979. Based on the information provided by the Club, it is understood that a small gathering of locals commenced shooting from what is now the equestrian area towards the centre of the Site. This continued until 1983, when shooting was moved to the southwest portion of the Site. It is understood that Council requested the Club halt shooting at the Site in 2020 due to potential human health risks resulting from clay target fragments (polycyclic aromatic hydrocarbon compounds) and residual lead shot (lead).

¹ Minay, S 1867. Township of Glenlyon. Department of Lands and Survey. Available from slv.gov.au.

² National Library of Australia (trove.nla.gov.au).

³ National Library of Australia (trove.nla.gov.au).

⁴ Lawrence, S. and Davies, P., 2012. Learning about landscape: Archaeology of water management in colonial Victoria. *Australian Archaeology*, 74, 47-54.

⁵ <https://tlnews.com.au/gun-club-out-after-40-years-due-to-lead-scare/>

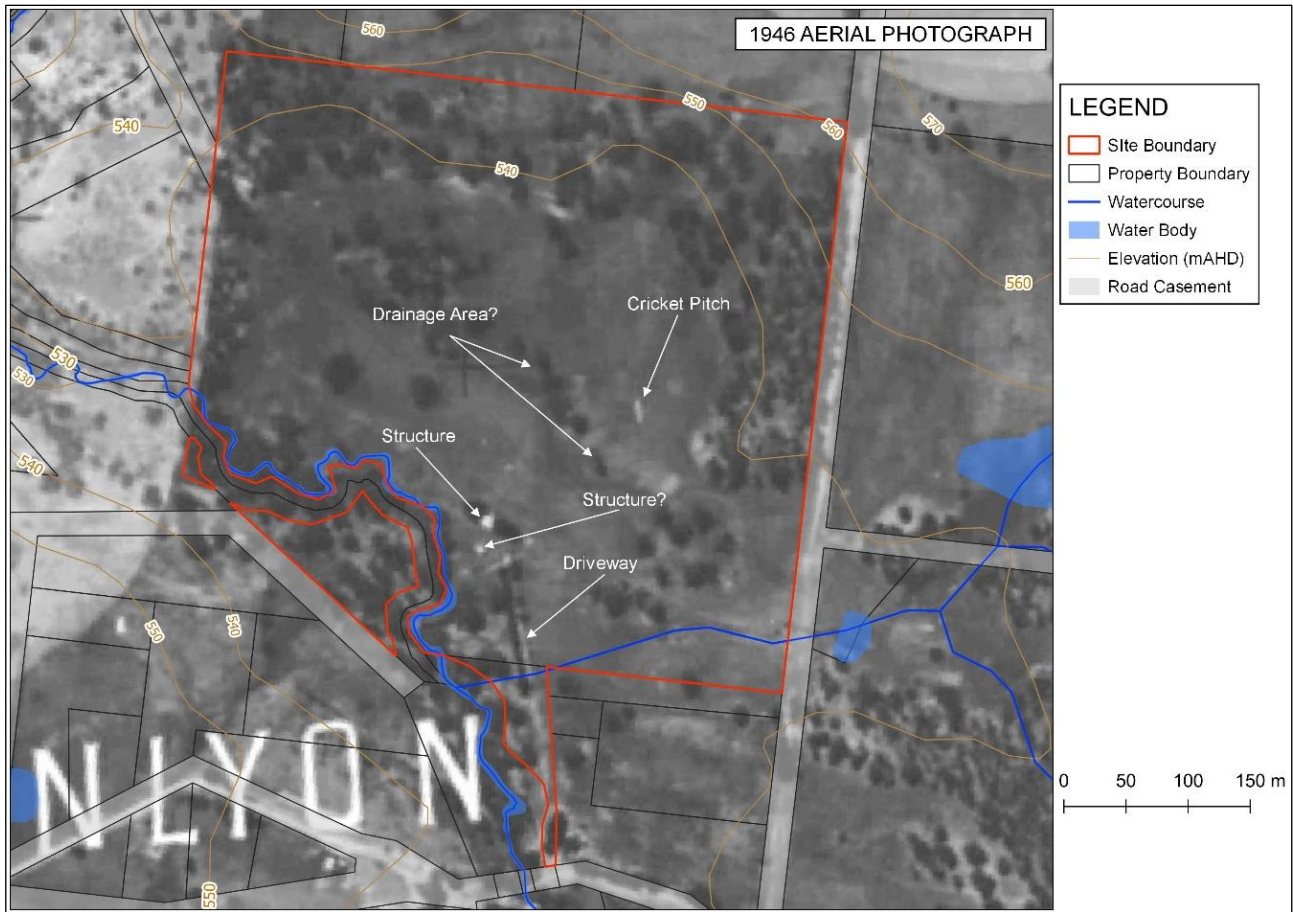


Figure 2.1: 1946 aerial photograph of the Glenlyon Recreation Reserve



Figure 2.2: 2016 aerial photograph of the Glenlyon Recreation Reserve



2.3 SITE USES

The Site is used for the following recreational activities:

- Clay target shooting (Council requested the club halt this activity in 2020 due to potential human health risks resulting from clay target fragments – polycyclic aromatic hydrocarbon (PAH) compounds) and residual lead shot).
- Equestrian activities including dressage, racing/training circuit, cross country and horse trial events.
- Sporting events (e.g. cricket).
- Public use as a park (e.g. dog walking).
- Camping.
- Open space for public events.
- Kleinfelder prepared a list of questions that were provided to the Daylesford Field and Game Club relating to the use of the Site for clay target shooting. A list of the questions and responses is provided in Appendix B.

2.4 CONTAMINANTS OF CONCERN

Based on the use of the Site for clay target shooting, the contaminants of concern were identified as:

- Lead shot:
 - Shotgun pellets are contained within shotgun wads and are made up of lead.
 - Lead shot is principally a mixture between antimony (0.5 to 6.5 wt% (for hardness)) and lead with minor arsenic (0.1 wt%) and tin (0.1 wt%) concentrations; trace elements (i.e., <1,000 mg/kg) include bismuth, copper, zinc, chromium and silver.
- Clay targets:
 - Historically made of limestone and bitumen mixture.
 - The bitumen makes up approximately 30% of the targets and may contain between 0.5 and 5% PAH compounds⁶.

It is acknowledged that this CUP relates only to contamination caused by shooting activities and not by other potential sources of historical contamination at the Site. Based on the historical review, however, particularly the information that horse racing commenced at the Site since 1867, and the absence of alluvial gold mining, it is considered unlikely that contaminating activities (other than clay target shooting) were undertaken at the Site.

2.5 SURROUNDING LAND USE

The surrounding land use is summarised in **Table 2.2** below.

⁶ Environment Canterbury, 2006. Potential for contamination from clay target debris at shooting sites: Review of literature on occurrence of site contamination from clay targets. Report No. U06/81



Table 2.2: Surrounding Land Use

Direction	Description
North	Agricultural land
East	Agricultural land
South	Agricultural land, public conservation areas, residential properties, Loddon River and the Glenlyon Community Dam
West	Public conservation areas, residential properties, Loddon River and Glenlyon township

2.6 TOPOGRAPHY AND HYDROLOGY

Glenlyon is located in the Victorian West Central Highlands where the local elevation ranges from approximately 540 mAHD⁷ at the Site to 685 mAHD, approximately 1.7 km to the Site's east. Glenlyon is situated at an elevation of approximately 575 mAHD, indicating that the Site is at a topographical low point.

The Loddon River, which forms the Site's southwestern boundary is the predominant surface water feature in the area. There are multiple unnamed tributaries flowing into the Loddon River in the regional area, including a creek that traverses the Site's southern boundary.

The northern boundary of the Site slopes down towards the middle (i.e. the drainage area), by approximately 20 m, and the surface elevation increases between the drainage area and the southern boundary of the Site by approximately 5 m toward the Loddon River.

The racecourse interior is grassed with a sparse tree cover, whereas the exterior areas are grassed with denser tree cover. Surface water overland flow within the racecourse area is controlled by an earthen spoon drain network that channels the water into a shallow water retention pond, located near the western boundary on the racecourse interior, from which overflowing water is discharged to the Loddon River through an earthen spoon drain.

2.7 GEOLOGY

The geological and hydrogeological review identified that the Site is located in a reasonably complex area with extensive basalt and partially mineralised siltstone located to the north and west, and east and south, respectively. The Site itself occupies an area of recent alluvium/colluvium accumulation on the eastern bank of the Loddon River.

The regional surface geology⁸ (refer to **Figure 2.3** below) is dominated by the folded and faulted Early to Middle Ordovician⁹ Castlemaine Formation made up of thickly bedded marine sandstones, mudstones and shales, with rarer conglomerates to the Site's south and east. Overlying the Castlemaine Formation are Late Miocene to Holocene¹⁰ Newer Volcanic Group basalts to the west and north, of which there are five known basalt eruption points within 2.7 km of the Site. The fluvial Eocene to Pliocene¹¹ Calivil Formation clays, silts, sands and conglomerates underlie the basalts and as these sediments are not known at high elevations it is probable that they were deposited by the ancient Loddon River, prior to basalt filling the river valley.

The Site surface geology is mapped as Pleistocene to Holocene¹² unconsolidated terrace/alluvial gravels, sands and silts, which based on the geological map overlie the Castlemaine Formation. These sediments are likely to comprise alluvium, derived from the Loddon River and colluvium derived from the higher elevation Castlemaine Formation and Newer Volcanic Group rocks surrounding the Site. It is considered likely that the alluvial sediments were deposited when the Loddon River was temporarily dammed on multiple occasions by basalt. The Daylesford-Glenlyon Lead beneath the basalt marks the approximate palaeo-Loddon River channel.

⁷ mAHD – metres relative to the Australian Height Datum

⁸ From gsv.vic.gov.au/sd_weave

⁹ Early to middle Ordovician marine sediments deposited between 485 and 460 million years before present.

¹⁰ Late Miocene to Holocene basalts were erupted between 8.5 million and 5,000 years before present.

¹¹ Eocene to Pliocene fluvial sediments deposited between approximately 50 and 5 million years before present.

¹² Pleistocene to Holocene terrace sediments deposited between 2.5 million years and the present.



Deep leads formed when basalt flows filled river valleys, hence the leads are essentially palaeo-alluvial deposits, some of which contain gold. Primary gold mineralisation is associated with regional hydrothermal alteration of the Ordovician sediments that resulted in quartz veining with minor sulfide (pyrite, arsenopyrite, chalcopyrite, sphalerite and galena) and iron carbonate¹³ precipitation. While Glenlyon is not within a historical gold producing area, the Ordovician rocks up-topographic gradient from the Site are described “*micaceous sandstones intersected by quartz veins*”¹⁴, hence the rocks have been hydrothermally altered and associated sulfides are to be expected.

Bore logs¹⁵ for wells within Glenlyon suggest the basalt is up to 60 metres thick (WRK009922) and thins toward the margins, to less than 20 metres thick. Bore 65296, to the Site's west, across the Loddon River intersected 12 m of basalt, cemented wash (a general term for cemented gravel sediment derived from nearby hills) to 22 metres below ground level (mbgl) and sandstone to 24 mbgl. Located near the Site's western boundary the 260 m deep Jet Bore log (Bore 65272, the Site mineral water well) indicates that clay and sandstone are present to 20 metres depth beneath which are sandstones and shales with quartz intervals, supporting the earlier observation that hydrothermal alteration is prevalent in the area.

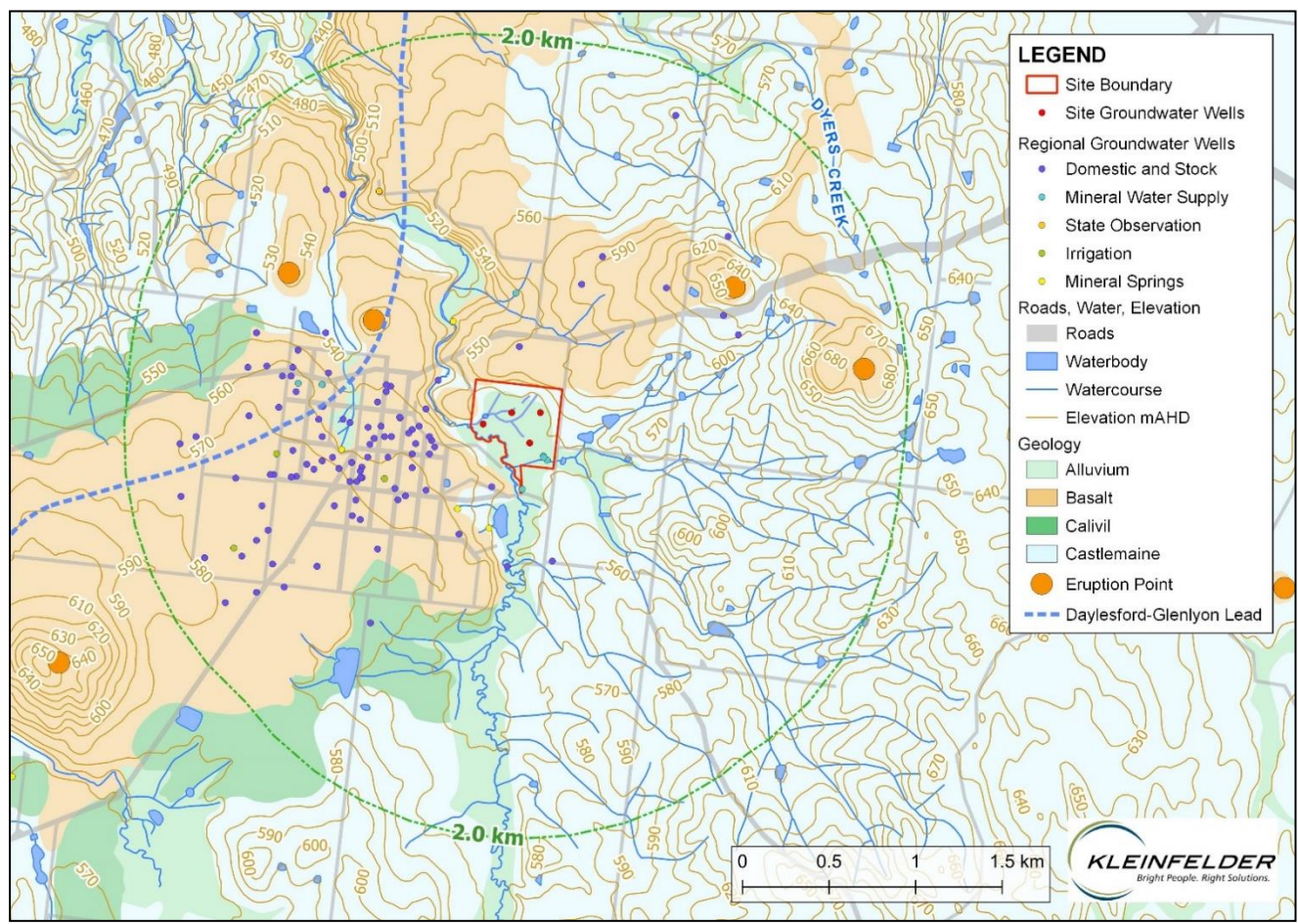


Figure 2.3: Map showing the Site location, regional geology (1:50,000 GSV interpretation), regional groundwater monitoring wells, elevation and surface water features

2.8 HYDROGEOLOGY

The Department of Environment Land Water and Planning (DELWP) groundwater resource report indicates there are three aquifers in the Site area. Details of the three different surface geology types in the Site area are summarised in **Table 2.3** below.

¹³ Phillips, G.N., et al. 2003. Gold. In Birch, W.D. (editor) Geology of Victoria. Pp. 377-433.

¹⁴ Geological Survey of Victoria., undated. Quarter Sheet 10 NW. 40 chains to 1 inch, geological map. Department of Mines, Victoria.

¹⁵ Available from bom.gov.au

**Table 2.3: Local Aquifers in the Site Area**

Aquifer	Type	Water Table Depth (m)	Total Dissolved Solids (mg/L)
Quaternary (alluvial, on-Site)	Unconsolidated sediments	<5	1,001 – 3,500
Quaternary Basalt	Fractured rock	10 – 20	<500
Palaeozoic (Castlemaine)	Fractured rock	10 – 20	1,001 – 3,500

The 1867 Glenlyon survey plan¹⁶ indicates there are three springs in the Glenlyon township. Two springs are present near the intersection of the Castlemaine Formation and overlying basalt and feed the present day Glenlyon Dam on the Loddon River floodplain, and the other is present near the town center at the head of a swamp, which is still present. Natural spring water discharge from the Castlemaine Formation in the Daylesford area is not uncommon, with many of the springs domed or converted to hand pumps to ensure mineral water supply¹⁷. No further information on the springs in Glenlyon was found.

There are 116 groundwater wells within 2 km of the Site¹⁸, seven of which have been capped or decommissioned (refer **Table 2.4** below). In general, the Castlemaine wells were installed at greater depths (59 – 92 mbgl) than the basalt aquifer wells (7 – 62 mbgl), and from **Figure 2.3** (above), it is evident the basalt aquifer is the preferred groundwater resource for domestic and stock use. There are no registered wells within 2 km of the Site installed within the alluvial aquifer. Shugg indicates that two mineral water bores are located in the vicinity of the Site (the recreation reserve rotunda hand pump and the Glenlyon 4 Spout (Jet) bore in the reserve car park).

A summary of the registered uses of these wells is provided in **Table 2.4** below.

Table 2.4: Summary of Registered Groundwater Uses within a 2 km radius of the site

Registered Use	Number of Registered Wells	Depth (mbgl)
Domestic and Stock	102	7.6 to 101
Mineral Water	8	33 to 260 ¹
Irrigation	3	39 to 65
Industrial	2	40 and 60
Investigation	2	54 and 85
Unknown	1	34

¹ The Jet bore is located in the vicinity of the Site

¹⁶ Minay, S 1867. Township of Glenlyon. Department of Lands and Survey. Available from slv.gov.au

¹⁷ Shugg, 2004. Sustainable management of Central Victorian mineral waters. PhD thesis, Melbourne University.

¹⁸ Water Measurement Information System (data.water.vic.gov.au)

A 3-dimensional representation of the hydrogeological setting, generated from the mapped geological contacts and regional bore logs in the Glenlyon area is shown in **Figure 2.4** (below).

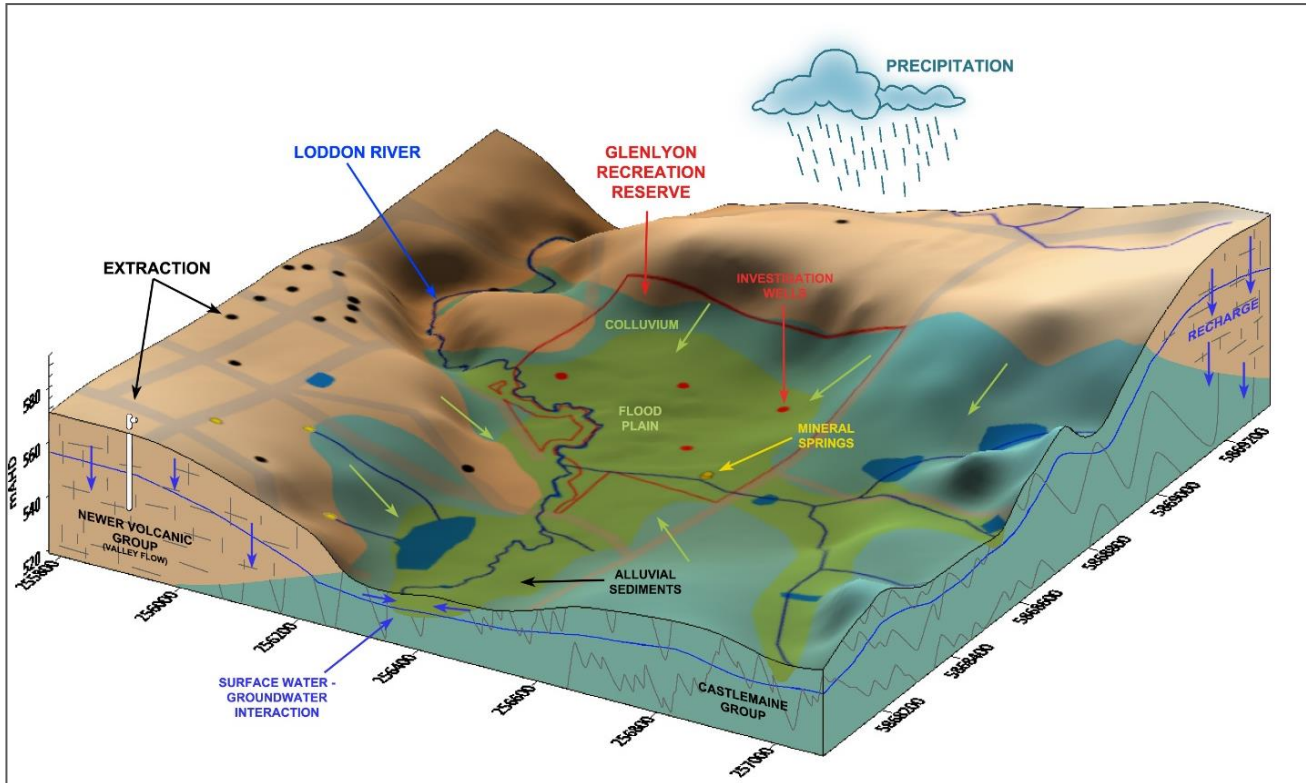


Figure 2.4: 3-dimensional representation of the Glenlyon Recreation Reserve regional setting

Major ion data for groundwater from 42 Water Measurement Information System (WMIS) and 20 analyses from the Site¹⁹ hand pump (13) and Bore 65272 (7) is presented in **Figure 2.5** (below). The regional groundwater is dominantly magnesium-bicarbonate (on the trilinear diamond), although on the cation ternary no metal is dominant. The groundwaters are bicarbonate-rich and generally sulfate-poor, with bicarbonate in the Site mineral water comprising more than 90% of the total anion relative abundance. Four Castlemaine aquifer groundwater samples are calcium-sodium chloride waters, although this is not a characteristic of the Castlemaine aquifer groundwater with four samples also classifying as magnesium-bicarbonate water.

¹⁹ Shugg, A. 2004. Sustainable management of Central Victorian mineral waters. PhD thesis, Melbourne University.

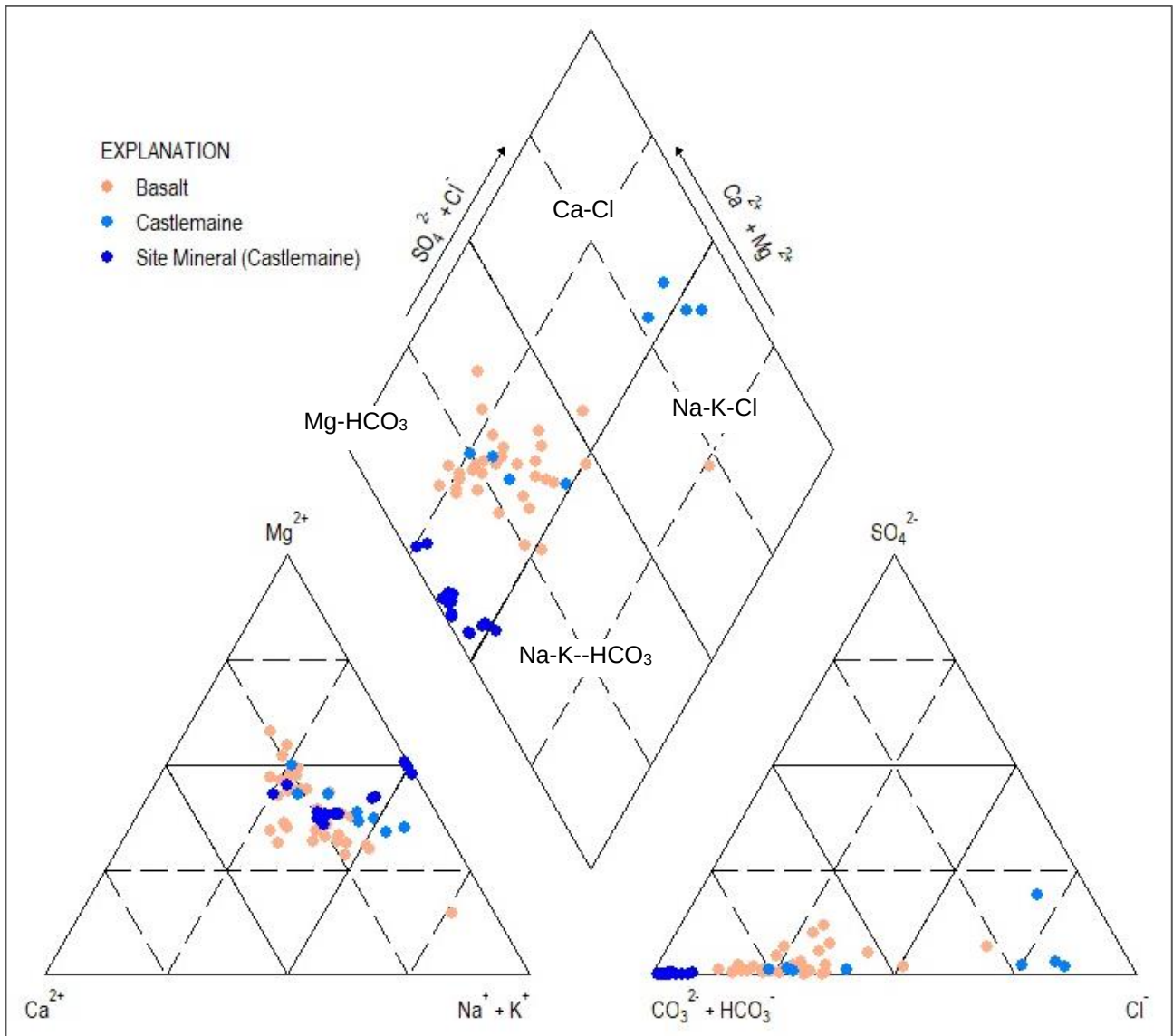


Figure 2.5: Trilinear major ion diagram for groundwater within 2 km of the Site



3 PREVIOUS ENVIRONMENTAL ASSESSMENTS

A preliminary soil contamination assessment (PSCA), which included a desktop review, site inspection and soil contamination assessment was undertaken by Beveridge Williams²⁰. The PSCA concluded that the Site contained lead and polycyclic aromatic hydrocarbon (PAH) impacts from the recreational shooting activities that may pose a potential health risk to Site users. The PSCA recommended limiting access to the Site to prevent health and environmental impacts from the identified contamination and further detailed soil and groundwater assessment for ongoing operation and management of the Site.

The EPA issued a CUN (90010886) for the Site on 31 January 2020, which required the Council to address imminent risks to human health and environment from the clay target shooting activity at the Site and undertake a detailed site investigation (DSI) to identify the level and extent of contamination in soil and groundwater on and from the Site.

Kleinfelder²¹ was engaged to undertake a DSI to satisfy the requirements of the CUN 90010886.

Details of the previous investigations undertaken at the Site in relation to soil, groundwater and surface water are included in the following sections.

3.1 ENVIRONMENTAL VALUES

The 2017 Victorian Environment Protection Act (the Act) identifies environmental values that are sought to be achieved or maintained for ambient air, ambient sound, land and water environments. Environmental values are provided in the environmental reference standard²² (ERS) that applies to each segment of the environment and specifies indicators and objectives to assess whether the environmental values are achieved, maintained or threatened.

The relevant ERS and environmental values for the Site listed below.

- Land: the Site is zoned PPRZ and the applicable environmental values are:
 - Land dependent ecosystems and species (modified ecosystems)
 - Land dependent ecosystems and species (highly modified ecosystems)
 - Human health
 - Buildings and structures
 - Aesthetics
- Groundwater: Groundwater Segment A1 has been conservatively adopted and the applicable environmental values are:
 - Water dependent ecosystems and species
 - Potable water supply (desirable)
 - Potable mineral water supply
 - Agriculture and irrigation (irrigation)
 - Agriculture and irrigation (stock watering)
 - Industrial and commercial
 - Water-based recreation (primary contact recreation)
 - Traditional Owner cultural values
 - Buildings and structures

²⁰ Beveridge Williams, 2019. Preliminary Soil Contamination Assessment, Glenlyon Reserve, Suttons Lane, Glenlyon

²¹ Kleinfelder, 2020. Detailed Site Investigation, Glenlyon Recreation Reserve, Suttons Lane, Glenlyon, Victoria

²² Victorian Government, 2021. Environment Reference Standard. Victoria Government Gazette No S 245



- Geothermal properties
- Surface water: the Central Foothills and Coastal Plains Segment has been adopted and the applicable environmental values are:
 - Water dependent ecosystems and species
 - Agriculture and irrigation
 - Human consumption of aquatic foods
 - Industrial and commercial
 - Water-based recreation
 - Traditional owner cultural values

3.2 SOIL

In order to address the EPA's concerns regarding risks to human and ecosystem health at the Site, Kleinfelder completed a DSI for the Site that included advancing 55 soil bores in an unbiased grid formation in the target shooting shot and clay-bitumen target fall zones. Beveridge and Williams (2019) had previously collected 30 surface soil samples targeting the six target launch areas and centrally where elevated lead concentrations were previously identified during X-ray fluorescence (XRF) preliminary screening. The previous sample locations are shown on **Figure 5** (attached).

The screening criteria applicable to NEPM²³ has been adopted to assess the Site for the ongoing land use scenario as a recreation reserve includes the following:

- Ecological investigation/screening level (EIL/ESL) for a public open space
- Health investigation/screening levels HIL/HSL C for public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths

Of the 85 surface samples analysed from within the racecourse/oval grid, the following exceedances of the Tier 1 HIL C were reported:

- Lead – two surface samples collected by Beveridge and Williams (SS28 and SS29)
- Benzo(a)pyrene toxicity equivalent quotient (BaP TEQ) for the following samples:
 - Ten surface samples collected by Beveridge and Williams, including:
 - SS01
 - SS03
 - SS04
 - SS11
 - SS13
 - SS15
 - SS17
 - SS27
 - SS28
 - SS29
 - Two surface samples collected by Kleinfelder (OG26_0.1 and OG42_0.1)
- Total PAH - one surface sample collected by Beveridge and Williams (SS15)

²³ National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)



Based on the proportion of Beveridge Williams samples exceeding HIL C being greater than the Kleinfelder collected samples, it is considered that target fragments are likely to have been included within the Beveridge Williams samples especially as the sample locations targeted the target launch areas.

Samples underlying the surface samples, which reported the highest concentrations of lead and PAH compounds were analysed and included the following: OG11_0.5, OG13_0.7, OG14_0.5, OG15_0.7, OG16_0.4, OG20_0.4, OG24_0.5, OG25_1.0, OG26_0.4, OG36_0.6, OG42_0.4, OG49_0.5 and OG53_0.5. The concentrations of lead reported for these samples ranged from 11 – 50 mg/kg, with concentrations of PAH compounds all less than the laboratory limit of reporting (LOR). Based on the concentrations reported in the samples analysed from below the surface samples (i.e. those samples analysed that were collected from depths of 0.4, 0.5, 0.7 and 1.0 mbgl), no evidence of lead and BaP migration through the soil profile was observed.

Kleinfelder also completed soil sampling and analysis in other areas of the Site, which included the barbecue area (samples BS01 to BS11), children's playground (samples PG01 to PG05), camping area (samples CG01 to CG12), mounting yard area (samples MY01 to MY05), pavilion (samples PV01 to PV10), eastern and south-eastern fence lines (samples FB01 to FB05) and neighbouring properties to the north, east and west of the Site (SB01 to SB14). The concentrations of PAH and lead were all below the adopted human health and ecological criteria, which demonstrates that the contamination associated with shooting activities at the Site is confined to the oval/racecourse area, with no exceedances reported in other areas of the Site where soil sampling was completed.

Refer to **Figures 5 to 7** attached showing the sample locations where the concentrations exceeded HIL C. The results from the previous soil assessments completed at the Site are provided in **Tables 1 to 8** (attached).

In addition to the identified contaminants of concern (including metals (predominantly lead) and PAH compounds), soil was also previously analysed for a broad analytical suite including petroleum and chlorinated hydrocarbons, organochlorine and organophosphorus pesticides (OCP/OPP), polychlorinated biphenyls (PCB), phenols, solvents and various other volatile organic compounds (VOC). None of the analytes within the broad analytical suite were reported by the laboratory at concentrations that exceeded the human health criteria for a recreational/public open space setting.

Concentrations of TRH (>C16-C34) exceeded the ESL (based on coarse soils) for a public open space at two Beveridge and Williams surface sample locations (SS11 and SS15). The ESL for fine-grained soils, however, is considered more applicable to the Site based on reported soil conditions (surface soils predominantly described as silts and/or silty clays) and only one location (SS15, 2,200 mg/kg) exceeded the ESL for fine soils (1,300 mg/kg). The reported exceedance at this sample location correlated with the highest reported concentrations of PAH compounds and is therefore considered likely to be associated with clay target fragments, which were observed on the surface of the soil by Beveridge Williams.

Concentrations of arsenic also exceeded the adopted EIL for a public open space at one Beveridge and Williams surface sample location (SS27) and one Kleinfelder surface sample location (MW01_0.1). A concentration of arsenic also exceeded the EIL at one surface sample location adjacent to the pavilion area outside of the oval/racecourse area (PV03_0.1). It is noted that gold mining historically took place in the area surrounding the Site and arsenic is therefore considered likely to be a naturally occurring compound in soil and not associated with contamination from clay target shooting.

Based on the findings of the soil assessments previously completed at the Site, the following applicable environmental values relating to land are therefore considered to be threatened:

- Land dependent ecosystems and species (modified ecosystems)
- Land dependent ecosystems and species (highly modified ecosystems)
- Human health

Further details of the previous soil assessments completed at the Site are included in the Kleinfelder 2020 DSI report.



3.2.1 Statistical Evaluation

A statistical evaluation of the lead, BaP TEQ, total PAH, BaP and TRH (>C16-C34) surface data was completed to assess whether the results met the criteria outlined in Schedule B1 of the NEPM. The data is summarised in **Table 3.1** (below). It is noted that soil samples collected as part of the wider investigation across other areas of the Site are not included in this statistical analysis.

Table 3.1: Human Health and Ecological Surface Sample Lead, BaP TEQ, Total PAH and BaP Data Summary

Descriptor	Lead (mg/kg)	BaP TEQ (mg/kg)	Total PAH (mg/kg)	BaP	TRH (>C16-C34)
HIL C	600	3.0	300	-	-
EIL/ESL	1,100	-	-	33²⁴	1,300
Number	84	84	84	84	12
Minimum	8.6	<0.1/<0.5	<0.1/<0.5	<0.1/<0.5	<50
Maximum	1,100	120	780	76	2,200
Arithmetic mean	123.5	3.726	20.92	2.477	336.3
95% upper confidence limit (UCL) mean	153.4	10.59	64.67	6.806	1,098
Standard deviation	178.6	14.44	91.99	9.102	605.4
Standard deviation <50% HIL C, EIL/ESL	Yes	No	Yes	Yes	Yes
Number > HIL C	2	12	1	-	-
Number > EIL/ESL	-	-	-	1	1
Number >250% HIL C	0	7	1	-	-
Number >250% EIL/ESL				0	0

Notes: The LOR was used in the BaP TEQ, total PAH and BaP 95% UCL_{mean} calculations.

Based on the findings of the statistical evaluation, the following is noted:

- Lead:
 - Standard deviation of the concentration was less than 50% of HIL C
 - No concentration exceeded 250% of HIL C
 - The arithmetic and 95% UCL mean were less than HIL C
 - No concentration exceeded the EIL
- BaP TEQ:
 - Standard deviation of the concentration exceeded 50% of HIL C
 - The concentration reported in seven samples exceeded 250% of HIL C
 - The arithmetic mean was less than HIL C, however, the 95% UCL mean exceeded HIL C.
- Total PAH:
 - Standard deviation of the concentration was less than 50% of HIL C
 - The concentration reported in one sample exceeded 250% of HIL C

²⁴ CRC CARE Technical Report 39: Risk-based remediation and management guidance for benzo(a)pyrene



- The arithmetic and 95% UCL means were less than HIL C.
- BaP:
 - Standard deviation of the concentration was less than 50% of the EIL
 - No concentration exceeded 250% of the EIL
 - The arithmetic and 95% UCL means were less than the EIL
- TRH (>C16-C34):
 - Standard deviation of the concentration was less than 50% of the ESL
 - No concentration exceeded 250% of the ESL
 - The arithmetic and 95% UCL means were less than the ESL

3.2.2 Metal Concentrations in Soil

Soil logs taken during groundwater monitoring well installation reveal the alluvial sediments are variable. Sub-angular to rounded gravel, including minor quartz fragments was observed in all bores with the abundance tending to decrease with depth. The associated soils were silts and silty clays. The gravel is probably derived from colluvium accumulation.

It is not known if the Castlemaine Formation was intersected during drilling. The soil colour tended to change to dark grey toward the bore bases, which could indicate the top of the Castlemaine Formation, although this cannot be confirmed.

In **Table 3.2** below, the mean metal concentrations for sandstones from the Daylesford area²⁵ are compared to available data for soils derived from Lower Silurian sediments and basalt in the Melbourne and Ballarat regions and shallow soil at the Site.

Table 3.2: Chalcophile Element Comparison Palaeozoic Rock/Soil, Basalt Soil and Site Surface Soil

Metal	Daylesford Sandstone Mean Concentration (mg/kg)	Lower Silurian Sediments Geometric Mean (mg/kg)	Basalt Geometric Geometric Mean (mg/kg)	Site Soil Range (mg/kg)	Site Soil Geometric Mean (mg/kg)
Arsenic	45	<5.0	<5.0	<2 – 180	3
Antimony	4.0	<5.0	<5.0	<5.0	-
Copper	40	7.6	9.1	5 – 44	9
Lead	37	12	8.8	<5 – 1,100	54
Nickel	30	10	21	<5 – 100	14
Zinc	165	15	16	<5 – 130	28

Notes: Silurian sediments and basalt concentrations are from soilexplorer.org.au. Where samples were reported with a concentration below the laboratory limit of reporting (LOR) ½ the LOR was used in calculations.

While Daylesford is a gold mining area²⁶, from **Table 3.2** above it is evident that Castlemaine Formation has elevated metal concentrations compared to soil derived from a similar rock type in the Melbourne area (Lower Silurian sediments) and soil derived from basalt (Melbourne and Ballarat). The Site surface soil, excluding lead which is likely influenced by clay target shooting activities, has potentially elevated nickel and zinc concentrations compared to soil derived from Lower Silurian rocks and zinc in soil derived from basalt.

²⁵ Shugg, A., 2004. Sustainable management of central Victorian mineral waters. PhD Thesis, RMIT University.

²⁶ It is not the intention of documenting all alteration halos associated with gold deposits in western Victoria, however it is noted that quartz and the associated sulfide mineral assemblage vary across the area



Soil derived from basalt is expected to have elevated nickel concentrations as olivine a major to minor basalt component and major nickel repository, weathers comparatively quickly compared to plagioclase (a major component) in the surface environment. Soils derived from the weathering of sulfides within the Castlemaine Formation may have elevated arsenic, copper, lead and zinc concentrations, although the arsenic could be regional as this arsenopyrite is generally associated with gold mineralisation.

As shown in **Figure 3.1** below, the lack of correlation between the arsenic, copper, nickel and zinc concentrations with the lead concentration in shallow or deeper Site soil provides a line of evidence that these heavy metals are not derived from lead shot associated with clay target shooting activities at the Site.

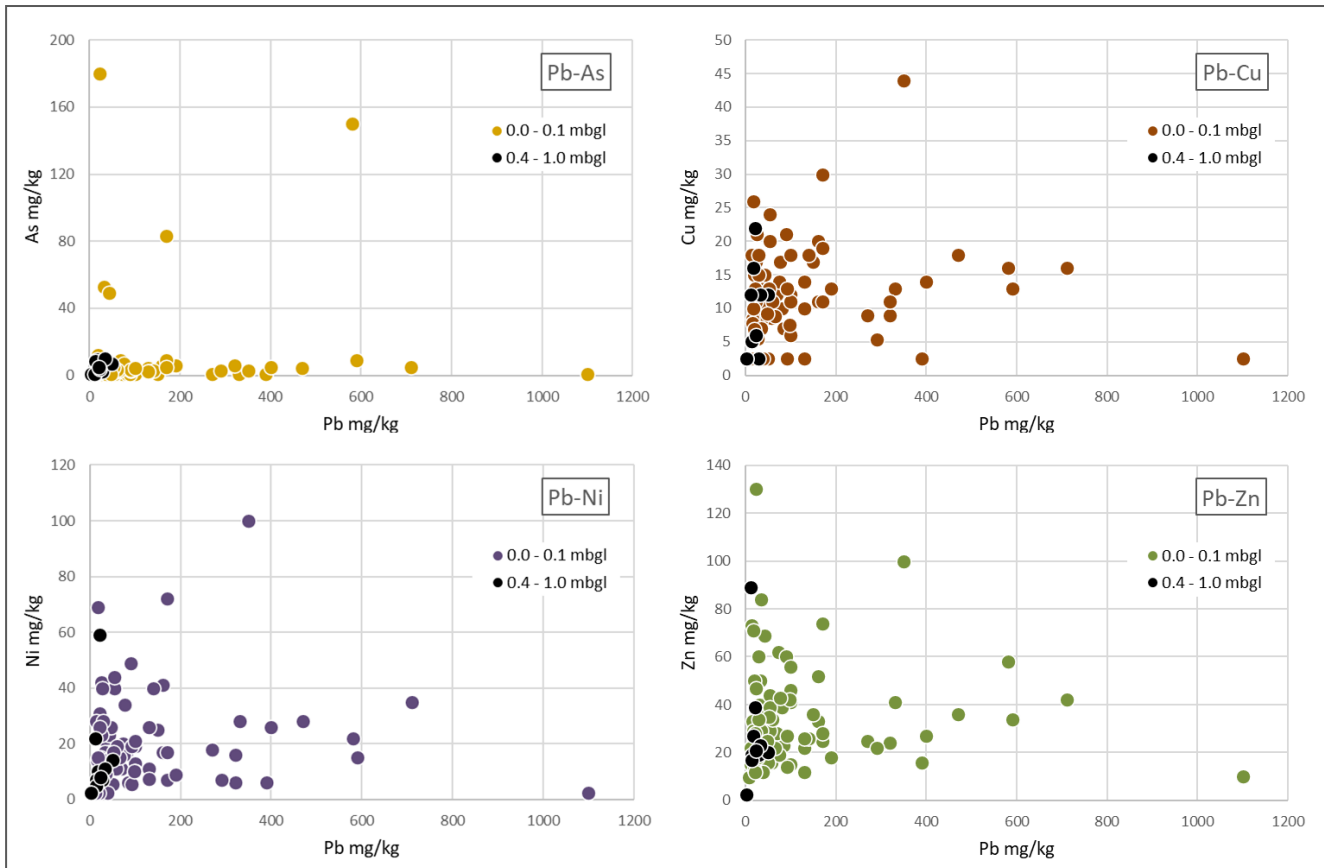


Figure 3.1: Lead vs arsenic, copper, nickel and zinc in shallow soil at the Site

3.2.3 Literature Review of PAH Mobility and Bioavailability

A literature review was performed to provide a greater understanding of whether the PAH compounds pose potential human health and environmental risks. The literature review was performed on readily available articles and reports related to clay targets at shooting ranges.

The Interstate Technology and Regulatory Council (ITRC)²⁷ notes that clay targets are composed of approximately 70% limestone (calcium carbonate) and 30% binding material (pitch, bitumen or other organic materials), with PAH compounds sourced from the binding material. PAH concentrations in clay targets varies widely, however, the highest concentrations are found in targets using pitch (crude oil or coal tar processing residues) as the binder²⁸. Total PAH concentrations in the clay targets vary with concentrations ranging from 1,000²⁹ to 100,000³⁰ mg/kg.

²⁷ Interstate Technology Regulatory Council, 2005. Environmental management at operating outdoor small arms firing ranges.

²⁸ Lobb, A., 2006. Potential for PAH contamination from clay target debris at shooting sites: Review of literature on occurrence of site contamination from clay targets. Report U06/81.

²⁹ Baer, K.N. et al., 1995. Toxicity evaluation of trap and skeet shooting targets to aquatic test species. *Ecotoxicology*, 4, 385-392.

³⁰ Gonzalez, G.R., 2003. Contaminants at a shooting range: Toxicological and nutritional significance to birds and mammals. Masters Thesis, Virginia Polytechnic Institute and State University.



The NEPM³¹ notes that PAH compounds do not pose significant human health risks where they are present in bitumen fragments, as the compounds are immobile and have low bioavailability, although notes that bioavailability is highly site and PAH source specific.

Total PAH concentrations reported in surface Site soil samples range from below the laboratory limit of reporting (LOR) to 780 mg/kg, with the higher concentrations observed in areas where clay targets fragments were present in the soil.

In the study conducted by Baer et al. it was found that:

- Similar PAH concentrations in new and weathered clay targets shows that the PAH are tightly bound in the targets and the targets were the PAH source in sediments near the study area.
- PAH were unlikely to be bioavailable in the aquatic environment.

More recently Forsberg et al³² assessed the PAH relative oral bioavailability and dermal absorption from $\leq 250 \mu\text{m}$ sandy soil fractions collected at two former clay target shooting ranges in the United States. The sum of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene and dibenz(a,h)anthracene concentrations in the soil samples ranged from 34 to 18,500 mg/kg. Forsberg et al concluded:

- The mean benzo(a)pyrene oral relative bioavailability factors ranged from 8 to 14% and the dermal absorption factors ranged from 0.6 to 1.3%.
- The mean chrysene and benzo(a)anthracene oral factors ranged from 30 to 38% and 15 to 23%, respectively.
- Compared to the benzo(a)pyrene residential soil USEPA RSL33 the benzo(a)pyrene screening criteria (1.1 mg/kg) would be eight times higher, at the 1:105 cancer target risk factor, for soil from the clay target shooting ranges.
- The benzo(a)pyrene relative oral bioavailability could conservatively be used for the three additional carcinogenic PAH compounds not studied.
- Dermal adsorption fractions for the five PAHs ranged from 0 to 3.6% in the soil samples and from 0 to 1.1% for a pulverised clay target. Dibenz(a,h)anthracene adsorption was 0% in all samples.

The compounds investigated by Forsberg et al comprise six of the eight carcinogenic compounds used to calculate the NEPM BaP TEQ, which assumes 100% bioavailability. The PAH bioavailability from soil containing clay target fragments was found by Forsberg et al. to be lower than 100%, but not unavailable, hence the human health risk posed by PAH compounds in Site soil is likely to be lower than that indicated by comparison to the NEPM HIL C BaP TEQ.

Based on the literature review it is considered that information obtained by Forsberg et al. could be used to estimate a BaP TEQ site-specific target levels (SSTL for the Site if the PAH concentrations in $<250 \mu\text{m}$ soil fractions are used.

3.2.4 Aesthetics

As per Schedule B1 of the NEPM, there are no specific numeric guidelines to assess the potential aesthetic issues – a site assessment needs to take into account the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

It is understood the previous licence for clay target shooting training days and scheduled competition days for the Glenlyon Recreation Reserve commenced on 1 July 2016 for a term of 3 years. The licensee was Daylesford Field and Game Association Inc (A0004492L) and the licensor was Glenlyon Recreation Reserve Special Committee representing Hepburn Shire Council. As a condition of the shooting licence, clean up measures

³¹ National Environment Protection (Assessment of Site Contamination) Amendment Measure, 2013. Schedule B7, Appendix A2: The derivation of HILs for PAHs and phenols.

³² Forsberg, N.D., et al., 2021. Oral and dermal bioavailability studies of polycyclic aromatic hydrocarbons from soils containing weathered fragments of clay shooting targets. *Environmental Science and Technology*, 55, 6897-6906.

³³ United States Environment Protection Agency regional screening level



comprising the removal of visible waste and debris associated with clay target shooting, was previously undertaken by the members of the Club to address potential aesthetic issues. During the Kleinfelder DSI, material in the form of clay target fragments and used ammunition wads were observed on the surface at some of the 55 soil bore locations during the Kleinfelder DSI. The presence of small quantities of foreign material are not considered to preclude the aesthetic environmental value at the Site.

3.3 GROUNDWATER

3.3.1 April 2020 GME

Four groundwater monitoring wells were installed into alluvium/colluvium adjacent to (MW01) and within (MW02 to MW04) the racecourse area (refer to **Figure 4** attached showing the well locations). During the first groundwater monitoring event (GME) completed at the Site in April 2020, dissolved lead was reported below the laboratory LOR in all samples; however concentrations of dissolved metals (including copper, nickel and zinc) exceeded the water dependent ecosystems and species (WDES) screening criteria³⁴. Dissolved nickel concentrations were also reported above the drinking water screening criteria³⁵. Very low concentrations of PAH compounds (fluorene and phenanthrene) were reported at or slightly above the laboratory LOR, however these compounds are not known to be carcinogenic and therefore do not exceed the screening criteria.

In a sample collected from the Site's mineral water well, all dissolved metals (associated with the anthropogenic Site use and metals identified in groundwater) were below the laboratory LOR and hence below the screening criteria. This result is consistent with the mineral water source being significantly below the surficial alluvial aquifer.

Further details of the April 2020 GME are included in the Kleinfelder 2020 DSI report.

3.3.2 July 2021 GME

A second GME was completed on 27 July 2021 for the four groundwater monitoring wells previously installed at the Site (MW01, MW02, MW03 and MW04). The GME was completed in accordance with the methodology outlined in the Auditor-approved sampling and analysis quality plan (SAQP)³⁶ included as **Appendix C**.

Monitoring wells were gauged using an oil/water interface probe prior to purging/sampling and the standing water level relative to top of casing (TOC) was recorded. Depth to groundwater ranged between 0.00 metres below top of casing (mBTOC) in MW02 and 0.621 mBTOC in MW04 in July 2021. Groundwater levels increased between 0.7 m and 5.5 m since April 2000 and was observed at the ground surface at monitoring well MW02. No visual or olfactory evidence of contamination (odour, sheen) was noted during groundwater gauging, purging or sampling. The groundwater sampling field sheets are provided in **Appendix D**.

Sampling was conducted using the low-flow method and in accordance with EPA Victoria Publication 669³⁷. During sampling, the depth to water was monitored. Field measurements were recorded during, and at the completion of purging (immediately prior to sample collection). Purging took place until field parameters stabilised. Samples were transferred into laboratory supplied containers via nitrile gloved hands (replaced at each location to prevent cross-contamination).

Groundwater samples were submitted to laboratories accredited by the National Association of Testing Authorities (NATA) for the analyses requested, which included:

- Metals (including arsenic, cadmium, chromium, copper, lead, nickel and zinc)
- PAH
- Nutrients

³⁴ Australian and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand, 2000. Australian and New Zealand guidelines for fresh and marine water quality.

³⁵ National Health and Medical Research Council, 2011. Australian drinking water guidelines 6. Version 3.5. Updated August 2018.

³⁶ Kleinfelder, 2021. Sampling and Analysis Quality Plan, Glenlyon Recreation Reserve, Suttons Lane, Glenlyon, Victoria

³⁷ Victoria EPA Publication 669, 2000. Groundwater sampling guidelines



- Cations/anions
- Total dissolved solids (TDS) and total suspended solids (TSS)

Groundwater samples were filtered in the field (0.45µm filter) for dissolved metals analysis.

One duplicate and triplicate sample pair was collected from MW01 and one rinsate sample (QC03) was collected from the low-flow pump.

No relative percent difference (RPD) exceedances were reported and all analytes were reported below the laboratory limits of reporting (LOR) in the rinsate sample, suggesting that decontamination measures between sampling locations were adequate. Based on a review of the results for the Kleinfelder and the laboratory quality assurance and quality control (QA/QC) program adopted, the overall data quality is acceptable for interpretive use.

Reported dissolved metals concentrations were generally consistent with the April 2020 GME. Copper, nickel and zinc concentrations exceeded the adopted criteria applicable to WDES in all groundwater samples analysed and drinking water screening criteria in MW03. Nickel concentrations reported in groundwater from MW02 and MW04 in April 2020 exceeded both the adopted water dependent ecosystems and species (95% freshwater) screening criteria and drinking water screening criteria.

A concentration of dissolved lead was reported at MW04 slightly above the laboratory LOR but was less than the applicable criteria. The dissolved lead concentration at MW04 indicates that there is the potential for leaching to have occurred from the overlying surface soils, however, this appears to be limited and has not resulted in groundwater concentrations being reported above the relevant objectives for applicable environmental values. It is considered that the higher lead concentration is likely associated with the higher water table, which was observed during the second GME, where the groundwater is likely to have come into contact with shallower soils comprising higher lead concentrations.

All PAH compounds were reported below the laboratory LOR. Nutrients, cations/anions, TDS and TSS concentrations were reported below the adopted screening criteria (where relevant) in all groundwater samples, consistent with the April 2020 GME results. The laboratory reports from the second GME are included in **Appendix D**.

The results from the previous groundwater assessments completed at the Site are provided in **Tables 14 to 16** (attached).

Based on the findings of the groundwater monitoring events completed at the Site, the applicable environmental values relating to this segment of the environment are not considered to be threatened as the reported exceedances are considered to be consistent with background concentrations. No evidence that historical clay target shooting activities has resulted in groundwater contamination at the Site was identified. Further discussion of this conclusion is provided in **Section 3.3.3** below.

3.3.3 Hydrogeological Conceptual Site Model

Kleinfelder completed a desktop hydrogeological review and develop a hydrogeological conceptual site model (HCSM) for the Site to further understand the relationship between the Site and regional aquifers, with particular reference to the elevated dissolved copper, nickel and zinc concentrations within the Site groundwater.

Based on the calculated water table elevations in the DSI and the second GME conducted in July 2021, the potential groundwater flow direction is toward the Loddon River. It is noted that the water table during the July 2021 monitoring event increased significantly from April 2020 GME (completed as part of the DSI) and was at the surface at monitoring wells MW02 and MW03, located at the eastern edge of the monitoring field (**Figure 3.2**, below). The variation suggests the aquifer may be semi-confined on the scale of the well field (i.e., clay layers within the stratigraphy may exert control on the water table elevations).

Considering the increase in water table elevation between the two GMEs, the fluctuation in the major ion and dissolved metal concentrations suggests the major ion and dissolved metal concentrations are controlled by groundwater with access to the screened intervals rather than the overall water table elevation.

A schematic cross section showing the relationship between the regional aquifers and the Site alluvial aquifer is presented in **Figure 3.3** below.

Trace dissolved metal concentrations are not available for the regional groundwater aquifer. As such, to determine whether there was a relevant hydrochemical relationship between the Site alluvial aquifer and the regional aquifers, the major ion concentrations were assessed by principal components analysis (PCA), which is a multivariate dimensional reduction statistical technique that allows underlying relationships in populations to be interpreted, without information loss. On this basis, it is therefore considered that PCA is more powerful to determine hydrochemical variations than by viewing on, for example a trilinear diagram (i.e. as presented in **Figure 2.5** above).

The PCA result for the regional, mineral water and Site alluvial aquifer groundwater is presented in **Figure 3.4** below. The analysis shows that in major ion concentration space the basalt aquifer yields a tight correlation between PC1 and PC2, whereas the Site mineral water major ions yield greater variation with PC1 but have a similar PC2 variation. In comparison the alluvial and Castlemaine formation groundwater major ions yield variable correlation with PC1 and PC2 and tend to define their own space trending toward a negative PC1 and PC2 correlation.

In its simplest sense the correlations are interpreted as indicating the hydrochemical variation observed in the alluvial samples has a stronger relationship with the Castlemaine Formation than the basalt aquifer and that there is no connection between the alluvial and basalt aquifers.

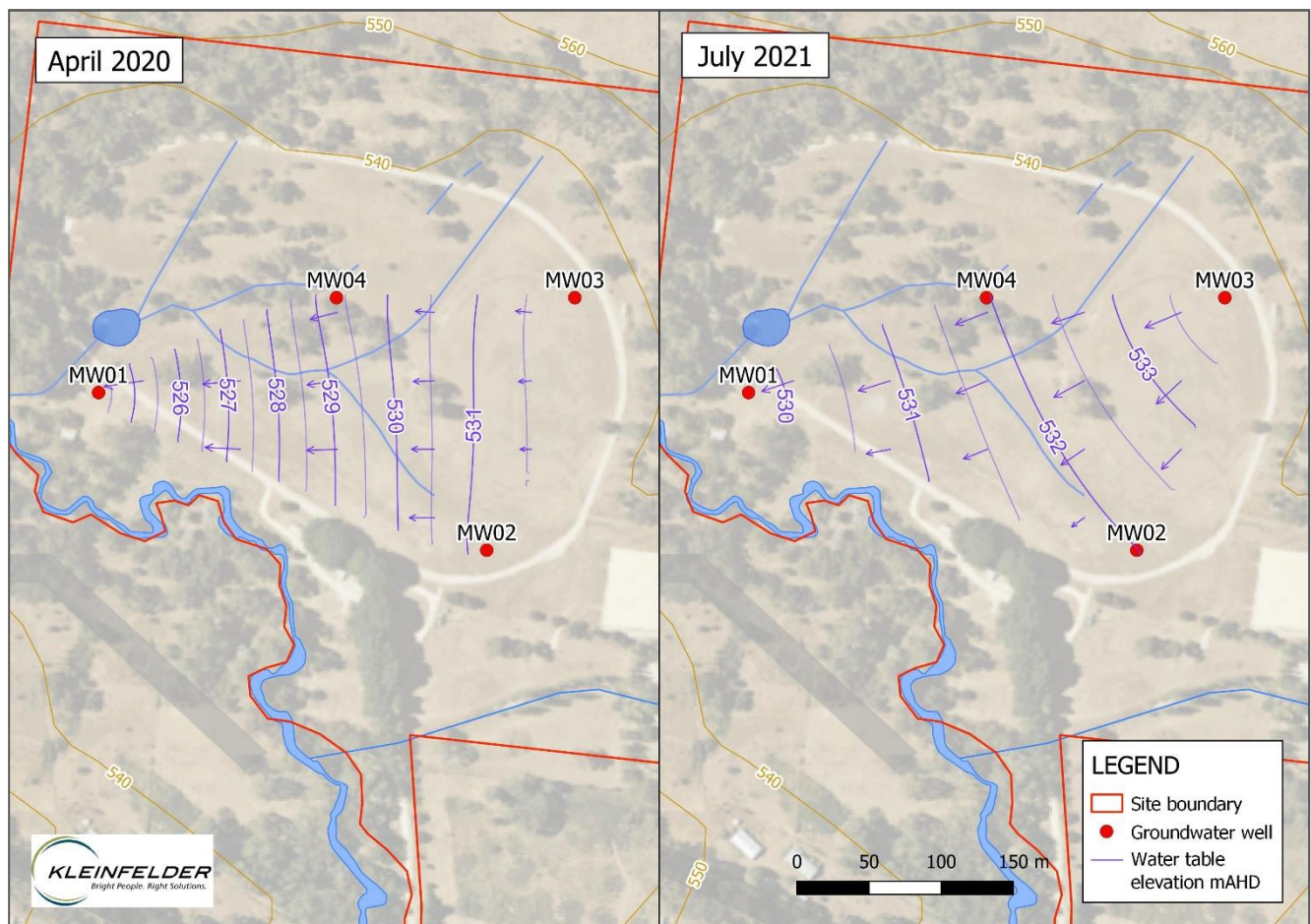


Figure 3.2: April 2020 and July 2021 GMEs – water table elevation contours

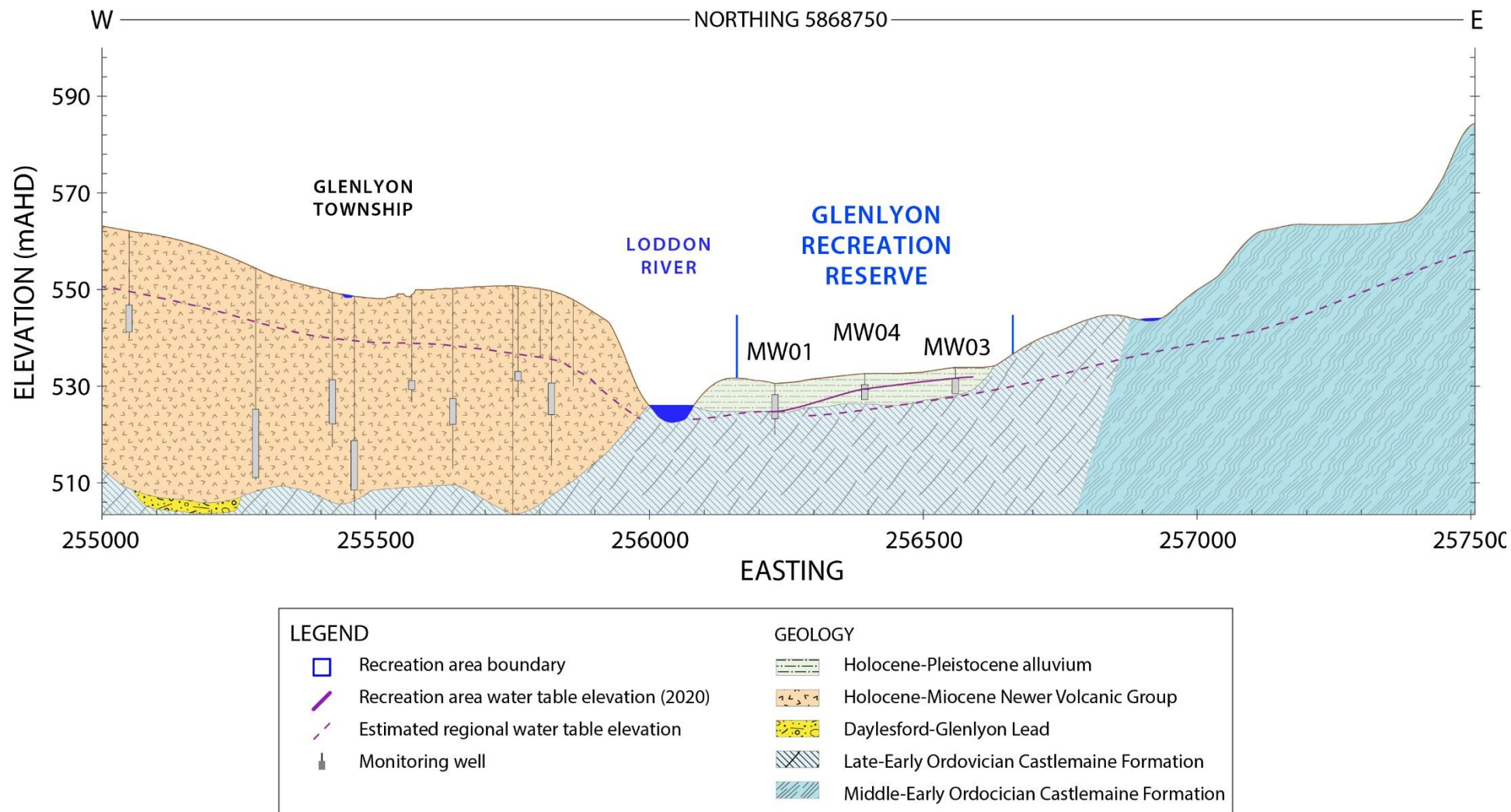


Figure 3.3: Hydrogeological conceptual cross section showing the relationship between regional and Site alluvial aquifers

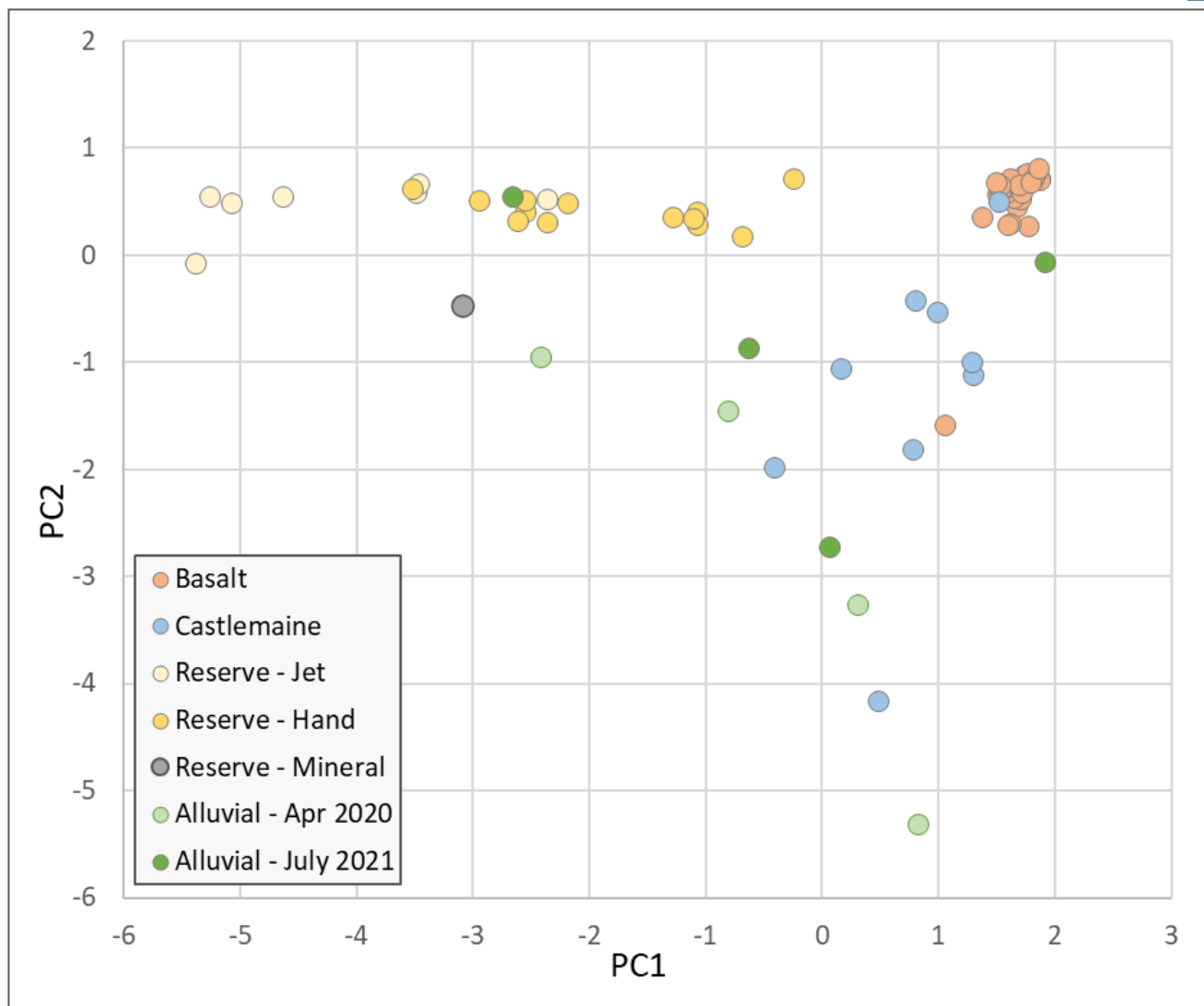


Figure 3.4: Major ion PC1 and PC2 correlation for regional and Site major ion concentrations

Based on the findings of the desktop hydrogeological review and HCSM, Kleinfelder concludes that the elevated concentrations of dissolved metals (including copper, nickel and zinc) reported in groundwater are considered to be background and not associated with historical clay target shooting activities at the Site.

3.4 SURFACE WATER AND SEDIMENT

Two watercourses are present in the southern area of the Site, including the Loddon River running along the southwestern boundary, and an unnamed tributary running through the camping area near the southern reserve boundary. The reserve interior also contains an internal surface water drainage, which includes a holding basin (soak) located near the western boundary, which discharges to the Loddon River. The soak was dry at the time of the Kleinfelder of the surface water and sediment sampling.

The DSI investigation strategy relied on a contamination model where clay target shooting produced large hot-spot areas where COPC may be elevated. Low-lying Site areas within the oval/racecourse were not specifically targeted during this investigation, however, sample locations OG46_0.1 and OG47_0.1 were located in proximity to the drainage areas within the racecourse area. One soil sample was also collected from the margin of the soak located at the western boundary (OG27_0.1) where water accumulates prior to discharge to the Loddon River. The concentrations of lead and PAH were all below the laboratory LOR and or applicable criteria at these soil sample locations, supporting the observation that transport within on-Site surface water is unlikely.

In addition, Auditor verification samples were collected targeting a drainage line leading into the soak (sample AV01) and the soak located at the western boundary, which was dry at the time (sample AV02). The



concentrations of metals (including lead) and PAH compounds were reported below the laboratory LOR or applicable screening criteria.

The following sediment and surface water samples were collected from Loddon River to assess whether metals and PAH impacts associated with surface water runoff were present:

- SD01 collected from the sediment adjacent to the Loddon River at the discharge point of the soak located near the western boundary.
- SW01 collected from Loddon River at the discharge point of the soak located near the western boundary. The sample was considered to be representative of surface waters (and any associated potential contaminants in the soil) discharging from the Site, however, it was noted that no surface water was entering Loddon River at the time of the collection.
- SD02 collected from the sediment adjacent to the Loddon River at the discharge point of the unnamed tributary running through the camping area near the southern reserve boundary.
- SW02 collected from Loddon River at the at the discharge point of the unnamed tributary running through the camping area near the southern reserve boundary. The sample was considered to be representative of surface waters (and any associated potential contaminants in the soil) discharging from the Site, however, it was noted that no surface water was entering Loddon River at the time of the collection.
- Refer to **Figure 3** attached showing the above sample locations.

The concentrations of contaminants were reported below the laboratory LOR or applicable screening criteria, indicating that contaminant surface water transport off-Site is unlikely to be occurring. Based on the findings of the surface water sampling completed at the Site, the relevant environmental values relating to this segment of the environment are therefore not considered to be precluded.

The results from the previous sediment and surface water sampling are provided in **Tables 3, 4 and 21 to 23** (attached).



4 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a qualitative analytical tool that identifies the sources of contamination, exposure pathways and potential receptors on-Site and in the site surroundings. A CSM also provides a discussion of the nature and extent of impacts in soil, groundwater and surface water and relevant source-pathway-receptor (S-P-R) linkages.

4.1 SOURCE-PATHWAY-RECEPTOR LINKAGES

4.1.1 Contaminants of Concern

Based on the findings of the investigations completed at the Site, the contaminants of concern associated with clay shooting activities and include the following:

- Lead associated with shot.
- Hydrocarbon compounds associated with the bituminous components of clay targets (including PAH compounds and TRH).

4.1.2 Receptors

Based on an ongoing recreational and public open space use of the Site, the potential receptors include:

- On-Site and Off-Site recreational users (e.g. equestrian, shooting, dog walkers, camping activities, children's playground)
- On-Site visitors (e.g., spectators)
- Off-Site residential users
- On-Site and Off-Site groundwater extraction for drinking water purposes
- On-Site and Off-Site ecosystems (terrestrial and freshwater)

4.1.3 Pathway

The potential primary transport mechanisms for the migration of COPCs are:

- Dermal contact.
- Dust inhalation.
- Direct and incidental ingestion.
- Discharge of contaminated groundwater/stormwater.

The S-P-R linkages associated with the identified contaminants of concern are outlined in **Table 4.1** below.



Table 4.1: Clay Target Shooting S-P-R Linkages

Source	Pathway	Receptor	Risk to Receptor	Comments
Lead shot	Dermal contact Dust inhalation Direct and incidental ingestion	On-Site and Off-Site recreational users (current and future) Off-Site residential receptors	Acceptable	The concentrations of lead in soil do not exceed the Tier 1 human health investigation levels (NEPM HIL C) following statistical evaluation of the dataset. No exceedances of lead were reported in other areas on-Site and off-Site where soil sampling was completed.
	Plant uptake within the root zone (applicable to 2 mbgl)	On-Site terrestrial ecosystem		The concentrations of lead in soil do not exceed the applicable ecological investigation levels (NEPM EIL).
	Migration in groundwater.	On-Site and off-Site extractive groundwater users On-Site and off-Site terrestrial and freshwater ecosystems		Limited leaching of lead in soil to the groundwater was observed, which has not resulted in groundwater concentrations being reported above the adopted screening criteria.
	Discharge to and migration in surface water	On-Site and off-Site receptors (as listed in Section 4.1.2 above)	Likely acceptable (subject to further data collection)	No evidence for migration within surface water was found based on the concentrations of lead reported in the samples collected from the drainage lines and soak within the oval/racecourse area and the sediment/surface water samples collected from the two discharge points to Loddon River. It is acknowledged that limited water was observed to be discharging at the time of sampling and it is therefore recommended that another round of surface water sampling is conducted during a rainfall event to confirm the contamination status of the water discharging to Loddon River.
Used clay targets (PAH, BaP TEQ, TRH)	Dermal contact Dust inhalation Direct and incidental ingestion	On-Site recreational Site users (current and future)	Potentially acceptable (subject to further risk assessment)	Although the concentrations of BaP TEQ in soil exceed the HIL C, NEPM assumes 100% bioavailability. Based on the findings of the literature review, however, the bioavailability of carcinogenic PAH compounds in clay targets is significantly lower and a SSTL for BaP TEQ could be developed to assess whether the PAH compounds in clay targets on-Site poses a risk to human health. No exceedances of TRH above the human health screening levels were reported in the soil.
		Off-Site recreational users (current and future) Off-Site residential receptors	Acceptable	No exceedances of PAH compounds were reported in other areas on-Site and off-Site where soil sampling was completed.
	Plant uptake within the root zone (applicable to 2 mbgl)	On-Site terrestrial ecosystem	Acceptable	The concentrations of BaP and TRH (>C16-C34) in soil do not exceed the NEPM EIL/SL following statistical evaluation of the dataset. No evidence of potential impact (i.e. stressed vegetation) was observed during investigation works on-Site.
	Migration in groundwater.	On-Site and off-Site extractive groundwater users On-Site and off-Site terrestrial and freshwater ecosystems	Acceptable	PAH associated with clay targets is typically non-leachable (as evidenced by the concentrations of PAH compounds in groundwater generally being less than the laboratory LOR). Concentrations of PAH in groundwater were less than the adopted screening criteria.
	Discharge to and migration in surface water	On-Site and off-Site receptors (as listed in Section 4.1.2 above)	Likely acceptable (subject to further data collection)	No evidence for migration of hydrocarbons within surface water was found based on the concentrations of PAH reported in the samples collected from the drainage lines and soak within the oval/racecourse area and the sediment/surface water samples collected from the two discharge points to Loddon River. It is acknowledged that limited water was observed to be discharging at the time of sampling and it is therefore recommended that another round of surface water sampling is conducted during a rainfall event to confirm the contamination status of the water discharging to Loddon River.



5 CLEAN UP PLAN

5.1 GOAL OF THE CLEAN UP STRATEGY

In line with the intent of Amended CUN 90011425 and duties under the EP Act 2017, the goal of this clean up strategy is to restore environmental values, which were impacted by historical clay target shooting activities at the Site, to the extent reasonably practicable.

The following environmental values relating to land are considered to be potentially threatened based on the historical clay target shooting activities at the Site:

- Land dependent ecosystems and species (modified ecosystems)
- Land dependent ecosystems and species (highly modified ecosystems)
- Human health

5.2 CLEAN UP STRATEGY

To achieve the stated goal a staged approach is proposed to further refine the CSM and ultimately to assess whether the existing contamination identified during previous investigations completed at the Site poses a risk to the relevant receptors. As outlined in Table 4.1 above, further data collection and risk assessment are recommended to assess the potential risk of contamination to the following receptors:

- On-Site recreational users
- On-Site and Off-Site terrestrial and freshwater ecosystems

Based on the outcome of stage 1 and potentially stage 2, the need for clean up to restore the relevant environmental values will be evaluated, which would include the selection of the most appropriate remediation options. The staged approach is summarised further in the following sections.

5.2.1 Stage 1 – Existing Risk Mitigation Strategies

The potential short-term exposure risk to public health and the environment are currently being maintained by Council in response EPA Victoria Pollution Abatement Notice (PAN 90011377)³⁸.

As noted in Section 3.2.4 above, the clean up measure comprising the removal of visible waste and debris associated with clay target shooting was previously undertaken by the members of the Club prior to the preparation of this CUP in accordance with the conditions of their licence. It is considered, however, that such waste/debris can appear over time (e.g. following significant rainfall events where this material can resurface). It is therefore recommended that waste removal is continued to be monitored during the ongoing use of the Site for clay target shooting activities to ensure that the debris/waste is removed. This could be included as part of a future Environmental Management Plan to be developed for the Site (as per 3.2 of CUN 90011425)

Further details of the temporary risk management measures are outlined in **Table 5.1** below.

5.2.2 Stage 2 – Further Sampling and Risk Assessment

The aim of the activities proposed as part of Stage 1 are to close data gaps identified based on the data collected to date and the current Site conditions, which is summarised in **Table 5.1** below.

5.2.3 Stage 3 – Triggers and Contingencies

Details of triggers and contingencies are included in **Table 5.1** below..

³⁸ Hepburn Shire Council Response to EPA Victoria Pollution Abatement Notice (PAN 90011377), March 2021



5.2.4 Stage 4 – Remediation (If Required to Meet Clean Up Objectives)

Should unacceptable risks still be identified following Stages 1 and 2, a remediation option assessment (ROA), which is consistent with the approach outlined in EPA Victoria Publication 1856³⁹ will need to be conducted to identify reasonably practicable remedial actions or other controls to mitigate the risks. Details of the risk profile, the ROA, trigger and contingency plans, associated monitoring programs and reporting dates would be included as part of a remediation action plan (RAP) to be developed for the Site. This is summarised in **Table 5.1** below.

³⁹ EPA Victoria, Reasonably practicable, September 2020

Table 5.1: Clean Up Strategy

Stage	Description	Deliverables	To be Reviewed By	Date Complete
1 – Existing Risk Mitigation Strategies	The existing risk management controls previously implement by Council for the Site include: • Temporary fencing installed over areas of contamination concern • Signage updated and installed on temporary fencing and permanent fencing at the entry points to the reserve • Continued implementation of changed grass mowing so that dust generation is reduced • Assistance to user groups developing event management plans to ensure contaminated soil is identified as risk and control measures are included and implemented • Testing of neighbouring properties. These tests determined that the contaminants were below NEPM HIL A and there was no likely contamination from shooting events • Monitoring of temporary precautionary measures and during events to ensure controls remain functional and are implemented properly	• Council Response to EPA Victoria Pollution Abatement Notice (PAN 90011377), March 2021 • EPA Victoria Notice of Revocation, 20 April 2021 • Hepburn Shire Council Event Management Plans • Kleinfelder Detailed Site Investigation, January 2021	Council, Auditor and EPA Victoria	April 2021
2 – Further Sampling and Risk Assessment	Develop a SSTL for BaP TEQ using published literature to assess the risk that this contaminant poses to human health. The NEPM HIL calculator excel spreadsheet will be used to calculate the BaP TEQ SSTL. The exposure frequency and duration will be modified to suit the actual recreational space usage where BaP TEQ concentrations exceed the HIL. The oral and dermal bioavailability information published by Forseberg et al. (2021) will also be used in the HIL derivation equation. A second surface water sampling event during a significant rainfall event to assess water quality, which would include collection of samples from the following locations: • Loddon River immediately downstream of the two discharge points • The soak and associated drain to the Loddon River • The unnamed tributary running through the camping area	Risk Assessment report, which would include the following: • The methodology used to derive the SSTL • Assumptions and limitations associated with the derived SSTL. • Scope, methodology and results of the surface water sampling. • Details of triggers and contingency measures • Updated risk profile and refined CSM for the Site • Discussion of the requirement for existing management controls • Discussion of the requirement for further risk assessment and/or remedial actions.	Council, Auditor and EPA Victoria	December 31 2021 (subject to contractual/ commercial arrangements)
3 – Triggers and Contingencies	Details of triggers and contingencies would include: • Triggers: 1. Literature review does not contain sufficient data to develop a SSTL for BaP TEQ 2. Elevated concentrations of contaminants are reported in the surface water • Contingencies: 1. Further assessment of soils comprising ○ verification sampling at the sample locations where concentrations of BaP TEQ were previously reported to exceed HIL C ○ Bioaccessibility assessment by analysing the <250µm soil fraction for PAH compounds. 2. Investigate recent site activities and visible evidence of contamination. Subsequent resampling of surface water and/or sampling of soils/sediments to inform the requirement for further risk assessment and/or remedial actions.	Revised Risk Assessment report (subject to findings of Stage 2 above)	Council, Auditor and EPA Victoria	March 31 2022 (subject to contractual/ commercial arrangements)
4 – Remediation (If required to meet clean up objectives)	The need to develop a RAP would be contingent on the findings of the risk assessment conducted in Stage 2 and 3 above, and would include: • ROA to identify practical and effective options to address identified risks. • A plan to implement the remediation option identified • The need for ongoing monitoring and/or management requirements • Further triggers and contingencies • The requirement for future reporting and associated timelines	RAP	Council, Auditor and EPA Victoria	TBC (subject to findings of Stages 2 and 3 above)



6 CONCLUSION

How this CUP addresses each requirement of CUN 90011425 is summarised in **Table 6.1** below.

Table 6.1: CUP Summary

CUN Requirement	CUP Reference
Information about background groundwater quality and beneficial use, presented in a Conceptual Site Model as per the National Environment Protection (Assessment of Site Contamination) Measure 1999.	Section 3.3.3
Clean up goals.	Section 5.1
Removal or remediation of contaminants on the premises.	Table 5.1
Details of contingency plans and associated monitoring programs and reporting dates.	Table 5.1
The date(s) by which requirements (a) – (d) above will be completed or specified (as the case may be).	Table 5.1
Anticipated completion date of clean up.	Table 5.1



7 LIMITATIONS

This report has been prepared by Kleinfelder Australia Pty Ltd (Kleinfelder) and may be used only by the Client and its designated representatives or relevant statutory authorities and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report.

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The findings and conclusions contained within this report are relevant to the conditions of the site and the state of legislation currently enacted in the relevant jurisdiction in which the site is located as at the date of this report.

Additionally, the findings and conclusions contained within this report are made following a review of certain information, reports, correspondence, and data noted by methods described in this report including information supplied by the client or its assigns. Kleinfelder has designed and managed the program for this report in good faith and in a manner that seeks to confirm the information provided and test its accuracy and completeness. However, Kleinfelder does not provide guarantees or assurances regarding the accuracy, completeness and validity of information and data obtained from these sources and accepts no responsibility for errors or omissions arising from relying on data or conclusions obtained from these sources.

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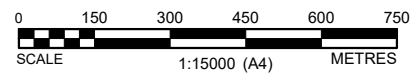


FIGURES

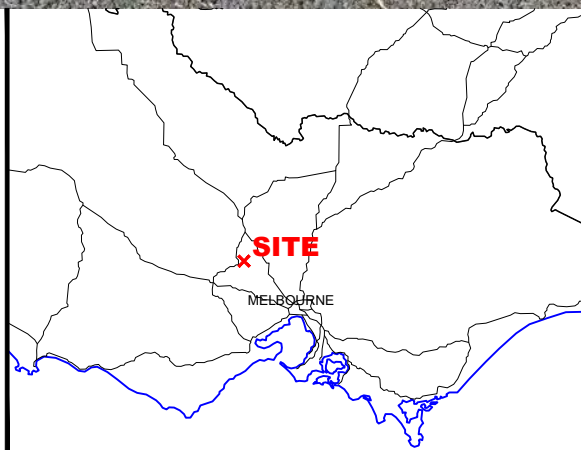




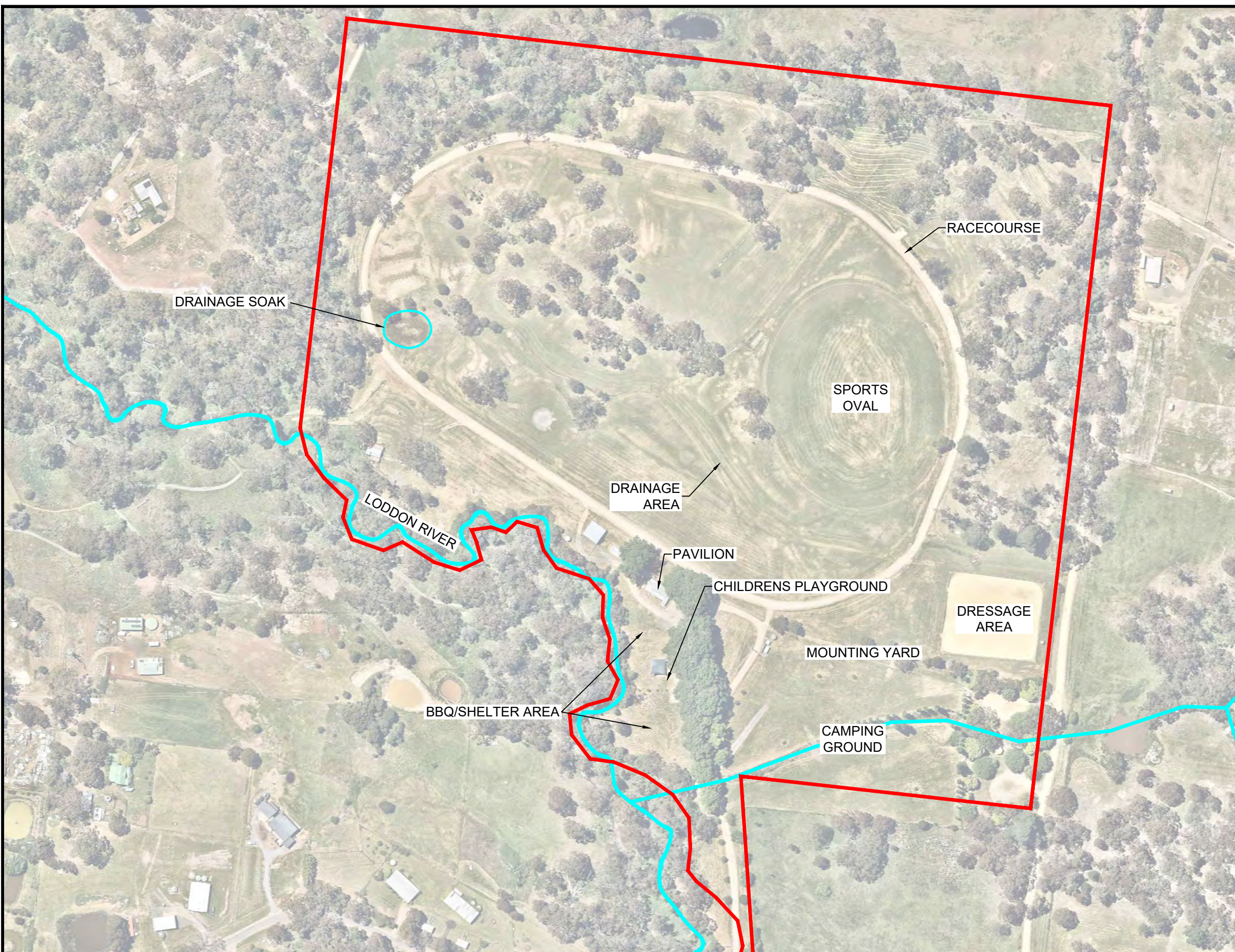
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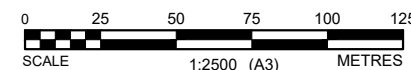
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 KLEINFELDER <i>Bright People. Right Solutions.</i> www.kleinfelder.com	PROJECT: 20204153.001A	SITE LOCATION PLAN	FIGURE 1
	DATE DRAWN: 20.01.21		
	DRAWN BY: LZ		
	CHECKED BY: JM		
	FILE NAME: 20204153.001A-3.dwg	GLENLYON RECREATION RESERVE SUTTONS LANE, GLENLYON, VICTORIA	



NOTE: ALL LOCATIONS ARE APPROXIMATE.
DIMENSIONS IN METRES (m).



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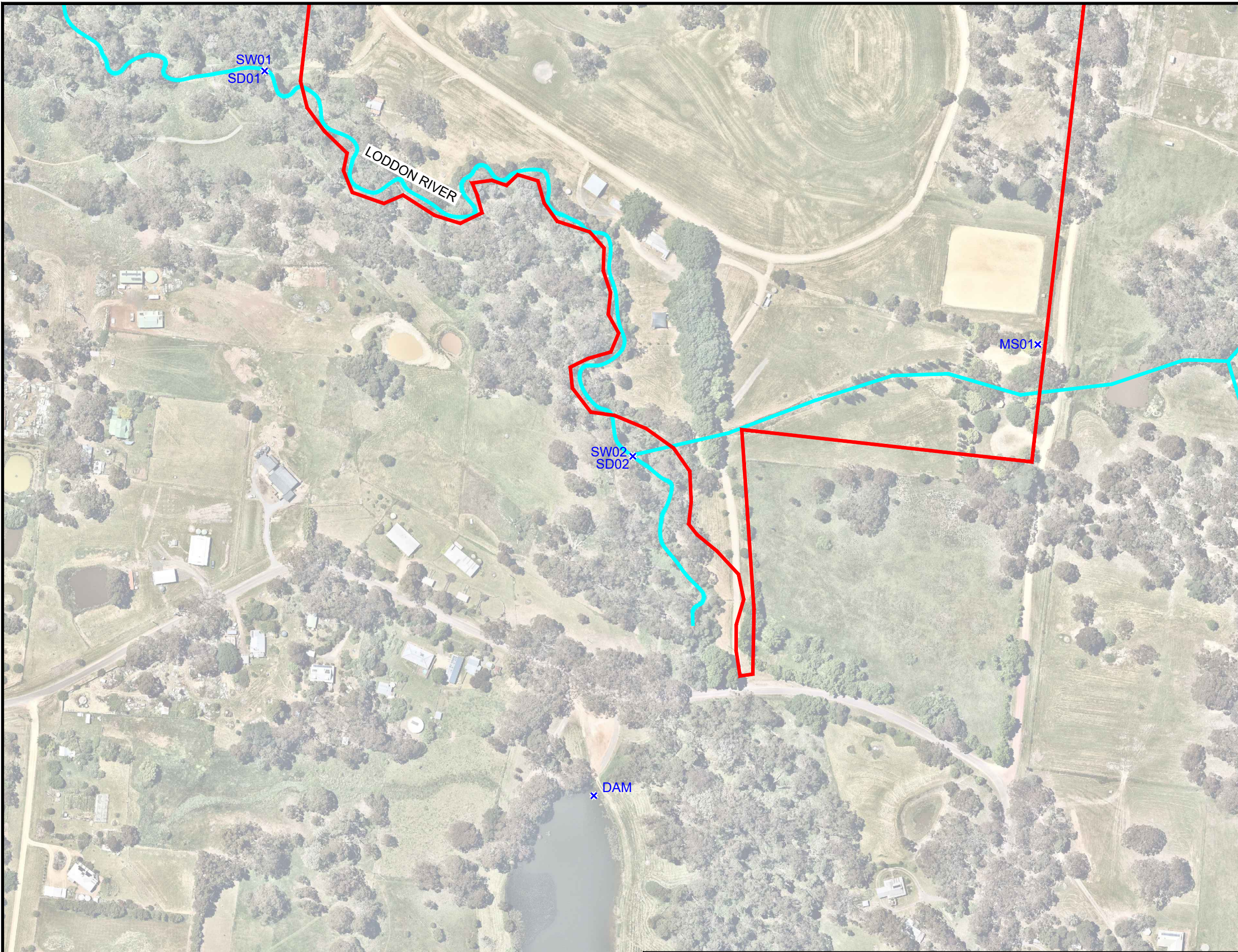
PROJECT:	20204153.001A
DATE DRAWN:	20.01.21
DRAWN BY:	LZ
CHECKED BY:	JM
FILE NAME:	20204153.001A-3.dwg

SITE LAYOUT PLAN

GLENLYON RECREATION RESERVE
SUTTONS LANE, GLENLYON, VICTORIA

FIGURE

2



LEGEND
x SAMPLE LOCATION

NOTE: ALL LOCATIONS ARE APPROXIMATE.
DIMENSIONS IN METRES (m).

0255075100125

SCALE1:2500 (A3)METRES

N

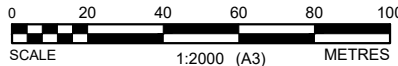
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	PROJECT: 20204153.001A	SEDIMENT, SURFACE WATER & MINERAL SPRINGS SAMPLING LOCATIONS	FIGURE 3	
	DATE DRAWN: 20.01.21			
	DRAWN BY: LZ	GLENLYON RECREATION RESERVE SUTTONS LANE, GLENLYON, VICTORIA		
	CHECKED BY: JM			
FILE NAME: 20204153.001A-3.dwg				



LEGEND
MONITORING WELL

NOTE: ALL LOCATIONS ARE APPROXIMATE.
DIMENSIONS IN METRES (m).



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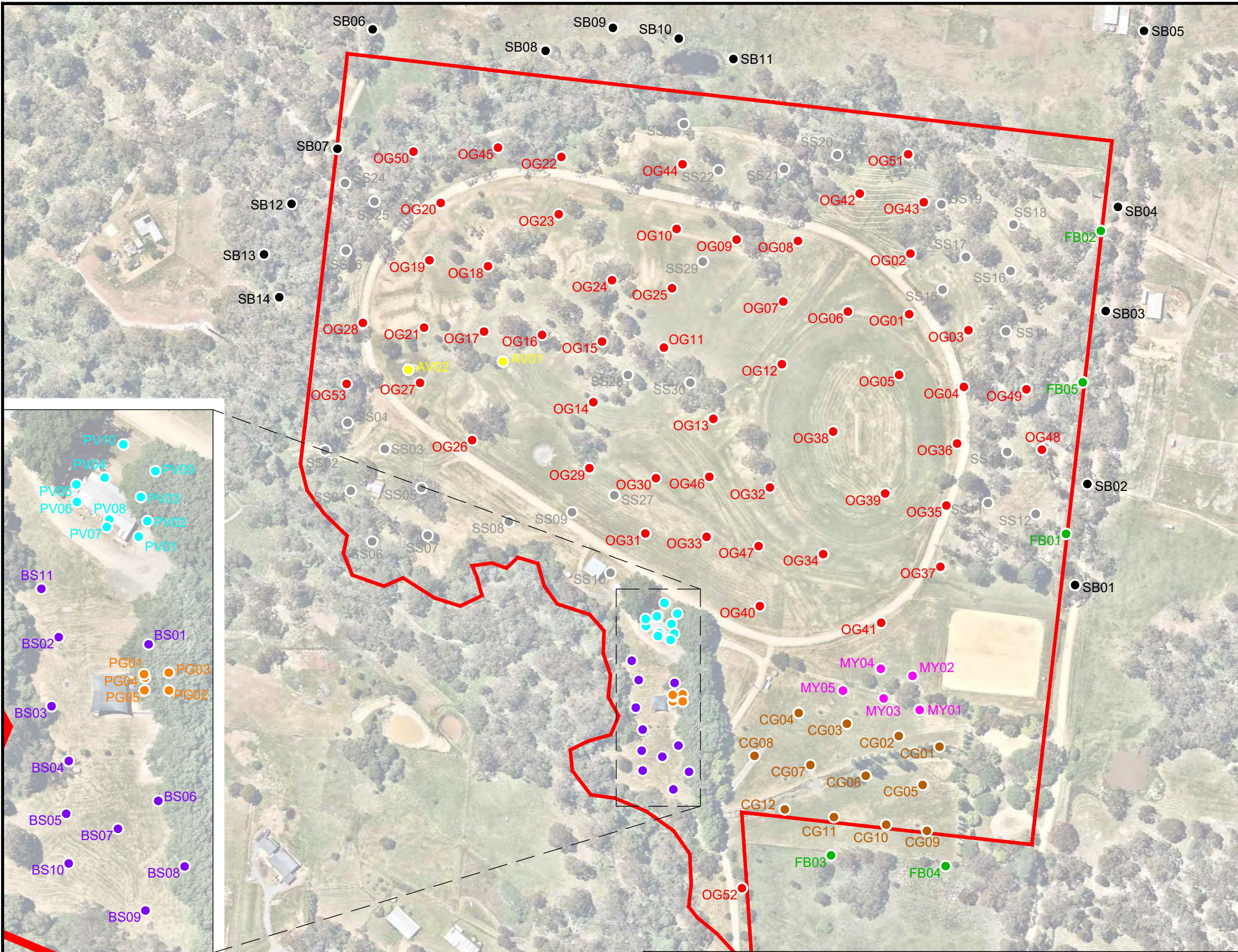
PROJECT:	20204153.001A
DATE DRAWN:	20.01.21
DRAWN BY:	LZ
CHECKED BY:	JM
FILE NAME:	20204153.001A-3.dwg

MONITORING WELL LOCATIONS

GLENLYON RECREATION RESERVE
SUTTONS LANE, GLENLYON, VICTORIA

FIGURE

4



LEGEND

● BEVERIDGE WILLIAMS, 2019

● OVAL GRID

● BBQ/SHELTER AREA

● CAMPING GROUND

● FENCE LINE

● MOUNTING YARD

● PLAYGROUND

● PAVILLION

● STORMWATER DISCHARGE

● OFFSITE

● AUDITOR VERIFICATION SAMPLE, 2021

NOTE: ALL LOCATIONS ARE APPROXIMATE.
DIMENSIONS IN METRES (m).

0 25 50 75 100 125

SCALE 1:2500 (A3) METRES

N

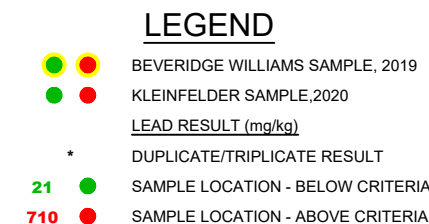
PROJECT: 20204153.001A	SOIL SAMPLE LOCATIONS	FIGURE 5
DATE DRAWN: 20.01.21		
DRAWN BY: LZ		
CHECKED BY: JM		
FILE NAME: 20204153.001A-3.dwg	GLENLYON RECREATION RESERVE SUTTONS LANE, GLENLYON, VICTORIA	

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0 25 50 75 100 125

SCALE 1:2500 (A3) METRES

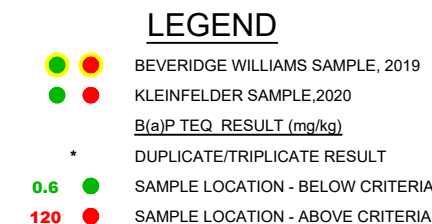


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GLENLYON RECREATION RESERVE
SUTTONS LANE, GLENLYON, VICTORIA

6



0 25 50 75 100 125
SCALE 1:2500 (A3) METRES



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FILE NAME:	20204153.001A-3.dwg

SOIL ANALYTICAL RESULTS - B(a)P TEQ

GLENLYON RECREATION RESERVE
SUTTONS LANE, GLENLYON, VICTORIA

FIGURE

7



TABLES



Table 1
Soil Analytical Data - BTEXN, TRH
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			BTEXN							Total Petroleum Hydrocarbons					Total Recoverable Hydrocarbons						
			Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Naphthalene	C ₆ - C ₉	C ₁₀ - C ₁₄	C ₁₅ - C ₂₈	C ₂₉ - C ₃₆	C ₁₀ - C ₃₆ sum	C ₆ - C ₁₀	C ₆ - C ₁₀ minus BTEX (F1)	>C ₁₀ - C ₁₆	>C ₁₀ - C ₁₆ minus Naphthalene (F2)	>C ₁₆ - C ₃₄	>C ₃₄ - C ₄₀	>C ₁₀ - C ₄₀ (sum)
LOR	Units		0.1	0.1	0.1	0.2	0.1	0.3	0.5	20	20	50	50	50	20	20	50	50	100	100	100
			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
ESL - Urban Residential/Public Open Space, Fine (NEPM 2013)			65	105	125	--	--	45	--	--	--	--	--	--	--	180	120	--	1,300	5,600	--
EIL - Urban Residential/Public Open Space (NEPM 2013)			--	--	--	--	--	--	170	--	--	--	--	--	--	--	--	--	--	--	--
Management Limits - Residential/Parkland/Public Open Space, Fine (NEPM 2013)			--	--	--	--	--	--	--	--	--	--	--	--	700	--	1,000	--	2,500	10,000	--
HSL C - Direct Contact (CRC CARE 2011)			120	18,000	5,300	--	--	15,000	1,900	--	--	--	--	--	5,100	NL	3,800	NL	5,300	7,400	--
HSL - Direct Contact Maintenance Workers (CRC CARE 2011)			1,100	280,000	85,000	--	--	230,000	29,000	--	--	--	--	--	82,000	NL	62,000	NL	85,000	120,000	--
Sample Name	Sample Date	Start Depth (m)																			
SS03	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 1.0	< 0.1	< 20	< 20	55	91	-	< 20	< 20	< 20	< 20	120	< 50	120
SS04	30-Oct-19	0.0	-	-	-	-	-	-	< 0.1	< 20	< 20	65	76	-	< 20	< 20	< 20	< 20	120	< 50	120
SS09	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 1.0	< 0.1	< 20	< 20	< 50	< 50	-	< 20	< 20	< 20	< 20	< 50	< 50	< 50
SS10	30-Oct-19	0.0	-	-	-	-	-	-	< 0.1	< 20	< 20	< 50	63	-	< 20	< 20	< 20	< 20	56	< 50	56
SS11	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 1.0	0.2	< 20	27	340	380	-	< 20	< 20	51	51	580	170	800
SS13	30-Oct-19	0.0	-	-	-	-	-	-	< 0.1	< 20	< 20	150	150	-	< 20	< 20	< 20	< 20	280	< 50	280
SS15	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 1.0	< 0.1	< 20	< 20	1,500	800	-	< 20	< 20	32	32	2,200	160	2,400
SS18	30-Oct-19	0.0	-	-	-	-	-	-	< 0.1	< 20	< 20	< 50	86	-	< 20	< 20	< 20	< 20	90	75	160
SS22	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 1.0	< 0.1	< 20	< 20	< 50	60	-	< 20	< 20	< 20	< 20	63	< 50	63
SS23	30-Oct-19	0.0	-	-	-	-	-	-	< 0.1	< 20	< 20	67	140	-	< 20	< 20	< 20	< 20	150	74	220
SS26	30-Oct-19	0.0	-	-	-	-	-	-	< 0.1	< 20	< 20	< 50	83	-	< 20	< 20	< 20	< 20	87	67	150
SS28	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 1.0	< 0.5	< 1.0	< 0.1	< 20	< 20	120	130	-	< 20	< 20	20	20	240	< 50	260
BS10_0.1	08-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.3	< 0.5	< 20	< 20	< 50	< 50	< 50	< 20	< 20	< 50	< 50	< 100	< 100	< 100
FB03_0.1	08-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.3	< 0.5	< 20	< 20	< 50	< 50	< 50	< 20	< 20	< 50	< 50	< 100	< 100	< 100
FB05_0.1	08-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.3	< 0.5	< 20	27	76	88	191	< 20	< 20	< 50	< 50	130	< 100	130
MY01_0.1	09-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.3	< 0.5	< 20	< 20	< 50	< 50	< 50	< 20	< 20	< 50	< 50	< 100	< 100	< 100
PG02_0.1	09-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.3	< 0.5	< 20	< 20	< 50	< 50	< 50	< 20	< 20	< 50	< 50	< 100	< 100	< 100
PV07_0.7	08-Apr-20	0.7	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.3	< 0.5	< 20	< 20	< 50	< 50	< 50	< 20	< 20	< 50	< 50	< 100	< 100	< 100

Notes:
-- Not analysed
< - Less than laboratory limit of reporting
NL - Not limiting
mg/kg - Milligrams per kilogram
BTEXN - Benzene, toluene, ethylbenzene, total xylenes, naphthalene
Bold indicates a detection above the laboratory limit of reporting

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).
CRC CARE Technical Report No. 10 - Health Screening Level (HSL) for Petroleum Hydrocarbons in Soil and Groundwater, Part 2: Application Document (2011).

Table 2
Soil Analytical Data - Inorganics
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Anions and Cations											
			Cyanide (total)	Fluoride	Free Cyanide	Total Phosphorus	Total Nitrogen as N	Total Kjeldahl Nitrogen as N	Nitrogen	Cation Exchange Capacity	Total Organic Carbon	Electrical Conductivity @ 25°C	pH	Clay (<2 µm)
LOR			5.0	100	5.0	5.0	5.0	10	10	0.05	0.1	10	0.1	1.0
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	meq/100g	%	µS/cm	pH units	%
HIL C - Recreational (NEPM 2013)			--	--	240	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	Start Depth (m)												
SS03	30-Oct-19	0.0	< 5.0	230	-	-	-	-	-	-	-	-	5.8	-
SS04	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	6.4	-
SS09	30-Oct-19	0.0	< 5.0	150	-	-	-	-	-	-	-	-	6.1	-
SS10	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	6.1	-
SS11	30-Oct-19	0.0	< 5.0	190	-	-	-	-	-	-	-	-	5.7	-
SS13	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	5.9	-
SS15	30-Oct-19	0.0	< 5.0	190	-	-	-	-	-	-	-	-	6.1	-
SS18	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	6.0	-
SS22	30-Oct-19	0.0	< 5.0	140	-	-	-	-	-	-	-	-	6.1	-
SS23	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	5.5	-
SS26	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	5.7	-
SS28	30-Oct-19	0.0	< 5.0	110	-	-	-	-	-	-	-	-	5.3	-
BS10_0.1	08-Apr-20	0.1	< 5.0	180	-	-	-	-	-	-	-	-	6.7	-
FB03_0.1	08-Apr-20	0.1	< 5.0	250	-	-	-	-	-	-	-	-	7.1	-
FB05_0.1	08-Apr-20	0.1	< 5.0	510	-	-	-	-	-	-	-	-	7.0	-
MY01_0.1	09-Apr-20	0.1	< 5.0	290	-	-	-	-	-	-	-	-	7.0	-
OG26_0.1	07-Apr-20	0.1	-	-	-	340	< 5.0	2,600	2,600	-	-	-	-	-
OG28_0.1	07-Apr-20	0.1	-	-	-	-	-	-	-	10	2.5	< 10	5.8	18
OG31_0.1	06-Apr-20	0.1	-	-	-	540	< 5.0	4,800	4,800	-	-	-	-	-
OG40_0.1	06-Apr-20	0.1	-	-	-	600	11	5,500	5,511	-	-	-	-	-
OG49_0.5	06-Apr-20	0.5	-	-	-	-	-	-	-	4.5	2.4	21	4.8	16
OG53_0.1	09-Apr-20	0.1	-	-	-	-	-	-	-	7.1	2.5	940	4.7	19
OG53_0.5	09-Apr-20	0.5	-	-	-	-	-	-	-	2.5	0.4	< 10	5.2	17
PG02_0.1	09-Apr-20	0.1	-	-	< 5.0	-	-	-	-	-	-	-	-	-
PV07_0.7	08-Apr-20	0.7	< 5.0	330	-	-	-	-	-	-	-	-	7.2	-

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
mg/kg - Milligrams per kilogram
µS/cm - Microsiemens per centimeter
Bold indicates a detection above the laboratory limit of reporting

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Analyte			Metals																						
			Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Tin	Vanadium	Zinc
LOR			5.0	5.0	2.0	5.0	2.0	10	0.4	5.0	1.0	5.0	5.0	20	5.0	5.0	0.1	5.0	5.0	2.0	0.2	5.0	10	5.0	5.0
Units			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
HIL C - Recreational (NEPM 2013)			--	--	300	--	90	20,000	90	--	300	300	17,000	--	600	19,000	80	--	1,200	700	--	--	--	--	30,000
EIL - Urban Residential/Public Open Space (NEPM 2013)			--	--	100	--	--	--	--	500	--	--	120	--	1,100	--	--	--	120	--	--	--	--	--	260
Sample Name	Sample Date	Start Depth (m)																							
D01	30-Oct-19	0.0	14,000	< 5.0	< 5.0	130	< 5.0	< 10	< 0.2	25	-	6.0	8.0	13,000	130	150	< 0.05	< 5.0	14	< 3.0	< 5.0	21	< 5.0	25	32
D02	30-Oct-19	0.0	9,800	< 5.0	6.0	79	< 5.0	< 10	< 0.2	88	-	5.0	5.0	58,000	36	92	< 0.05	< 5.0	11	< 3.0	< 5.0	10	< 5.0	70	17
SS01	30-Oct-19	0.0	16,000	< 5.0	< 5.0	160	< 5.0	< 10	< 0.2	31	-	8.0	12	18,000	100	200	< 0.05	< 5.0	19	< 3.0	< 5.0	21	< 5.0	22	41
SS01A	30-Oct-19	0.0	-	< 10	5.4	160	< 2.0	< 10	< 0.4	26	-	6.0	11	-	160	180	< 0.1	< 5.0	17	< 2.0	< 0.2	-	< 10	28	33
SS02	30-Oct-19	0.0	16,000	< 5.0	< 5.0	130	< 5.0	< 10	< 0.2	25	-	7.0	10	17,000	80	190	< 0.05	< 5.0	17	< 3.0	< 5.0	23	< 5.0	16	39
SS03	30-Oct-19	0.0	-	< 5.0	< 5.0	160	< 5.0	< 10	< 0.2	19	< 1.0	8.0	11	-	100	580	< 0.05	< 5.0	13	< 3.0	< 5.0	-	< 5.0	13	46
SS04	30-Oct-19	0.0	19,000	< 5.0	6.0	120	< 5.0	< 10	< 0.2	56	-	16	20	32,000	160	420	< 0.05	< 5.0	41	< 3.0	< 5.0	28	< 5.0	42	52
SS05	30-Oct-19	0.0	19,000	< 5.0	< 5.0	200	< 5.0	< 10	< 0.2	28	-	12	14	19,000	34	590	< 0.05	< 5.0	21	< 3.0	< 5.0	39	< 5.0	22	84
SS06	30-Oct-19	0.0	10,000	< 5.0	< 5.0	110	< 5.0	< 10	< 0.2	15	-	8.0	7.0	12,000	28	320	< 0.05	< 5.0	11	< 3.0	< 5.0	20	< 5.0	9.0	39
SS07	30-Oct-19	0.0	11,000	< 5.0	< 5.0	110	< 5.0	< 10	< 0.2	19	-	7.0	9.0	16,000	31	270	< 0.05	< 5.0	14	< 3.0	< 5.0	20	< 5.0	13	40
SS08	30-Oct-19	0.0	13,000	< 5.0	< 5.0	130	< 5.0	< 10	< 0.2	25	-	9.0	10	16,000	33	320	< 0.05	< 5.0	15	< 3.0	< 5.0	23	< 5.0	15	50
SS09	30-Oct-19	0.0	-	< 5.0	< 5.0	89	< 5.0	< 10	< 0.2	20	< 1.0	6.0	9.0	-	53	230	< 0.05	< 5.0	15	< 3.0	< 5.0	-	< 5.0	18	30
SS10	30-Oct-19	0.0	25,000	< 5.0	< 5.0	220	< 5.0	< 10	< 0.2	30	-	8.0	13	22,000	73	320	0.05	< 5.0	20	< 3.0	17	32	< 5.0	28	62
SS11	30-Oct-19	0.0	-	< 5.0	6.0	95	< 5.0	< 10	< 0.2	12	< 1.0	< 5.0	9.0	-	320	170	0.06	< 5.0	6.0	< 3.0	< 5.0	-	< 5.0	11	24
SS12	30-Oct-19	0.0	9,100	< 5.0	< 5.0	90	< 5.0	< 10	< 0.2	20	-	< 5.0	7.0	26,000	84	160	< 0.05	< 5.0	6.0	< 3.0	< 5.0	17	< 5.0	12	23
SS13	30-Oct-19	0.0	14,000	< 5.0	9.0	130	< 5.0	< 10	< 0.2	28	-	< 5.0	12	23,000	69	240	< 0.05	< 5.0	11	< 3.0	< 5.0	20	< 5.0	21	28
SS14	30-Oct-19	0.0	27,000	< 5.0	< 5.0	210	< 5.0	< 10	< 0.2	54	-	10	17	29,000	150	400	0.05	< 5.0	25	< 3.0	< 5.0	30	< 5.0	44	36
SS15	30-Oct-19	0.0	-	< 5.0	< 5.0	140	< 5.0	< 10	< 0.2	44	< 1.0	11	9.0	-	270	460	< 0.05	< 5.0	18	< 3.0	< 5.0	-	< 5.0	35	25
SS16	30-Oct-19	0.0	20,000	< 5.0	< 5.0	130	< 5.0	< 10	< 0.2	53	-	9.0	12	38,000	40	140	< 0.05	< 5.0	17	< 3.0	< 5.0	13	< 5.0	41	19
SS17	30-Oct-19	0.0	9,200	< 5.0	53	81	< 5.0	< 10	< 0.2	30	-	10	11	19,000	32	240	0.09	< 5.0	17	< 3.0	< 5.0	19	< 5.0	20	29
SS18	30-Oct-19	0.0	9,100	< 5.0	< 5.0	79	< 5.0	< 10	< 0.2	27	-	6.0	6.0	8,700	100	140	< 0.05	< 5.0	10	< 3.0	< 5.0	19	< 5.0	15	15
SS19	30-Oct-19	0.0	17,000	< 5.0	< 5.0	130	< 5.0	< 10	< 0.2	110	-	28	13	40,000	31	590	< 0.05	< 5.0	26	< 3.0	< 5.0	25	< 5.0	74	32
SS20	30-Oct-19	0.0	26,000	< 5.0	< 5.0	230	< 5.0	< 10	< 0.2	130	-	18	21	42,000	90	460	< 0.05	< 5.0	49	< 3.0	< 5.0	30	< 5.0	82	60
SS21	30-Oct-19	0.0	8,400	< 5.0	< 5.0	65	< 5.0	< 10	< 0.2	46	-	< 5.0	< 5.0	29,000	27	84	< 0.05	< 5.0	9.0	< 3.0	< 5.0	7.0	< 5.0	30	14
SS21A	30-Oct-19	0.0	-	< 10	3.5	63	< 2.0	< 10	< 0.4	50	-	< 5.0	< 5.0	-	28	65	< 0.1	< 5.0	8.6	< 2.0	< 0.2	-	< 10	48	15
SS22	30-Oct-19	0.0	-	< 5.0	< 5.0	98	< 5.0	< 10	< 0.2	61	< 1.0	15	9.0	-	54	290	< 0.05	< 5.0	17	< 3.0	< 5.0	-	< 5.0	38	29
SS23	30-Oct-19	0.0	17,000	< 5.0	< 5.0	140	< 5.0	< 10	< 0.2	76	-	11	13	22,000	330	160	< 0.05	< 5.0	28	4.0	< 5.0	26	< 5.0	52	41
SS24	30-Oct-19	0.0	7,800	< 5.0	83	57	< 5.0	< 10	< 0.2	21	-	< 5.0	19	24,000	170	180	< 0.05	< 5.0	7.0	< 3.0	< 5.0	12	< 5.0	19	25
SS25	30-Oct-19	0.0	13,000	< 5.0	6.0	130	< 5.0	< 10	< 0.2	28	-	< 5.0</													

Analyte			Metals																							
			Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Tin	Vanadium	Zinc	
LOR			5.0	5.0	2.0	5.0	2.0	10	0.4	5.0	1.0	5.0	5.0	20	5.0	5.0	0.1	5.0	5.0	2.0	0.2	5.0	10	5.0	5.0	
Units			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	
HIL C - Recreational (NEPM 2013)			--	--	300	--	90	20,000	90	--	300	300	17,000	--	600	19,000	80	--	1,200	700	--	--	--	--	30,000	
EIL - Urban Residential/Public Open Space (NEPM 2013)			--	--	100	--	--	--	--	500	--	--	120	--	1,100	--	--	--	120	--	--	--	--	--	260	
Sample Name	Sample Date	Start Depth (m)																								
OG15 0.1	07-Apr-20	0.1	-	-	2.8	-	-	-	< 0.4	15	-	-	< 5.0	-	12	-	-	-	< 5.0	-	-	-	-	-	15	
OG15 0.7	07-Apr-20	0.7	-	-	4.1	-	-	-	< 0.4	27	-	-	6.0	-	23	-	-	-	8.0	-	-	-	-	-	21	
OG16 0.1	07-Apr-20	0.1	-	-	2.9	-	-	-	< 0.4	19	-	-	5.4	-	290	-	-	-	6.9	-	-	-	-	-	22	
OG16 0.4	07-Apr-20	0.4	-	-	2.3	-	-	-	< 0.4	22	-	-	< 5.0	-	28	-	-	-	6.9	-	-	-	-	-	19	
OG17 0.1	07-Apr-20	0.1	-	-	2.7	-	-	-	< 0.4	14	-	-	< 5.0	-	92	-	-	-	5.5	-	-	-	-	-	14	
OG18 0.1	07-Apr-20	0.1	-	-	2.3	-	-	-	< 0.4	15	-	-	< 5.0	-	49	-	-	-	5.4	-	-	-	-	-	16	
OG19 0.1	07-Apr-20	0.1	-	-	5.4	-	-	-	< 0.4	27	-	-	8.3	-	35	-	-	-	12	-	-	-	-	-	24	
OG20 0.1	07-Apr-20	0.1	-	-	2.3	-	-	-	< 0.4	13	-	-	< 5.0	-	130	-	-	-	7.3	-	-	-	-	-	12	
OG20 0.4	07-Apr-20	0.4	-	-	6.8	-	-	-	< 0.4	47	-	-	12	-	50	-	-	-	14	-	-	-	-	-	20	
OG21 0.1	06-Apr-20	0.1	-	-	4.9	-	-	-	< 0.4	28	-	-	11	-	36	-	-	-	14	-	-	-	-	-	22	
OG22 0.1	07-Apr-20	0.1	-	-	< 2.0	-	-	-	< 0.4	12	-	-	8.5	-	15	-	-	-	6.1	-	-	-	-	-	33	
OG23 0.1	07-Apr-20	0.1	-	-	3.1	-	-	-	< 0.4	30	-	-	8.8	-	65	-	-	-	15	-	-	-	-	-	22	
OG24 0.1	07-Apr-20	0.1	-	-	2.5	-	-	-	< 0.4	16	-	-	< 5.0	-	16	-	-	-	< 5.0	-	-	-	-	-	21	
OG24 0.5	07-Apr-20	0.5	-	-	2.5	-	-	-	< 0.4	19	-	-	5.1	-	14	-	-	-	5.0	-	-	-	-	-	17	
OG25 0.1	07-Apr-20	0.1	-	-	3.5	-	-	-	< 0.4	78	-	-	24	-	53	-	-	-	44	-	-	-	-	-	39	
OG25 1.0	07-Apr-20	1.0	-	-	4.8	-	-	-	< 0.4	81	-	-	22	-	21	-	-	-	59	-	-	-	-	-	39	
OG26 0.1	07-Apr-20	0.1	-	-	4.5	-	-	-	< 0.4	20	-	-	7.5	-	98 *	-	-	-	10	-	-	-	-	-	42	
OG27 0.1	07-Apr-20	0.1	-	-	3.8	-	-	-	< 0.4	26	-	-	7.8	-	15	-	-	-	14	-	-	-	-	-	19	
OG28 0.1	07-Apr-20	0.1	-	-	7.2	-	-	-	< 0.4	49	-	-	17	30,000	76	-	-	-	34	-	-	-	-	-	43	
OG29 0.1	06-Apr-20	0.1	-	-	3.8	-	-	-	< 0.4	38	-	-	11	-	23	-	-	-	25	-	-	-	-	-	47	
OG30 0.1	06-Apr-20	0.1	-	-	6.7	-	-	-	< 0.4	54	-	-	18	-	28	-	-	-	40	-	-	-	-	-	60	
OG31 0.1	06-Apr-20	0.1	-	-	49	-	-	-	< 0.4	32	-	-	15	-	43	-	-	-	23	-	-	-	-	-	69	
OG32 0.1	06-Apr-20	0.1	-	-	5.1	-	-	-	< 0.4	23	-	-	7.0	-	34	-	-	-	9.3	-	-	-	-	-	29	
OG33 0.1	06-Apr-20	0.1	-	-	3.5	-	-	-	< 0.4	21	-	-	13	-	91	-	-	-	19	-	-	-	-	-	27	
OG34 0.1	06-Apr-20	0.1	-	-	< 2.0	-	-	-	< 0.4	10	-	-	< 5.0	-	38	-	-	-	< 5.0	-	-	-	-	-	12	
OG35 0.1	06-Apr-20	0.1	-	-	5.6	-	-	-	< 0.4	12	-	-	5.5	-	26	-	-	-	7.4	-	-	-	-	-	18	
OG36 0.1	06-Apr-20	0.1	-	-	9.1	-	-	-	< 0.4	27	-	-	11	-	170	-	-	-	17	-	-	-	-	-	28	
OG36 0.6	06-Apr-20	0.6	-	-	10*	-	-	-	< 0.4	27	-	-	12	-	33	-	-	-	11	-	-	-	-	-	23	
OG37 0.1	06-Apr-20	0.1	-	-	< 2.0	-	-	-	< 0.4	6.8	-	-	< 5.0	-	8.6	-	-	-	< 5.0	-	-	-	-	-	9.8	
OG38 0.1	06-Apr-20	0.1	-	-	3.0	-	-	-	< 0.4	130	-	-	44	-	350	-	-	-	100	-	-	-	-	-	100	
OG39 0.1	06-Apr-20	0.1	-	-	3.2	-	-	-	< 0.4	39	-	-	11	-	60	-	-	-	19	-	-	-	-	-	34	
OG40 0.1	06-Apr-20	0.1	-	-	5.0	-	-	-	< 0.4	27	-	-	13	-	52	-	-	-	17	-	-	-	-	-	35	
OG41 0.1	06-Apr-20	0.1	-	-	4.5	-	-	-	< 0.4	29	-	-	10	-	17	-	-	-	15	-	-	-	-	-	29	
OG42 0.1	07-Apr-20	0.1	-	-	4.9	-	-	-	< 0.4	170	-	-	30	-	170	-	-	-	72	-	-	-	-	-	74	
OG43 0.1	07-Apr-20	0.1	-	-	< 2.0	-	-	-	< 0.4	79	-	-	9.2	-	47	-	-	-	26	-	-	-	-	-	25	
OG44 0.1	07-Apr-20	0.1	-	-	2.7	-	-	-	< 0.4	130	-	-	26	-	17	-	-	-	69	-	-	-	-	-	71	
OG45 0.1	07-Apr-20	0.1	-	-	4.6	-	-	-	< 0.4	60	-	-	18	-	470	-	-	-	28	-	-	-	-	-	36	
OG46 0.1	06-Apr-20	0.1	-	-	4.6	-	-	-	< 0.4	43	-	-	15	-	29	-	-	-	28	-	-	-	-	-	34	
OG47 0.1	06-Apr-20	0.1	-	-	4.4	-	-	-	< 0.4	33	-	-	18	-	100	-	-	-	21	-	-	-	-	-	56	
OG48 0.1	06-Apr-20	0.1	-	-	2.0	-	-	-	< 0.4	17	-	-	6.9	-	19	-	-	-	< 5.0	-	-	-	-	-	13	
OG49 0.1	06-Apr-20	0.1	-	-	2.8	-	-	-	< 0.4	17	-	-	12	-	22	-	-	-	6.5	-	-	-	-	-	12	
OG49 0.5	06-Apr-20	0.5	-	-	-	-	-	-	-	-	-	-	-	14,000	-	-	-	-	-	-	-	-	-	-	-	
OG50 0.1	09-Apr-20	0.1	-	-	2.2	-	-	-	< 0.4	67	-	-	12	-	25	-	-	-	23	-	-	-	-	-	22	
OG51 0.1	09-Apr-20	0.1	-	-	2.4	-	-	-	< 0.4	87	-	-	13	-	21	-	-	-	26	-	-	-	-	-	28	
OG52 0.1	09-Apr-20	0.1	-	-	< 2.0	-	-	-	< 0.4	13	-	-	< 5.0	-	12	-	-	-	< 5.0	-	-	-	-	-	22	
OG53 0.1	09-Apr-20	0.1	-	-	12	-	-	-	< 0.4	37	-	-	13	23,000	81	-	-	-	18	-	-	-	-	-	27	
OG53 0.5	09-Apr-20	0.5	-	-	-	-	-	-	-	-	-	-	-	19,000	-	-	-	-	-	-	-	-	-	-	-	
PV01 0.1	08-Apr-20	0.1	-	-	6.2	-	-	-	< 0.4	35	-	-	9.9	-	52	-	-	-	23	-	-	-	-	-	38	
PV03 0.1	08-Apr-20	0.1	-	-	180	-	-	-	< 0.4	25	-	-	22	-	59	-	-	-	36	-	-	-	-	-	98	
PV05 0.1	08-Apr-20	0.1	-	-	79	-	-	-	< 0.4	27	-	-	17	-	58	-	-	-	22	-	-	-	-	-	130	
PV07 0.7	08-Apr-20	0.7	-	-	5.3	-	-	-	< 0.4	25	< 1.0	-	7.6	-	17	-	< 0.1	< 5.0	14	< 2.0	< 0.2	-	< 10	-	37	
PV10 0.1	08-Apr-20	0.1	-	-	8.0	-	-	-	< 0.4	30	-	-	12	-	45	-	-	-	18	-	-	-	-	-	94	
SD01	09-Apr-20	0.0	-	-	35 *	-	-	-	< 0.4	17	-	-	10	-	16	-	-	-	11	-	-	-	-	-	39	
SD02	09-Apr-20	0.0	-	-	2.3	-	-	-	< 0.4	7.6	-	-	< 5.0	-	6.3	-	-	-	< 5.0	-	-	-	-	-	12	

Notes:
-- Not analysed
< - Less than laboratory limit of reporting
mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting
"*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
Highlighting indicates an exceedance of the corresponding criteria (highlighting corresponds to the guideline with the highest criteria value where analytical result exceeds more than one guideline)
RPD - Relative Percentage Difference

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 3A
Soil Analytical Data - Metals
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals																	
			Arsenic	Beryllium	Boron	Cadmium	Chromium	Chromium VI	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Tin	Zinc
LOR			2.0	2.0	10	0.4	5.0	1.0	5.0	5.0	20	5.0	5.0	0.1	5.0	5.0	2.0	0.2	10	5.0
Units			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
HIL A - Residential (NEPM 2013)			100	60	4,500	20	--	100	100	6,000	--	300	3,800	40	--	400	200	--	--	7,400
EIL - Urban Residential/Public Open Space (NEPM 2013)			100	--	--	--	500	--	--	120	--	1,100	--	--	--	120	--	--	--	260
Sample Name	Sample Date	Start Depth (m)																		
PG01_0.1	09-Apr-20	0.1	10 *	-	-	< 0.4	62 *	-	-	13	-	17	-	-	-	25	-	-	-	46
PG02_0.1	09-Apr-20	0.1	5.2	< 2.0	< 10	< 0.4	21	< 1.0	5.3	9.4	-	31	320	< 0.1	-	10	< 2.0	-	-	89
PG03_0.1	09-Apr-20	0.1	4.5	-	-	< 0.4	23	-	-	14	-	20	-	-	-	14	-	-	-	44
PG04_0.1	09-Apr-20	0.1	4.3	-	-	< 0.4	22	-	-	8.7	-	27	-	-	-	12	-	-	-	39
PG05_0.1	09-Apr-20	0.1	6.2	-	-	< 0.4	22	-	-	11	-	22	-	-	-	11	-	-	-	47

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting
"*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
Highlighting indicates an exceedance of the corresponding criteria (highlighting corresponds to the guideline with the highest criteria value where analytical result exceeds more than one guideline)
RPD - Relative Percentage Difference

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 3B
Soil Analytical Data - Metals
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals														
			Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
LOR			2.0	2.0	2.0	10	0.4	5.0	5.0	5.0	5.0	5.0	0.1	5.0	2.0	5.0	5.0
Units			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
HIL A - Residential (NEPM 2013)			100	--	60	4,500	20	--	100	6,000	300	3,800	40	400	200	--	7,400
EIL - Urban Residential/Public Open Space (NEPM 2013)			100	--	--	--	--	500	--	120	1,100	--	--	120	--	--	260
Sample Name	Sample Date	Start Depth (m)															
AV01	03-Mar-21	0.0	6.0	100	< 1.0	<50	< 1.0	25	4.0	10	59	45	<0.1	14	<5	26	21
AV02	03-Mar-21	0.0	15	220	1.0	<50	< 1.0	33	16	16	318	660	<0.1	28	<5	38	36

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting
"*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
Highlighting indicates an exceedance of the corresponding criteria (highlighting corresponds to the guideline with the highest criteria value where analytical result exceeds more than one guideline)
RPD - Relative Percentage Difference

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 3C
Soil Analytical Data - Metals
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals
			Lead
LOR			5.0
Units			mg/kg
HIL A - Residential (NEPM 2013)			300
Sample Name	Sample Date	Start Depth (m)	
SB01_0.15	05-Jan-21	0.15	12
SB02_0.1	05-Jan-21	0.1	16
SB03_0.15	05-Jan-21	0.15	13
SB04_0.1	05-Jan-21	0.1	11
SB05_0.1	05-Jan-21	0.1	11
SB06_0.1	05-Jan-21	0.1	12
SB07_0.1	05-Jan-21	0.1	35
SB08_0.1	05-Jan-21	0.1	33
SB09_0.1	05-Jan-21	0.1	17
SB10_0.1	05-Jan-21	0.1	19
SB11_0.1	05-Jan-21	0.1	16
SB12_0.1	05-Jan-21	0.1	21
SB13_0.1	05-Jan-21	0.1	52
SB14_0.1	05-Jan-21	0.1	16

Notes:
mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

20204153.001A

Notes:
 < - Less than laboratory limit of reporting
 LOR - Laboratory limit of reporting
 mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting
 "*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
 Highlighting indicates an exceedance of the corresponding criteria (highlighting corresponds to the guideline with the highest criteria value where analytical result exceeds more than one guideline)
 RPD - Relative Percentage Difference

20204153.001A



Analyte			Polycyclic Aromatic Hydrocarbons																		
			Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Chrysene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene	Total PAH	Benzo[a]pyrene TEQ (Zero)	Benzo[a]pyrene TEQ (Half LOR)
LOR			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Units			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
HIL A - Residential (NEPM 2013)			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	300	3.0	3.0
ESL - Urban Residential/Public Open Space, Coarse (CRC Care 39)			--	--	--	--	--	--	--	--	--	--	--	33	--	--	--	--	--	--	
EIL - Urban Residential/Public Open Space (NEPM 2013)			170	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
HSL A - Direct Contact (CRC CARE 2011)			1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
HSL - Direct Contact Maintenance Workers (CRC CARE 2011)			29,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Sample Name	Sample Date	Start Depth (m)																			
PG01_0.1	09-Apr-20	0.1	< 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	0.6	
PG02_0.1	09-Apr-20	0.1	< 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	0.6	
PG03_0.1	09-Apr-20	0.1	< 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	0.6	
PG04_0.1	09-Apr-20	0.1	< 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	0.6	
PG05_0.1	09-Apr-20	0.1	< 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	0.6	

Notes:
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting
"*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
Highlighting indicates an exceedance of the corresponding criteria (highlighting corresponds to the guideline with the highest criteria value where analytical result exceeds more than one guideline)
RPD - Relative Percentage Difference

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).
CRC CARE Technical Report No. 10 - Health Screening Level (HSL) for Petroleum Hydrocarbons in Soil and Groundwater, Part 2: Application Document (2011).



Analyte			Polycyclic Aromatic Hydrocarbons																		
			Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Chrysene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene	Total PAH	Benzo[a]pyrene TEQ (Zero)	Benzo[a]pyrene TEQ (Half LOR)
LOR			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Units			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
HIL A - Residential (NEPM 2013)			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	300	3.0	3.0	
HSL A - Direct Contact (CRC CARE 2011)			1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
HSL (Vapour Intrusion) A & B - CLAY (NEPM 2013)	0 m - <1 m	5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	1 m - <2 m	NL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	2 m - <4 m	NL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	4 m +	NL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Sample Name	Sample Date	Start Depth (m)																			
SB01_0.15	05-Jan-21	0.15	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.6	
SB02_0.1	05-Jan-21	0.1	< 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	0.6	
SB03_0.15	05-Jan-21	0.15	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.6	
SB04_0.1	05-Jan-21	0.1	< 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	0.6	
SB05_0.1	05-Jan-21	0.1	< 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	0.6	
SB06_0.1	05-Jan-21	0.1	< 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	0.6	
SB07_0.1	05-Jan-21	0.1	< 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	0.6	
SB08_0.1	05-Jan-21	0.1	< 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	0.6	
SB09_0.1	05-Jan-21	0.1	< 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	0.6	
SB10_0.1	05-Jan-21	0.1	< 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	0.6	
SB11_0.1	05-Jan-21	0.1	< 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	0.6	
SB12_0.1	05-Jan-21	0.1	< 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	0.6	
SB13_0.1	05-Jan-21	0.1	< 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	0.6	
SB14_0.1	05-Jan-21	0.1	< 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	0.6	

Notes:
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
NL - Not limiting
mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).
CRC CARE Technical Report No. 10 - Health Screening Level (HSL) for Petroleum Hydrocarbons in Soil and Groundwater, Part 2: Application Document (2011).



Analyte			Polycyclic Aromatic Hydrocarbons																		
			Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Chrysene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene	Total PAH	Benzo[a]pyrene TEQ (Zero)	Benzo[a]pyrene TEQ (Half LOR)
LOR			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Units			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
HIL A - Residential (NEPM 2013)			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	300	3.0	3.0	
HSL A - Direct Contact (CRC CARE 2011)			1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
HSL (Vapour Intrusion) A & B - CLAY (NEPM 2013)	0 m - <1 m	5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	1 m - <2 m	NL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	2 m - <4 m	NL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	4 m +	NL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Sample Name	Sample Date	Start Depth (m)																			
AV01	03-Mar-21	0.0	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 1.4	< 0.7	2.8
AV02	03-Mar-21	0.0	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 2.3	< 1.4	< 0.7	2.8

Notes:
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
NL - Not limiting
mg/kg - Milligrams per kilogram
Bold indicates a detection above the laboratory limit of reporting

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).
CRC CARE Technical Report No. 10 - Health Screening Level (HSL) for Petroleum Hydrocarbons in Soil and Groundwater, Part 2: Application Document (2011).

Table 5
Soil Analytical Data - PCBs
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Polychlorinated Biphenyls							
			Aroclor-1260	Aroclor-1254	Aroclor-1221	Aroclor-1232	Aroclor-1248	Aroclor-1016	Aroclor-1242	Total PCBs
LOR			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
HIL C - Recreational (NEPM 2013)			--	--	--	--	--	--	--	1.0
Sample Name	Sample Date	Start Depth (m)								
SS03	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
SS09	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
SS11	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
SS15	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
SS22	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
SS28	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
BS10_0.1	08-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FB03_0.1	08-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
FB05_0.1	08-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
MY01_0.1	09-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PG02_0.1	09-Apr-20	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PV07_0.7	08-Apr-20	0.7	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Notes:

< - Less than laboratory limit of reporting

LOR - Laboratory limit of reporting

mg/kg - Milligrams per kilogram

PCB - Polychlorinated Biphenyl

Criteria:

National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 6
Soil Analytical Data - Pesticides
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Organochlorine																		
			2,4,5-T	2,4-Dichlorophenoxyacetic Acid	2-Methyl-4-Chlorophenoxy Butanoic Acid	4,4'-DDE	4,4'-DDD	4,4'-DDT	alpha-BHC	beta-BHC	gamma-BHC	delta-BHC	Aldrin	Heptachlor epoxide	cis-Chlordane	trans-Chlordane	Chlordane	alpha-Endosulfan	beta-Endosulfan	Endosulfan (sum)	Endosulfan sulfate
LOR			0.5	0.5	0.5	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.05	0.05	0.05	0.05
Units			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
HIL C - Recreational (NEPM 2013)			800	1,300	800	--	--	--	--	--	--	--	--	--	70	70	70	--	--	340	--
EIL - Urban Residential/Public Open Space (NEPM 2013)			--	--	--	--	--	180	--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	Start Depth (m)																			
SS03	30-Oct-19	0.0	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
SS09	30-Oct-19	0.0	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
SS11	30-Oct-19	0.0	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
SS15	30-Oct-19	0.0	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
SS22	30-Oct-19	0.0	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
SS28	30-Oct-19	0.0	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
BS10_0.1	08-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
CG02_0.1	08-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
CG07_0.1	08-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
CG09_0.1	08-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
CG12_0.1	08-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
FB03_0.1	08-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
FB05_0.1	08-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
MY01_0.1	09-Apr-20	0.1	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	
PG02_0.1	09-Apr-20	0.1	< 0.5	< 0.5	< 0.5	< 0.05	< 0.05	< 0.05	-	-	-	< 0.05	-	-	-	-	< 0.1	< 0.05	< 0.05	-	
PV07_0.7	08-Apr-20	0.7	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	< 0.1	< 0.05	< 0.05	-	

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram
DDT - Dichlorodiphenyltrichloroethane
2,4,5-T - 2,4,5-Trichlorophenoxyacetic acid
MCPA - 2-methyl-4-chlorophenoxyacetic acid
DDE - Dichlorodiphenyldichloroethylene
DDD - Dichlorodiphenyldichloroethane

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 6
Soil Analytical Data - Pesticides
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Pesticides																			
			Endrin	Endrin aldehyde	Endrin ketone	Dieldrin	Heptachlor	Hexachlorobenzene	Hexachlorocyclopentadiene	Hexachloroethane	MCPA	Mecoprop	Methoxychlor	Mirex	Oxychlordane	Picloram	Toxaphene	Sum of Aldrin + Dieldrin	Sum of DDD + DDE + DDT	Sum of other Organochlorine pesticides	Total Organochlorine Pesticides	Azinphos methyl
LOR			0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.5	0.5	0.05	0.01	0.05	0.5	1.0	0.05	0.05	0.1	0.1	0.2
Units			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
HIL C - Recreational (NEPM 2013)			20	--	--	--	10	10	--	--	800	--	400	20	--	5,700	30	10	400	--	--	--
EIL - Urban Residential/Public Open Space (NEPM 2013)			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	Start Depth (m)																				
SS03	30-Oct-19	0.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	-	-	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	-	-	-
SS09	30-Oct-19	0.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	-	-	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	-	-	-
SS11	30-Oct-19	0.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	-	-	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	-	-	-
SS15	30-Oct-19	0.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	-	-	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	-	-	-
SS22	30-Oct-19	0.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	-	-	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	-	-	-
SS28	30-Oct-19	0.0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1	-	-	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	-	-	-
BS10_0.1	08-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	-
CG02_0.1	08-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	< 0.2
CG07_0.1	08-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	< 0.2
CG09_0.1	08-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	< 0.2
CG12_0.1	08-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	< 0.2
FB03_0.1	08-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	-
FB05_0.1	08-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	-
MY01_0.1	09-Apr-20	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	-
PG02_0.1	09-Apr-20	0.1	< 0.05	-	-	< 0.05	< 0.05	< 0.05	-	-	< 0.5	< 0.5	< 0.05	< 0.01	-	< 0.5	< 1.0	-	-	-	-	-
PV07_0.7	08-Apr-20	0.7	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	-	-	-	< 0.05	-	-	-	< 1.0	< 0.05	< 0.05	< 0.1	< 0.1	-

Notes:
-- Not analysed

< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram
DDT - Dichlorodiphenyltrichloroethane
2,4,5-T - 2,4,5-Trichlorophenoxyacetic acid
MCPA - 2-methyl-4-chlorophenoxyacetic acid
DDE - Dichlorodiphenyldichloroethylene
DDD - Dichlorodiphenyldichloroethane

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 6
Soil Analytical Data - Pesticides
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Organophosphorus Pesticides																					
			Bolstar	Chlorfenvinphos	Chlorpyriphos	Chlorpyriphos-methyl	Coumaphos	Demeton-S	Demeton-O	Disulfoton	Diazinon	Dichlorvos	Dimethoate	EPN	Ethion	Ethoprop	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Mevinphos	Monocrotophos	
LOR			0.2	0.2	0.2	0.2	2.0	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	
Units			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
HIL C - Recreational (NEPM 2013)			--	--	250	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
EIL - Urban Residential/Public Open Space (NEPM 2013)			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Sample Name	Sample Date	Start Depth (m)																						
SS03	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SS09	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SS11	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SS15	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SS22	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
SS28	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
BS10_0.1	08-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
CG02_0.1	08-Apr-20	0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 2.0	< 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		
CG07_0.1	08-Apr-20	0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 2.0	< 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		
CG09_0.1	08-Apr-20	0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 2.0	< 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		
CG12_0.1	08-Apr-20	0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 2.0	< 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		
FB03_0.1	08-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
FB05_0.1	08-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MY01_0.1	09-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
PG02_0.1	09-Apr-20	0.1	-	-	< 0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
PV07_0.7	08-Apr-20	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Notes:
- - Not analysed

< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram
DDT - Dichlorodiphenyltrichloroethane
2,4,5-T - 2,4,5-Trichlorophenoxyacetic acid
MCPA - 2-methyl-4-chlorophenoxyacetic acid
DDE - Dichlorodiphenyldichloroethylene
DDD - Dichlorodiphenyldichloroethane

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 6
Soil Analytical Data - Pesticides
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte															
			Omethoate	Parathion	Parathion-methyl	Phorate	Pirimiphos-methyl	Ronnel	Terbufos	Tetrachlorvinphos	Trichloronate	Atrazine	Bifenthrin	Naled	Pyrazophos
LOR			2.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.05	0.2	0.2	0.2
Units			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
HIL C - Recreational (NEPM 2013)			--	--	--	--	--	--	--	--	400	730	--	--	--
EIL - Urban Residential/Public Open Space (NEPM 2013)			--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	Start Depth (m)													
SS03	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SS09	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SS11	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SS15	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SS22	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
SS28	30-Oct-19	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
BS10_0.1	08-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
CG02_0.1	08-Apr-20	0.1	< 2.0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-	-	< 0.2	< 0.2
CG07_0.1	08-Apr-20	0.1	< 2.0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-	-	< 0.2	< 0.2
CG09_0.1	08-Apr-20	0.1	< 2.0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-	-	< 0.2	< 0.2
CG12_0.1	08-Apr-20	0.1	< 2.0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-	-	< 0.2	< 0.2
FB03_0.1	08-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
FB05_0.1	08-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
MY01_0.1	09-Apr-20	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
PG02_0.1	09-Apr-20	0.1	-	-	-	-	-	-	-	-	-	< 0.2	< 0.05	-	-
PV07_0.7	08-Apr-20	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
- - Not analysed

< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram
DDT - Dichlorodiphenyltrichloroethane
2,4,5-T - 2,4,5-Trichlorophenoxyacetic acid
MCPA - 2-methyl-4-chlorophenoxyacetic acid
DDE - Dichlorodiphenyldichloroethylene
DDD - Dichlorodiphenyldichloroethane

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 7
Soil Analytical Data - Phenols
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Phenolic Compounds (Non-Chlorinated)										Phenolic Compounds (Chlorinated)									
			Phenol	2-Methylphenol (o-Cresol)	3- & 4-Methylphenol (m&p cresol)	2-Nitrophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	4-Nitrophenol	Dinoseb	2-Cyclohexyl-4,6-dinitrophenol	4,6-Dinitro-2-methylphenol	Non-Halogenated Phenols (Sum of total)	2-Chlorophenol	4-Chloro-3-methylphenol	2,4-Dichlorophenol	2,6-Dichlorophenol	2,4,6-Trichlorophenol	2,4,5-Trichlorophenol	Tetrachlorophenols (Sum of total)	Pentachlorophenol	Halogenated Phenols (Sum of total)
LOR			0.5	0.2	0.4	1.0	0.5	5.0	5.0	20	20	5.0	20	0.5	1.0	0.5	0.5	1.0	1.0	10	1.0	1.0
Units			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
HIL C - Recreational (NEPM 2013)			40,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	120	--
Sample Name	Sample Date	Start Depth (m)																				
SS03	30-Oct-19	0.0	< 0.5	-	-	< 0.5	< 0.5	< 30	< 0.5	< 10	< 30	< 10	< 30	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
SS09	30-Oct-19	0.0	< 0.5	-	-	< 0.5	< 0.5	< 30	< 0.5	< 10	< 30	< 10	< 30	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
SS11	30-Oct-19	0.0	< 0.5	-	-	< 0.5	< 0.5	< 30	< 0.5	< 10	< 30	< 10	< 30	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
SS15	30-Oct-19	0.0	< 0.5	-	-	< 0.5	< 0.5	< 30	< 0.5	< 10	< 30	< 10	< 30	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
SS22	30-Oct-19	0.0	< 0.5	-	-	< 0.5	< 0.5	< 30	< 0.5	< 10	< 30	< 10	< 30	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
SS28	30-Oct-19	0.0	< 0.5	-	-	< 0.5	< 0.5	< 30	< 0.5	< 10	< 30	< 10	< 30	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
BS10_0.1	08-Apr-20	0.1	< 0.5	< 0.2	< 0.4	< 1.0	< 0.5	< 5.0	< 5.0	< 20	< 20	< 5.0	< 20	< 0.5	< 1.0	< 0.5	< 0.5	< 1.0	< 1.0	< 10	< 1.0	< 1.0
FB03_0.1	08-Apr-20	0.1	< 0.5	< 0.2	< 0.4	< 1.0	< 0.5	< 5.0	< 5.0	< 20	< 20	< 5.0	< 20	< 0.5	< 1.0	< 0.5	< 0.5	< 1.0	< 1.0	< 10	< 1.0	< 1.0
FB05_0.1	08-Apr-20	0.1	< 0.5	< 0.2	< 0.4	< 1.0	< 0.5	< 5.0	< 5.0	< 20	< 20	< 5.0	< 20	< 0.5	< 1.0	< 0.5	< 0.5	< 1.0	< 1.0	< 10	< 1.0	< 1.0
MY01_0.1	09-Apr-20	0.1	< 0.5	< 0.2	< 0.4	< 1.0	< 0.5	< 5.0	< 5.0	< 20	< 20	< 5.0	< 20	< 0.5	< 1.0	< 0.5	< 0.5	< 1.0	< 1.0	< 10	< 1.0	< 1.0
PG02_0.1	09-Apr-20	0.1	< 0.5	< 0.2	< 0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 1.0	-
PV07_0.7	08-Apr-20	0.7	< 0.5	< 0.2	< 0.4	< 1.0	< 0.5	< 5.0	< 5.0	< 20	< 20	< 5.0	< 20	< 0.5	< 1.0	< 0.5	< 0.5	< 1.0	< 1.0	< 10	< 1.0	< 1.0

Notes:
-- Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram

Criteria:
National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013).

Table 8
Soil Analytical Data - VOCs
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Halogenated Aliphatic Compounds											
			1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2-Dibromo-3-chloropropane	1,2-Dichloroethane	1,2,3-Trichloropropane	1,3-Dichloropropane	Bromomethane
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample Name	Sample Date	Start Depth (m)												
SS03	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS09	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS11	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS15	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS22	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS28	30-Oct-19	0.0	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
BS10_0.1	08-Apr-20	0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5
FB03_0.1	08-Apr-20	0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5
FB05_0.1	08-Apr-20	0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5
MY01_0.1	09-Apr-20	0.1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5
PV07_0.7	08-Apr-20	0.7	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	< 0.5	< 0.5	< 0.5	< 0.5

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram

Table 8
Soil Analytical Data - VOCs
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte				Volatile Halogenated Compounds	Halogenated Aliphatic Compounds					Volatile Halogenated Compounds	Halogenated Aliphatic Compounds	Volatile Halogenated Compounds	Halogenated Aliphatic Compounds	Volatile Halogenated Compounds	Halogenated Aliphatic Compounds	Volatile Halogenated Compounds					
			Bromochloromethane	Carbon tetrachloride	Chloroethane	Chloromethane	cis-1,2-Dichloroethene	Dibromomethane	Dichlorodifluoromethane	Dichloromethane	Hexachlorobutadiene	Iodomethane	Tetrachloroethene	trans-1,2-Dichloroethene	Trichloroethene	Trichlorofluoromethane	Vinyl chloride	1,2,4-Trichlorobenzene	1,2,3,5-Tetrachlorobenzene	1,2,3-Trichlorobenzene	1,2,4,5-Tetrachlorobenzene
Units			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
Sample Name	Sample Date	Start Depth (m)																			
SS03	30-Oct-19	0.0	< 0.5	< 0.5	-	-	< 0.5	< 0.5	-	< 1.0	< 0.1	-	< 0.5	< 0.5	< 0.5	< 2.0	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
SS09	30-Oct-19	0.0	< 0.5	< 0.5	-	-	< 0.5	< 0.5	-	< 1.0	< 0.1	-	< 0.5	< 0.5	< 0.5	< 2.0	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
SS11	30-Oct-19	0.0	< 0.5	< 0.5	-	-	< 0.5	< 0.5	-	< 1.0	< 0.1	-	< 0.5	< 0.5	< 0.5	< 2.0	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
SS15	30-Oct-19	0.0	< 0.5	< 0.5	-	-	< 0.5	< 0.5	-	< 1.0	< 0.1	-	< 0.5	< 0.5	< 0.5	< 2.0	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
SS22	30-Oct-19	0.0	< 0.5	< 0.5	-	-	< 0.5	< 0.5	-	< 1.0	< 0.1	-	< 0.5	< 0.5	< 0.5	< 2.0	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
SS28	30-Oct-19	0.0	< 0.5	< 0.5	-	-	< 0.5	< 0.5	-	< 1.0	< 0.1	-	< 0.5	< 0.5	< 0.5	< 2.0	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
BS10_0.1	08-Apr-20	0.1	< 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	-	-	-
FB03_0.1	08-Apr-20	0.1	< 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	-	-	-
FB05_0.1	08-Apr-20	0.1	< 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	-	-	-
MY01_0.1	09-Apr-20	0.1	< 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	-	-	-
PV07_0.7	08-Apr-20	0.7	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram

Table 8
Soil Analytical Data - VOCs
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Chlorinated MAHs								Volatile Halogenated Compounds	Chlorinated MAHs				Monocyclic Aromatic Hydrocarbons			Monocyclic Aromatic Hydrocarbons (MAH)	Monocyclic Aromatic Hydrocarbons	
			1,3,5-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2-Chlorotoluene	4-Chlorotoluene	Benzyl chloride	Bromobenzene	Chlorobenzene	Pentachlorobenzen e	1,2,3,4-Tetrachlorobenzen e	Benzal chloride	Benzotrichloride	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Isopropylbenzene	Styrene	Sum of monocyclic aromatic hydrocarbons	Sum of other chlorinated hydrocarbons
Units			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
Sample Name	Sample Date	Start Depth (m)																			
SS03	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	-	< 0.5	< 0.5	-	-
SS09	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	-	< 0.5	< 0.5	-	-
SS11	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	-	< 0.5	< 0.5	-	-
SS15	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	-	< 0.5	< 0.5	-	-
SS22	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	-	< 0.5	< 0.5	-	-
SS28	30-Oct-19	0.0	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.5	< 0.1	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.5	-	< 0.5	< 0.5	-	-
BS10_0.1	08-Apr-20	0.1	-	< 0.5	< 0.5	< 0.5	-	< 0.5	-	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
FB03_0.1	08-Apr-20	0.1	-	< 0.5	< 0.5	< 0.5	-	< 0.5	-	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
FB05_0.1	08-Apr-20	0.1	-	< 0.5	< 0.5	< 0.5	-	< 0.5	-	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
MY01_0.1	09-Apr-20	0.1	-	< 0.5	< 0.5	< 0.5	-	< 0.5	-	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
PV07_0.7	08-Apr-20	0.7	-	< 0.5	< 0.5	< 0.5	-	< 0.5	-	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram

Table 8
Soil Analytical Data - VOCs
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Volatile Halogenated Compounds	Trihalomethanes		Volatile Halogenated Compounds	Trihalomethanes	Solvents		Fumigants							
			Sum of volatile chlorinated hydrocarbons	Bromodichloromethane	Bromoform	Chloroform	Dibromochloromethane	2-Butanone (MEK)	4-Methyl-2-pentanone (MIBK)	Acetone	Allyl chloride	1,2-Dibromoethane	1,2-Dichloropropane	2,2-Dichloropropane	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Carbon disulfide
Units			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
Sample Name	Sample Date	Start Depth (m)	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS03	30-Oct-19	0.0	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS09	30-Oct-19	0.0	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS11	30-Oct-19	0.0	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS15	30-Oct-19	0.0	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS22	30-Oct-19	0.0	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
SS28	30-Oct-19	0.0	-	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-
BS10_0.1	08-Apr-20	0.1	< 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
FB03_0.1	08-Apr-20	0.1	< 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
FB05_0.1	08-Apr-20	0.1	< 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
MY01_0.1	09-Apr-20	0.1	< 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
PV07_0.7	08-Apr-20	0.7	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	< 0.5	< 0.5

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/kg - Milligrams per kilogram

Table 9
Quality Control Sample Analysis - Metals
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals							
			Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Nickel	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample Name	Sample Date	Sample Type								
OG36_0.6_06042020	06-Apr-20	Primary	5.1	< 0.4	27	12	-	33	11	23
QC01_06042020	06-Apr-20	Duplicate	5.0	< 0.4	33	12	-	31	14	29
Relative Percentage Difference			2%	NC	20%	0%	NC	6%	24%	23%
OG36_0.6_06042020	06-Apr-20	Primary	5.1	< 0.4	27	12	-	33	11	23
QC02_06042020	06-Apr-20	Triplicate	10	< 1.0	27	11	-	46	12	18
Relative Percentage Difference			65%	NC	0%	9%	NC	33%	9%	24%
OG04_0.1_06042020	06-Apr-20	Primary	4.2	< 0.4	26	14	-	130	11	22
QC03_06042020	06-Apr-20	Duplicate	3.7	< 0.4	30	14	-	83	13	26
Relative Percentage Difference			13%	NC	14%	0%	NC	44%	17%	17%
OG04_0.1_06042020	06-Apr-20	Primary	4.2	< 0.4	26	14	-	130	11	22
QC04_06042020	06-Apr-20	Triplicate	6.0	< 1.0	26	14	-	56	11	19
Relative Percentage Difference			35%	NC	0%	0%	NC	80%	0%	15%
OG26_0.1_07042020	07-Apr-20	Primary	4.5	< 0.4	20	7.5	-	42	10	42
QC08_07042020	07-Apr-20	Duplicate	4.0	< 0.4	21	7.4	-	98	11	47
Relative Percentage Difference			12%	NC	5%	1%	NC	80%	10%	11%
OG26_0.1_07042020	07-Apr-20	Primary	4.5	< 0.4	20	7.5	-	42	10	42
QC09_07042020	07-Apr-20	Triplicate	5.0	< 1.0	18	7.0	-	45	10	38
Relative Percentage Difference			11%	NC	11%	7%	NC	7%	0%	10%
OG20_0.4_07042020	07-Apr-20	Primary	6.8	< 0.4	47	12	-	50	14	20
QC10_07042020	07-Apr-20	Duplicate	5.8	< 0.4	40	12	-	72	15	20
Relative Percentage Difference			16%	NC	16%	0%	NC	36%	7%	0%
OG20_0.4_07042020	07-Apr-20	Primary	6.8	< 0.4	47	12	-	50	14	20
QC11_07042020	07-Apr-20	Triplicate	6.0	< 1.0	34	11	-	49	13	14
Relative Percentage Difference			13%	NC	32%	9%	NC	2%	7%	35%
CG03_0.1_08042020	08-Apr-20	Primary	< 2.0	< 0.4	14	< 5.0	-	9.4	< 5.0	15
QC15_08042020	08-Apr-20	Duplicate	< 2.0	< 0.4	13	< 5.0	-	10	< 5.0	14
Relative Percentage Difference			NC	NC	7%	NC	NC	6%	NC	7%
CG03_0.1_08042020	08-Apr-20	Primary	< 2.0	< 0.4	14	< 5.0	-	9.4	< 5.0	15
QC16_08042020	08-Apr-20	Triplicate	< 5.0	< 1.0	14	< 5.0	-	9.0	4.0	11
Relative Percentage Difference			NC	NC	0%	NC	NC	4%	22%	31%
CG02_0.5_08042020	08-Apr-20	Primary	3.4	< 0.4	36	16	-	21	29	42
QC17_08042020	08-Apr-20	Duplicate	3.0	< 0.4	34	14	-	19	31	36
Relative Percentage Difference			13%	NC	6%	13%	NC	10%	7%	15%
CG02_0.5_08042020	08-Apr-20	Primary	3.4	< 0.4	36	16	-	21	29	42
QC18_08042020	08-Apr-20	Triplicate	< 5.0	< 1.0	30	14	-	21	22	24
Relative Percentage Difference			38%	NC	18%	13%	NC	0%	27%	55%
PG01_0.1_09042020	09-Apr-20	Primary	5.7	< 0.4	35	13	-	17	25	46
QC23_09042020	09-Apr-20	Duplicate	8.3	< 0.4	62	13	-	18	26	43
Relative Percentage Difference			37%	NC	56%	0%	NC	6%	4%	7%
PG01_0.1_09042020	09-Apr-20	Primary	5.7	< 0.4	35	13	-	17	25	46
QC24_09042020	09-Apr-20	Triplicate	10	< 1.0	35	10	-	17	19	38
Relative Percentage Difference			55%	NC	0%	26%	NC	0%	27%	19%
OG53_0.1_09042020	09-Apr-20	Primary	12	< 0.4	37	13	23,000	81	18	27
QC25_09042020	09-Apr-20	Duplicate	4.5	< 0.4	26	13	-	21	13	21
Relative Percentage Difference			91%	NC	35%	0%	NC	118%	32%	25%
OG53_0.1_09042020	09-Apr-20	Primary	12	< 0.4	37	13	23,000	81	18	27
QC26_09042020	09-Apr-20	Triplicate	6.0	< 1.0	33	13	-	24	16	24
Relative Percentage Difference			67%	NC	11%	0%	NC	109%	12%	12%
SD01_09042020	09-Apr-20	Primary	7.8	< 0.4	17	10	-	16	11	39
QC27_09042020	09-Apr-20	Duplicate	3.6	< 0.4	11	< 5.0	-	12	7.5	24
Relative Percentage Difference			74%	NC	43%	67%	NC	29%	38%	48%
SD01_09042020	09-Apr-20	Primary	7.8	< 0.4	17	10	-	16	11	39
QC28_09042020	09-Apr-20	Triplicate	35	< 1.0	14	6.0	-	14	12	65
Relative Percentage Difference			127%	NC	19%	50%	NC	13%	9%	50%

Notes:
 - - Not analysed
 < - Less than laboratory limit of reporting
 NC - Not calculated
 mg/kg - Milligrams per kilogram
 RPD - Relative Percentage Difference

Criteria:

Table 9A
Quality Control Sample Analysis - Metals
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals
			Lead
Units			mg/kg
Sample Name	Sample Date	Sample Type	
SB07_0.1_05012021	05-Jan-21	Primary	35
QC01_0.1_05012021	05-Jan-21	Duplicate	34
Relative Percentage Difference			3%
SB07_0.1_05012021	05-Jan-21	Primary	35
QC02_0.1_05012021	05-Jan-21	Triplicate	32
Relative Percentage Difference			9%

Notes:
mg/kg - Milligrams per kilogram

Notes:
 - - Not analysed
 < - Less than laboratory limit of reporting
 LOR - Laboratory limit of reporting
 NC - Not calculated
 mg/kg - Milligrams per kilogram
 RPD - Relative Percentage Difference

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Notes:
 - - Not analysed
 < - Less than laboratory limit of reporting
 LOR - Laboratory limit of reporting
 NC - Not calculated
 mg/kg - Milligrams per kilogram

Table 11
Quality Control Sample Analysis - BTEXN, TRH
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			BTEXN							Total Petroleum Hydrocarbons	Total Recoverable Hydrocarbons	
			Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Naphthalene	C ₆ - C ₉	C ₆ - C ₁₀	C ₆ - C ₁₀ minus BTEX (F1)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type										
QC20_06042020	06-Apr-20	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.002	< 0.001	< 0.003	< 0.01	< 0.02	< 0.02	< 0.02
QC30_09042020	09-Apr-20	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.002	< 0.001	< 0.003	< 0.01	< 0.02	< 0.02	< 0.02

Notes:
< - Less than laboratory limit of reporting
mg/L - Milligrams per litre
BTEXN - Benzene, toluene, ethylbenzene, total xylenes, naphthalene

Table 12
Quality Control Sample Analysis - Metals
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals						
			Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type							
QC07_06042020	06-Apr-20	Rinsate	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
QC19_06042020	06-Apr-20	Rinsate	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
QC14_07042020	07-Apr-20	Rinsate	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
QC29_09042020	09-Apr-20	Rinsate	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005

Notes:
< - Less than laboratory limit of reporting
mg/L - Milligrams per litre

Table 13
Quality Control Sample Analysis - PAHs
Glenlyon Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Polycyclic Aromatic Hydrocarbons																
			Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Chrysene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene	Total PAH
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type																	
QC07_06042020	06-Apr-20	Rinsate	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
QC19_06042020	06-Apr-20	Rinsate	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
QC14_07042020	07-Apr-20	Rinsate	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
QC29_09042020	09-Apr-20	Rinsate	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Notes:
< - Less than laboratory limit of reporting
mg/L - Milligrams per litre

Inputs	
Select contaminant from list below	
As	
Below needed to calculate fresh and aged ACLs	
Below needed to calculate fresh and aged ABCs	
or for fresh ABCs only	
or for aged ABCs only	

Outputs		
Land use	Arsenic generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	20	40
Urban residential and open public spaces	50	100
Commercial and industrial	80	160

Inputs	
Select contaminant from list below	
DDT	
Below needed to calculate fresh and aged ACLs	
Below needed to calculate fresh and aged ABCs	
or for fresh ABCs only	
or for aged ABCs only	

Outputs		
Land use	DDT generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	3	3
Urban residential and open public spaces	180	180
Commercial and industrial	640	640

Inputs	
Select contaminant from list below	
Naphthalene	
Below needed to calculate fresh and aged ACLs	
Below needed to calculate fresh and aged ABCs	
or for fresh ABCs only	
or for aged ABCs only	

Outputs		
Land use	Naphthalene generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	10	10
Urban residential and open public spaces	170	170
Commercial and industrial	370	370

Inputs	
Select contaminant from list below	
Pb	
Below needed to calculate fresh and aged ACLs	
Below needed to calculate fresh and aged ABCs	
or for fresh ABCs only	
or for aged ABCs only	

Outputs		
Land use	Lead generic EILs	
	(mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	110	470
Urban residential and open public spaces	270	1100
Commercial and industrial	440	1800

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)	
8.55	
Enter soil pH (calcium chloride method) (values from 1 to 14)	
5.25	
Enter organic carbon content (%OC) (values from 0 to 50%)	
2.5	
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	
7	
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	45	45
Urban residential and open public spaces	75	120
Commercial and industrial	100	170

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)	
8.55	
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	
7	
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	30	25
Urban residential and open public spaces	60	120
Commercial and industrial	100	200

Inputs	
Select contaminant from list below	
Cr_III	
Below needed to calculate fresh and aged ACLs	
Enter % clay (values from 0 to 100%)	
18.5	
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	
7	
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	140	170
Urban residential and open public spaces	270	500
Commercial and industrial	400	820

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)	
8.55	
Enter soil pH (calcium chloride method) (values from 1 to 14)	
5.25	
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	
7	
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	55	90
Urban residential and open public spaces	120	260
Commercial and industrial	170	390

Table 15
Groundwater Analytical Data - Inorganics
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Anions and Cations												Alkalinity				Inorganics	
			Sodium	Calcium	Magnesium	Potassium	Sulphate	Chloride	Total Phosphorus	Nitrite as N	Nitrate as N	Ammonia as N	Total Nitrogen as N	Total Kjeldahl Nitrogen as N	Nitrogen	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Hydroxide Alkalinity as CaCO3	Total Alkalinity as CaCO3	Total Dissolved Solids
LOR			0.5	0.5	0.5	0.5	5.0	1.0	0.01	0.02	0.02	0.01	0.05	0.2	0.2	20	10	20	20	10
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Water Dependent Ecosystems and species - 95% Freshwater			--	--	--	--	--	--	--	--	--	0.9	--	--	--	--	--	--	--	--
Drinking Water - Health (NHRMC 2016)			--	--	--	--	500	--	--	--	--	--	--	--	--	--	--	--	--	--
Stock Watering (ANZECC 2000)			--	--	--	--	1,000	--	--	--	400	--	--	--	--	--	--	--	--	2,500
Risks in Recreational Water X10 (NHMRC 2008)			--	--	--	--	5,000	--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	SWL (mBTC)																		
MW01	08-Apr-20	5.961	106	52	20	7.5	140	130	0.01	0.06	0.17	0.06	0.23	0.5	0.73	150	< 10	< 20	150	550
	27-Jul-21	0.429	30	< 1.0	6.0	< 1.0	21	24	0.1	< 0.01	0.52	-	1.0	0.5	-	42	< 1.0	< 1.0	42	252
MW02	08-Apr-20	0.703	350	180	170	14	27	110	0.02	< 0.02	0.05	0.42 *	0.6 *	0.4	0.46	1,800	< 10	< 20	2,600	2,200
	27-Jul-21	0.000	311	164	183	16	< 1.0	50	0.14	< 0.01	0.02	-	0.6	0.6	-	2,270	< 1.0	< 1.0	2,270	2,120
MW03	08-Apr-20	2.137	190	62	72	4.1	29	400	0.01	< 0.02	0.36	< 0.01	0.38	0.4	0.78	360	< 10	< 20	760	1,100
	27-Jul-21	0.100	206	62	91	4.0	20	375	0.02	< 0.01	0.36	-	0.5	0.1	-	632	< 1.0	< 1.0	632	1,030
MW04	08-Apr-20	3.203	250	100	140	7.3	39	120	0.01	< 0.02	0.13	0.03	0.14	< 0.2	< 0.2	1,100	< 10	< 20	1,500	1,600
	27-Jul-21	0.621	242	85	102	8.0	24	113	0.15	0.02	0.04	-	1.1	1.0	-	1,170	< 1.0	< 1.0	1,170	1,290
MS01	09-Apr-20	-	360	230	200	15	26	58	0.02	< 0.02	< 0.02	0.19	< 0.05	< 0.2	< 0.2	2,300	< 10	< 20	2,300	1,700

Notes:
-- Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/L - Milligrams per litre
Bold indicates a detection above the laboratory limit of reporting
"*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
RPD - Relative Percentage Difference

Criteria:
Water Quality Australia - Low Reliability Trigger Values (for toluene and ethylbenzene) for Freshwater (Water Quality Guidelines 2018).
National Health and Medical Research Council (NHMRC) - National Water Quality Management Strategy: Australian Drinking Water Guidelines (2016).
Australian and New Zealand Environment and Conservation Council (ANZECC) - Australian and New Zealand Guidelines for Freshwater and Stock Watering Quality, and Irrigation Trigger Value for long term use (LTV) (2000).
National Health and Medical Research Council (NHMRC) - Guidelines for Managing Risks in Recreational Water (multiplication factor of 10 applied) (2008).

Table 16
Groundwater Analytical Data - Metals
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals						
			Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
LOR			0.001	0.0002	0.001	0.001	0.001	0.001	0.005
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Water Dependent Ecosystems and species - 95% Freshwater			0.024	0.0002	--	0.0014	0.0034	0.011	0.008
Drinking Water - Health (NHRMC 2016)			0.01	0.002	--	2.0	0.01	0.02	--
Irrigation (LTV) (ANZECC 2000)			0.1	0.01	0.1	0.2	2.0	0.2	2.0
Stock Watering (ANZECC 2000)			0.5	0.01	1.0	1.0	0.1	1.0	20
Risks in Recreational Water X10 (NHMRC 2008)			0.1	0.02	--	20	0.1	0.2	--
Sample Name	Sample Date	SWL (mBTC)							
MW01	08-Apr-20	5.961	0.001	< 0.0002	0.01	0.012	< 0.001	0.013	0.06
	27-Jul-21	0.429	< 0.001	< 0.0001	< 0.001	0.008	< 0.001	0.016	0.055
MW02	08-Apr-20	0.703	0.001	< 0.0002	< 0.001	0.011 *	< 0.001	0.13	0.095
	27-Jul-21	0.000	0.002	< 0.0001	< 0.001	0.013	< 0.001	0.018	0.135
MW03	08-Apr-20	2.137	< 0.001	< 0.0002	< 0.001	0.013	< 0.001	0.12	0.13
	27-Jul-21	0.100	< 0.001	0.0001	< 0.001	0.005	< 0.001	0.143	0.044
MW04	08-Apr-20	3.203	0.002	< 0.0002	< 0.001	0.015	< 0.001	0.16	0.061
	27-Jul-21	0.621	0.002	< 0.0001	0.001	0.01	0.003	0.012	0.034
MS01	09-Apr-20	-	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
mg/L - Milligrams per litre
Bold indicates a detection above the laboratory limit of reporting
"*" denotes duplicate/triplicate sample result adopted for analytical use due to RPD >50%
Highlighting indicates an exceedance of the corresponding criteria (highlighting corresponds to the guideline with the highest criteria value where analytical result exceeds more than one guideline)
RPD - Relative Percentage Difference

Criteria:
Water Quality Australia - Low Reliability Trigger Values (for toluene and ethylbenzene) for Freshwater (Water Quality Guidelines 2018).
National Health and Medical Research Council (NHMRC) - National Water Quality Management Strategy: Australian Drinking Water Guidelines (2016).
Australian and New Zealand Environment and Conservation Council (ANZECC) - Australian and New Zealand Guidelines for Freshwater and Stock Watering Quality, and Irrigation Trigger Value for long term use (LTV) (2000).
National Health and Medical Research Council (NHMRC) - Guidelines for Managing Risks in Recreational Water (multiplication factor of 10 applied) (2008).

Table 17
Groundwater Analytical Data - PAHs
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Polycyclic Aromatic Hydrocarbons																
			Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Chrysene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene	Total PAH
LOR			0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Water Dependent Ecosystems and species - 95% Freshwater			0.016	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Drinking Water - Health (NHRMC 2016)			--	--	--	--	--	--	--	--	--	--	--	0.00001	--	--	--	--	--
Stock Watering (ANZECC 2000)			--	--	--	--	--	--	--	--	--	--	--	0.00001	--	--	--	--	--
Risks in Recreational Water X10 (NHMRC 2008)			--	--	--	--	--	--	--	--	--	--	--	0.0001	--	--	--	--	--
Sample Name	Sample Date	SWL (mBTOC)																	
MW01	08-Apr-20	5.961	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
	27-Jul-21	0.429	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005
MW02	08-Apr-20	0.703	< 0.00001	< 0.00001	< 0.00001	0.00001	0.00002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00003
	27-Jul-21	0.000	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005
MW03	08-Apr-20	2.137	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
	27-Jul-21	0.100	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005
MW04	08-Apr-20	3.203	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
	27-Jul-21	0.621	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
mg/L - Milligrams per litre

Criteria:
Water Quality Australia - Low Reliability Trigger Values (for toluene and ethylbenzene) for Freshwater (Water Quality Guidelines 2018).
National Health and Medical Research Council (NHMRC) - National Water Quality Management Strategy: Australian Drinking Water Guidelines (2016).
Australian and New Zealand Environment and Conservation Council (ANZECC) - Australian and New Zealand Guidelines for Freshwater and Stock Watering Quality, and Irrigation Trigger Value for long term use (LTV) (2000).
National Health and Medical Research Council (NHMRC) - Guidelines for Managing Risks in Recreational Water (multiplication factor of 10 applied) (2008).



Analyte			Anions and Cations																Alkalinity					Inorganics
			Sodium	Calcium	Magnesium	Potassium	Sulphate	Chloride	Total Phosphorus	Nitrite as N	Nitrate as N	Nitrite + Nitrate as N	Ammonia as N	Total Nitrogen as N	Total Kjeldahl Nitrogen as N	Nitrogen	Total Cations	Total Anions	Ionic Balance	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Hydroxide Alkalinity as CaCO3	Total Alkalinity as CaCO3	Total Dissolved Solids
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	
Sample Name	Sample Date	Sample Type																						
RB_08042020	08-Apr-20	Rinsate	< 0.5	< 0.5	< 0.5	< 0.5	< 5.0	< 1.0	< 0.01	< 0.02	< 0.02	-	< 0.01	< 0.05	< 0.2	< 0.2	-	-	-	< 20	< 10	< 20	< 20	< 10
MW02_08042020	08-Apr-20	Primary	350	180	170	14	27	110	0.02	< 0.02	0.05	-	0.2	0.06	0.4	0.46	-	-	-	1,800	< 10	< 20	2,600	2,200
QC01_08042020	08-Apr-20	Duplicate	340	180	160	14	41	100	0.02	< 0.02	0.05	-	0.17	0.06	0.4	0.46	-	-	-	1,600	< 10	< 20	2,700	2,200
Relative Percentage Difference			3%	0%	6%	0%	41%	10%	0%	NC	0%	NC	16%	0%	0%	NC	NC	NC	NC	12%	NC	NC	4%	0%
MW02_08042020	08-Apr-20	Primary	350	180	170	14	27	110	0.02	< 0.02	0.05	-	0.2	0.06	0.4	0.46	-	-	-	1,800	< 10	< 20	2,600	2,200
QC02_08042020	08-Apr-20	Triplicate	351	192	190	19	< 1.0	42	< 0.01	< 0.01	0.05	0.05	0.42	0.6	0.5	-	41	45	4.17	2,170	< 1.0	< 1.0	2,170	2,190
Relative Percentage Difference			0%	6%	11%	30%	186%	89%	67%	NC	0%	NC	71%	164%	22%	NC	NC	NC	NC	19%	NC	NC	18%	0%

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
NC - Not calculated
mg/L - Milligrams per litre
RPD - Relative Percentage Difference



Analyte			Metals						
			Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type							
RB_08042020	08-Apr-20	Rinsate	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
MW02_08042020	08-Apr-20	Primary	0.001	< 0.0002	< 0.001	0.006	< 0.001	0.13	0.095
QC01_08042020	08-Apr-20	Duplicate	0.001	< 0.0002	< 0.001	0.011	< 0.001	0.14	0.1
Relative Percentage Difference			0%	NC	NC	59%	NC	7%	5%
MW02_08042020	08-Apr-20	Primary	0.001	< 0.0002	< 0.001	0.006	< 0.001	0.13	0.095
QC02_08042020	08-Apr-20	Triplicate	0.001	< 0.0001	0.001	0.006	< 0.001	0.143	0.089
Relative Percentage Difference			0%	NC	0%	0%	NC	10%	7%
QC03_27072021	27-Jul-21	Rinsate	< 0.001	< 0.0001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
MW01_27072021	27-Jul-21	Primary	< 0.001	< 0.0001	< 0.001	0.008	< 0.001	0.016	0.055
QC01_27072021	27-Jul-21	Duplicate	< 0.001	< 0.0001	< 0.001	0.009	< 0.001	0.016	0.054
Relative Percentage Difference			NC	NC	NC	12%	NC	0%	2%
MW01_27072021	27-Jul-21	Primary	< 0.001	< 0.0001	< 0.001	0.008	< 0.001	0.016	0.055
QC02_27072021	27-Jul-21	Triplicate	< 0.001	< 0.0002	< 0.001	0.011	< 0.001	0.014	0.052
Relative Percentage Difference			NC	NC	NC	32%	NC	13%	6%

Notes:
< - Less than laboratory limit of reporting
NC - Not calculated
mg/L - Milligrams per litre
RPD - Relative Percentage Difference



Analyte			Polycyclic Aromatic Hydrocarbons											Polycyclic Aromatic Hydrocarbons				
			Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Chrysene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type																
RB_08042020	08-Apr-20	Rinsate	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
MW02_08042020	08-Apr-20	Primary	< 0.00001	< 0.00001	< 0.00001	0.00001	0.00002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00003
QC01_08042020	08-Apr-20	Duplicate	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Relative Percentage Difference			NC	NC	NC	196%	192%	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	188%
MW02_08042020	08-Apr-20	Primary	< 0.00001	< 0.00001	< 0.00001	0.00001	0.00002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00003
QC02_08042020	08-Apr-20	Triplicate	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	-	< 0.00001	< 0.00001	< 0.00005	< 0.001	< 0.001	< 0.0005
Relative Percentage Difference			NC	NC	NC	196%	192%	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	177%
QC03_27072021	27-Jul-21	Rinsate	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005
MW01_27072021	27-Jul-21	Primary	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005
QC01_27072021	27-Jul-21	Duplicate	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005
Relative Percentage Difference			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
MW01_27072021	27-Jul-21	Primary	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.00005
QC02_27072021	27-Jul-21	Triplicate	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Relative Percentage Difference			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
NC - Not calculated
µg/L - Micrograms per litre
mg/L - Milligrams per litre

Table 21
Quality Control Sample Analysis - BTEXN, TRH
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			BTEXN							Total Petroleum Hydrocarbons	Total Recoverable Hydrocarbons	
			Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Naphthalene	C ₆ - C ₉	C ₆ - C ₁₀	C ₆ - C ₁₀ minus BTEX (F1)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type										
TB_08042020	08-Apr-20	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.002	< 0.001	< 0.003	< 0.01	< 0.02	< 0.02	< 0.02

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
NC - Not calculated
mg/L - Milligrams per litre
BTEXN - Benzene, toluene, ethylbenzene, total xylenes, naphthalene

Table 22
Surface Water Analytical Data - Inorganics
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Anions and Cations												Alkalinity				Inorganics		
			Sodium	Calcium	Magnesium	Potassium	Sulphate	Chloride	Total Phosphorus	Nitrite as N	Nitrate as N	Ammonia as N	Total Nitrogen as N	Total Kjeldahl Nitrogen as N	Nitrogen	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Hydroxide Alkalinity as CaCO3	Total Alkalinity as CaCO3	Total Dissolved Solids	Total Suspended Solids
LOR			0.5	0.5	0.5	0.5	5.0	1.0	0.01	0.02	0.02	0.01	0.05	0.2	0.2	20	10	20	20	10	1.0
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Water Dependent Ecosystems and species - 95% Freshwater			--	--	--	--	--	--	--	--	--	0.9	--	--	--	--	--	--	--	--	--
Drinking Water - Health (NHRMC 2016)			--	--	--	--	500	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stock Watering (ANZECC 2000)			--	--	--	--	1,000	--	--	--	400	--	--	--	--	--	--	--	--	2,500	--
Risks in Recreational Water X10 (NHMRC 2008)			--	--	--	--	5,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Name	Sample Date	SWL (mBTOC)																			
DAM	09-Apr-20	-	13	7.6	6.5	0.6	< 5.0	17	0.02	< 0.02	< 0.02	0.08	< 0.05	0.3	0.3	81	< 10	< 20	81	230	-
SW01	09-Apr-20	-	14	3.9	3.8	1.2	< 5.0	20	0.01	< 0.02	< 0.02	0.01	< 0.05	1.3	1.3	51	< 10	< 20	51	200	12
SW02	09-Apr-20	-	14	4.0	3.8	1.2	< 5.0	55	0.02	< 0.02	< 0.02	< 0.01	< 0.05	0.3	0.3	54	< 10	< 20	54	150	15

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
LOR - Laboratory limit of reporting
mg/L - Milligrams per litre
Bold indicates a detection above the laboratory limit of reporting

Criteria:
Water Quality Australia - Low Reliability Trigger Values (for toluene and ethylbenzene) for Freshwater (Water Quality Guidelines 2018).
National Health and Medical Research Council (NHMRC) - National Water Quality Management Strategy: Australian Drinking Water Guidelines (2016).
Australian and New Zealand Environment and Conservation Council (ANZECC) - Australian and New Zealand Guidelines for Freshwater and Stock Watering Quality, and Irrigation Trigger Value for long term use (LTV) (2000).
National Health and Medical Research Council (NHMRC) - Guidelines for Managing Risks in Recreational Water (multiplication factor of 10 applied) (2008).

Table 23
Surface Water Analytical Data - Metals
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Metals						
			Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
LOR			0.001	0.0002	0.001	0.001	0.001	0.001	0.005
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Water Dependent Ecosystems and species - 95% Freshwater			0.024	0.0002	--	0.0014	0.0034	0.011	0.008
Drinking Water - Health (NHRMC 2016)			0.01	0.002	--	2.0	0.01	0.02	--
Irrigation (LTV) (ANZECC 2000)			0.1	0.01	0.1	0.2	2.0	0.2	2.0
Stock Watering (ANZECC 2000)			0.5	0.01	1.0	1.0	0.1	1.0	20
Risks in Recreational Water X10 (NHMRC 2008)			0.1	0.02	--	20	0.1	0.2	--
Sample Name	Sample Date	SWL (mBTC)							
DAM	09-Apr-20	-	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
SW01	09-Apr-20	-	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
SW02	09-Apr-20	-	< 0.001	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
mg/L - Milligrams per litre

Criteria:
Water Quality Australia - Low Reliability Trigger Values (for toluene and ethylbenzene) for Freshwater (Water Quality Guidelines 2018).
National Health and Medical Research Council (NHMRC) - National Water Quality Management Strategy: Australian Drinking Water Guidelines (2016).
Australian and New Zealand Environment and Conservation Council (ANZECC) - Australian and New Zealand Guidelines for Freshwater and Stock Watering Quality, and Irrigation Trigger Value for long term use (LTV) (2000).
National Health and Medical Research Council (NHMRC) - Guidelines for Managing Risks in Recreational Water (multiplication factor of 10 applied) (2008).

Table 24
Surface Water Analytical Data - PAHs
Glenlyon Recreation Reserve
Suttons Lane
Glenlyon, Victoria



Analyte			Polycyclic Aromatic Hydrocarbons															
			Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Chrysene	Benzo[a]anthracene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno[1,2,3-c,d]pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene
LOR			0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Water Dependent Ecosystems and species - 95% Freshwater			0.016	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Drinking Water - Health (NHRMC 2016)			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00001
Stock Watering (ANZECC 2000)			--	--	--	--	--	--	--	--	--	--	--	0.00001	--	--	--	--
Risks in Recreational Water X10 (NHMRC 2008)			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0001
Sample Name	Sample Date	SWL (mBTOC)																
SW01	09-Apr-20	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
SW02	09-Apr-20	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
mg/L - Milligrams per litre

Criteria:
Water Quality Australia - Low Reliability Trigger Values (for toluene and ethylbenzene) for Freshwater (Water Quality Guidelines 2018).
National Health and Medical Research Council (NHMRC) - National Water Quality Management Strategy: Australian Drinking Water Guidelines (2016).
Australian and New Zealand Environment and Conservation Council (ANZECC) - Australian and New Zealand Guidelines for Freshwater and Stock Watering Quality, and Irrigation Trigger Value for long term use (LTV) (2000).
National Health and Medical Research Council (NHMRC) - Guidelines for Managing Risks in Recreational Water (multiplication factor of 10 applied) (2008).



Analyte			BTEXN							Total Petroleum Hydrocarbons	Total Recoverable Hydrocarbons	
			Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Naphthalene	C ₆ - C ₉	C ₆ - C ₁₀	C ₆ - C ₁₀ minus BTEX (F1)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample Name	Sample Date	Sample Type										
QC30_09042020	09-Apr-20	Trip Blank	< 0.001	< 0.001	< 0.001	< 0.002	< 0.001	< 0.003	< 0.01	< 0.02	< 0.02	< 0.02

Notes:
- - Not analysed
< - Less than laboratory limit of reporting
NC - Not calculated
mg/L - Milligrams per litre
BTEXN - Benzene, toluene, ethylbenzene, total xylenes, naphthalene



APPENDIX A: CLEAN UP NOTICE





ENVIRONMENT PROTECTION ACT 1970 SECTION 62A(1AB)

AMENDED CLEAN UP NOTICE

Mr. Bruce Lucas
HEPBURN SHIRE COUNCIL
76 Vincent ST
DAYLESFORD VIC 3460

TO: HEPBURN SHIRE COUNCIL

ADDRESS: 76 Vincent ST, DAYLESFORD VIC 3460

PREMISES: Crown Allotment 5, Section 48 Township Glenlyon, Parish of Glenlyon, Suttons Lane, GLENLYON VIC 3461

LEGAL REFERENCE: EP Act 1970 s.62A(1) Clean up and ongoing management measures required

Who we are: Environment Protection Authority (EPA) Victoria is an independent statutory authority established under the *Environment Protection Act 1970* (the EP Act). Our purpose is to protect and improve our environment by preventing harm to the environment and human health.

Why we amend remedial notices: EPA may revoke or amend any requirement in a remedial notice if EPA is satisfied that the circumstances of the case justify such action.

What you are required to do: Section 62A(1) of the EP Act requires you to comply with the requirements in this notice with one or more actions to prevent or remedy an actual or likely non-compliance. You must comply with all other requirements in the original notice that have not been amended.

Under section 60A(1), you must notify any person proposing to take control of your premises of this notice and your progress towards compliance with this notice.

When you are required to act: You should already be acting to comply with the original notice identified above. *New or amended requirements take effect immediately.* When EPA is satisfied that all requirements in this notice have been complied with this notice will be revoked.

What happens if you do not comply: If found guilty of contravening a requirement of this notice, you may be ordered to pay a fine of up to 2400 penalty units (\$396,528).

Review rights: You may apply in writing to the Supreme Court of Victoria within 60 days of the date of this notice for a review. For further information on how to apply contact the Supreme Court of Victoria on (03) 9603 9300.

For the purpose of this notice 'You' means the recipient of this notice and 'Premises' means the site at the premises address, as identified above.

Ryan Straub

DELEGATE OF THE ENVIRONMENT PROTECTION AUTHORITY

DATE OF ISSUE: 24/05/2021

NOTICE STRUCTURE

1 EPA OBSERVATIONS

This section details what was observed during the inspection. It also summarises the information relevant to the amendment.

2 REASONS FOR VIEW FORMED

This section interprets the observations and articulates why the authorised officer believes

- a) a clean up notice should be issued in accordance with section 62A of the EP Act, and
- b) justification exists to amend this notice.

3 REQUIREMENTS - WHAT OUTCOMES ARE REQUIRED TO COMPLY?

Considering the view that has been formed, this section lists the notice requirements to address the environmental risk(s) or impact(s), highlighting any changes made to original notice requirements.

4 AN EXAMPLE OF HOW YOU CAN COMPLY

This section provides an example or amended example of how you may achieve compliance with the requirements of this and the original notice.

1 EPA OBSERVATIONS

Observations relating to the original notice

1.1 On 31 January 2020, EPA served Clean up Notice 90010886 on Hepburn Shire Council to require the assessment of the extent and level of contamination of groundwater, surface water and soil on and from the Glenlyon Recreation Reserve located at Suttons Lane, GLENLYON ("the premises").

1.2 On 14 March 2020 at approximately 1000 hours, EPA attended the premises to check compliance with requirement 3.1 of 90010886 which required action to identify imminent risk to human health or the environment including restriction of contaminated areas and signage to prevent access from the public. During the inspection, the officer:

1.2.1 Observed at the entrance of the premises, signage with a map of the premises and a sign with information regarding potential contamination of the site and warning the community to stay clear of the marked areas.

1.3 On 27 May 2020, EPA received a document titled 'Detailed Site Investigation, Glenlyon Recreation Reserve, Suttons Lane, Glenlyon VIC 3461, Kleinfelder Project Number: 20204153.001A' and dated 25 May 2020. An EPA officer assessed the report and noted that;

1.3.1 the DSI involved a limited historical review and field works that included the installation of four groundwater monitoring wells, soil sampling from 104 soil bores, groundwater sampling, surface water and sediment sampling.

1.3.2 the soil sampling found concentrations of arsenic above the adopted ecological investigation levels ("EILs") for public open space (100 mg/kg) at two soil sample locations, which included within the racecourse (MW01_0.1 – 180 mg/kg) and the pavilion (PV03_0.1 – 180 mg/kg).

1.3.3 the concentrations of lead in soil samples were reported below the Health investigation level C ("HIL C") as per the National environment protection (assessment of site contamination) measure 1999 ("NEPM").

1.3.4 elevated concentrations of fluoride was reported in one soil sample at the proposed fence line (510 mg/kg) compared with NEPM HIL C.

1.3.5 the concentrations of Benzo(a)Pyrene Toxic Equivalence Quotient (BaP TEQ) exceeded the HIL C for soil in public open space, as per NEPM (4 mg/kg) in two soil samples (4.2 mg/kg and 20 mg/kg), one sample was located in the north-east portion and one sample was located in the south-west portion of the racecourse.

1.3.6 based on the water table elevation contours the potential groundwater flow was reported to be in a westerly direction toward, or parallel with the Loddon River.

1.3.7 groundwater Segment A1 was conservatively adopted as the beneficial use segment.

1.3.8 concentrations of copper, nickel and zinc exceeded the water dependent ecosystems and species criteria in all four groundwater samples as per the NEPM.

1.3.9 concentrations of nickel in groundwater sampled from groundwater monitoring wells MW02, MW03 and MW04 exceeded the drinking water criterion as per the NEPM.

1.3.10 read that potential exposure pathways on-site include dermal contact, incidental ingestion and inhalation of dust from impacted soils e.g. on-site users, visitors, intrusive workers or construction workers, dermal contact or ingestion of impacted groundwater for potential intrusive workers was considered unlikely and residual exposure risks can be managed under a Construction Environmental Management Plan (CEMP) if required.

1.3.11 concentrations of copper, nickel and zinc in on-site groundwater exceeded the Water Dependent Ecosystems and Species (WDES) criteria and the drinking water criteria, however as concentrations of these metals were not elevated in soil, the concentrations were considered to be background concentrations in groundwater.

1.3.12 concentrations of nickel exceeded the Drinking Water criterion at groundwater monitoring wells MW02, MW03 and MW04.

- 1.3.13 groundwater was not sampled in a background location on/from the premises.
- 1.3.14 concentrations of total metals were reported below the laboratory LOR in all surface water samples.
- 1.3.15 concentrations of PAHs were reported below the laboratory LOR in surface water samples SW01 and SW02.
- 1.3.16 the findings of the delineation investigation confirmed the PAH contamination are restricted to the racecourse area, with no exceedances reported in other areas of the Site where soil sampling was completed.
- 1.3.17 based on the findings of the investigations completed at the Site, the PAH compound contamination is considered likely to be associated with clay target shooting activities.

Observations relating to the amendment

- 1.3.18 On 19 May 2021, EPA received an application to amend from HEPBURN SHIRE COUNCIL to extend the timeframes for Clean Up Notice (CUN) 90011425. The EPA Officer:
- 1.3.19 Read in the application, the type of amendment sought was extension of compliance dates.
- 1.3.20 Read in the application, works have been delayed due to Council elections, the Christmas break and COVID-19.
- 1.3.21 Observed in the application a timeline detailing works undertaken thus far.
- 1.3.22 Read in the application, evidence of Council's intent to comply with the notice has been demonstrated by the works undertaken to comply with the previous PAN.
- 1.3.23 Read in the application, extension to timeframes will not have any further long term environmental impacts to the site as shooting has been temporarily suspended.

2

REASONS FOR VIEW FORMED**Reasons for serving the remedial notice**

EPA has confirmed that you occupy a premises where shooting activities have resulted in contamination of soil with Polycyclic Aromatic Hydrocarbons above the Health Investigation Levels set out in Schedule B1 of the National Environment Protection Measure 1999 for recreational land.

Groundwater at the site contains elevated metals including copper, nickel and zinc which may be indicative of background groundwater quality.

Further action is required to restore beneficial uses to an extent practicable and to minimise the environmental risk from ongoing shooting activities.

In order to address this, you must take the clean up and ongoing management measures listed in this notice.

Reasons for amendment

EPA has taken into consideration the application and has made a decision to amend the current remedial notice with revised timeframes to allow further opportunity to achieve compliance.

On the basis of the information previously stated, I have formed a view that the circumstances of your case have led me to

- extend the period if any for compliance with a requirement specified in the notice



Ryan Straub
AUTHORISED OFFICER
EPA North West
EPA Victoria
DATE OF ISSUE: 24/05/2021

3

REQUIREMENTS - WHAT OUTCOMES ARE REQUIRED TO COMPLY?

General Requirements

3.1 By 11 October 2021, you must supply to EPA a clean up plan, verified by an EPA appointed auditor, to restore beneficial use to the extent practicable, which includes:

a) information about background groundwater quality and beneficial use, presented in a Conceptual Site Model as per the National Environment Protection (Assessment of Site contamination) Measure 1999.

b) clean up goals.

c) removal or remediation of contaminants on the premises.

d) details of contingency plans and associated monitoring programs and reporting dates.

e) the date(s) by which requirements (a) – (d) above will be completed or specified (as the case may be).

f) anticipated completion date of clean up.

3.2 By 23 December 2021, you must supply to EPA for approval an Environmental Management Plan for the ongoing use of the premises for shooting activities, to ensure the shooting activities at the premises do not pose any unacceptable environmental risks.

Reporting Requirements

3.3 By 23 December 2021, you must, in writing to the authorised officer listed on page 5 of this notice, provide a final report that:

a) specifies how the process, activity, or use has been carried on or will be carried on, modified or controlled to achieve compliance with the notice requirements,

b) includes a copy of the auditor approved clean up plan, and;

c) is signed by your managing director, most senior executive, or a person authorised to speak on behalf of the notice recipient.

4

AN EXAMPLE OF HOW YOU CAN COMPLY

One way of achieving compliance with this notice would be to:

4.1 By the date specified in requirement 3.1, engage a suitably qualified person to create a clean up plan for the premises that is submitted to EPA for approval and that addresses the following:

- a) confirmation of the background groundwater quality, presented in a conceptual site model (“CSM”) for the site. The CSM should be prepared in accordance with the National Environment Protection (Assessment of Site contamination) Measure 1999 and include on-site sampling data, geological information, hydrogeological information, and observations of the site’s setting, use and receptors. If possible, prepare the CSM in pictorial-type form.
- b) clean up goals and clear justification for each, including derivation of site specific goals (if required).
- c) analysis and selection of best remediation option and implementation plan and classification of waste to be removed from site.
- d) contingency planning, groundwater and/or vapour monitoring program.
- e) timelines for all works and reporting requirements (including regular review of chosen remediation technology).
- f) completion date of clean up and how this is going to be measured.

4.2 By the date specified in requirement 3.2, engage a suitably qualified person to prepare an Environmental Management Plan for the ongoing use of the premises for shooting activities, to ensure that no unacceptable environmental risks are promoted by the shooting activities, and provide to EPA. The plan must be based on scientific evidence, include best practice options and includes, but it not limited to:

- a) consideration of the use of alternative materials.
- b) risk assessment/register of all actual or likely environmental impacts resulting from the premises operation.
- c) maintenance and cleaning plan for all impacted areas, including removal and disposal of the collected material.
- d) monitoring and sampling methods pertinent to all processes and activities conducted at the premises.
- e) a stakeholder/sensitive receptor map identifying sensitive receptors in relation to the premises, including distances and directions.
- f) regular review and updating of monitoring processes.

4.3 By the date specified in requirement 3.3, provide a signed cover letter briefly outlining the works completed to provide to EPA an Environmental Management Plan and an EPA verified Clean up Plan for the premises.



APPENDIX B: DAYLESFORD FIELD AND GAME CLUB QUESTIONNAIRE



1. When did Daylesford Field and Game Club commence clay target shooting at the Glenlyon Recreation Reserve?

Daylesford club commenced shooting at the Glenlyon Reserve in the late 1970s then a small gathering of locals shooting from what is now the equestrian area towards the centre of the reserve this only lasted until 1983 when we were moved to the southwest of the reserve shooting inwards.

2. What is the frequency of shooting events (i.e. how many times per year are shooting events held)?

The frequency was always monthly apart from the occasional special event; these were few and far between though once a month on the first Saturday was our gazetted time.

3. Approximately how many clay targets were used during shooting events?

How many clay targets used relates directly to the number of competitors attracted on the day, in the early days of the club from the eighties to the nineties we gazetted from 25 to 50 target events and may have got 25 to 50 competitors to the events on an average in those days I would say we threw 1500 targets per shoot.

4. It is understood the previous licence for clay target shooting training days and scheduled competition days for the Glenlyon Recreation Reserve commenced on 1 July 2016 for a term of 3 years. The licensee was Daylesford Field and Game Association Inc A0004492L and the licensor was Glenlyon Recreation Reserve Committee Special Committee representing Hepburn Shire Council. The shooting licence was confined within a certain area of the Glenlyon Recreation Reserve as shown in Figure 1 below. How were the areas controlled to ensure there was no debris present in the areas marked as prohibited?

The licence for clay shooting on the reserve was implemented by council and administered by the Glenlyon reserve committee and ourselves, we knew the limitations of the boundaries set so therefore targets were set as to not fall on the prohibited areas and given our range rules that state we must shoot inwards that was followed to the letter. Shooting out of the fenced area of the reserve and into the car park area therefore is preposterous. The gun club, the recreation reserve committee and all the other user groups all worked together to ensure that the rules set were followed. In my opinion this worked very well as a self regulated reserve.

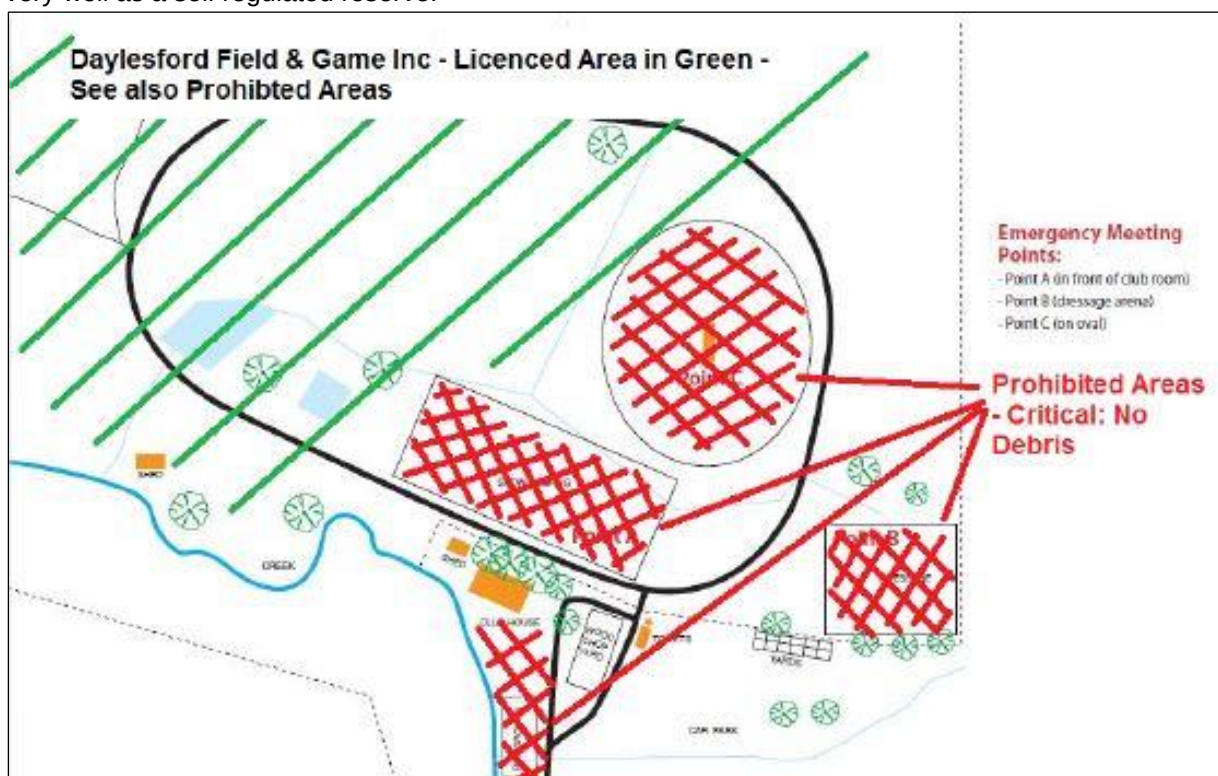


Figure 1: Licenced area for clay target shooting at Glenlyon Recreation Reserve

5. A condition of the above license relating to the environment was that the holder was responsible to ensure that, as far as practicable, all waste and debris was to be removed from the Glenlyon Recreation Reserve after target shooting events. How were clay targets/debris captured and where was the waste disposed to? Was the area monitored post clean up to ensure no waste remained? Did the clean up also include shotgun pellet fragments/wads?

The clean up was done as the licence stated to the very best of our ability, we bought yard machines which were like big motorised rakes that raked fragment clays and wads into a barrel and transferred into garbage bins which were taken to the tip. Wads that were missed were raked up into piles by hand and transferred to the tip. Empty cartridges were put into bins at every shooting stand and transferred to the tip as was all drink bottles and general rubbish. The activities of the pony club also helped as the horses hooves pulverised smaller fragments, shot of course was a little harder to pick up and in all reality not possible over such a large area but given the ground type and the long grass, plus the horses activities, I personally never saw any lying on the ground.

6. Figure 2 below shows 6 areas where clay targets are understood to have been launched at the Glenlyon Recreation Reserve. Is this an accurate representation of where the clay targets were launched? Where were the targets and shooting directed towards?

It's a fairly accurate representation of where the clays were launched from, at times you could add a couple of stations at each end of the map shown. Again depending on the type of event advertised. As stated before given our range rules that imply we must shoot toward the centre of the ground that is what happened and great care was given by the ground setters to make it so and also to provide a safe shooting environment for the shooters and general public.



Figure 2: Clay target launch areas

7. It is understood that eco-friendly targets replaced petroleum pitch-based targets (i.e. the polycyclic aromatic hydrocarbon (PAH) compound source). When was this change made? How does the club ensure that only eco-friendly targets are used? Have you been provided information from the target manufacture to confirm the targets are PAH-free (If so, it would be great to have the specifications).

Eco friendly targets it must be said are not a new thing, much research has gone into this over the last ten years. I first encountered these pre 2015 and we used the corsivia green dream eco target from then on. These are a pine resin target but after a while these became unavailable and we switched to the eco target provided by Sparten global. At the time the green dream target was the cleanest in the world. I will try to find the specs on this if I can.

8. It is understood that a new license is to be issued with conditions on what the Daylesford Field and Game are required to implement to continue to shoot. It understood that some of these conditions

aim to try and reduce possible effects on the environment and further potential contamination.
What are these conditions?

The conditions set to limit the effect of our shooting on the environment include, the use of steel shot with a biodegradable wad, again a very new product and by the time we are ready to shoot again it may be readily available in Australia.

The continued use of PAH free targets.

The limitation to a certain extent of the times we shoot to help out the locals with noise and the changes to our event types which may be easier to clean up.

I look forward to further correspondence with all of you and hope this email provides an insight into the club activities over the last forty years

yours Colin Johns

DFGA Secretary



APPENDIX C: SAMPLING AND ANALYSIS QUALITY PLAN





22 July 2021
20220348.001A

Hepburn Shire Council
76 Vincent Street
Daylesford
VIC 3460

Attention: Daniel Owe-Young

Subject: Sampling and Analysis Quality Plan
Glenlyon Recreation Reserve, Suttons Lane Glenlyon, VIC, 3461

1 INTRODUCTION

Kleinfelder Australia Pty Ltd (Kleinfelder) was engaged by Hepburn Shire Council (Council) to prepare a sampling and analysis quality plan (SAQP) for the Glenlyon Recreation Reserve, Suttons Lane Glenlyon, VIC 3461 (herein referred to as the Site).

2 BACKGROUND & OBJECTIVE

2.1 Background

Kleinfelder was previously engaged by Council to prepare a desktop analysis with an aim to identify data gaps for the environmental site assessment works undertaken at the Site in response to general requirement 3.1 of Environmental Protection Agency Victoria (EPA) Clean Up Notice (CUN) 90011425, stating:

3.1 By 11 October 2021, you must supply to EPA a clean up plan, verified by an EPA appointed auditor, to restore beneficial use to the extent practicable, which includes:

a) information about background groundwater quality and beneficial use, presented in a Conceptual Site Model as per the National Environment Protection (Assessment of Site contamination) Measure 1999.

Based on the findings of the desktop analysis completed by Kleinfelder¹, it was concluded that the source of elevated dissolved metal concentrations (including copper, nickel and zinc) are representative of natural background concentrations. However, a second round of groundwater monitoring and analysis from the existing on-Site monitoring wells is required to establish this conclusion. Following the completion of groundwater sampling and receipt of the analytical results, the hydrogeological conceptual site model (CSM) will be expanded on to assess potential risks to groundwater environmental values.

2.2 Objective

This objective of this SAQP is to provide the environmental auditor appointed for the Site (Kristi Hanson, of Senversa Pty Ltd) with a scope of works that will address Requirement 3.1 a) of CUN 90011425.

¹ Kleinfelder (2021), *Glenlyon Recreation Reserve – Data Gap Analysis*, Draft V2



3 SCOPE OF WORK

The groundwater monitoring is proposed to be undertaken on the existing groundwater monitoring well network at the Site to further assess groundwater quality. The proposed scope of work will include the following:

- Complete a groundwater monitoring event (GME) in accordance with:
 - Environment Protection Authority Victoria, 2000. Groundwater sampling guidelines. Publication 669.
- Submission of collected samples under chain of custody (COC) documentation to a laboratory that has National Association of Testing Authorities (NATA) accreditation for the required analysis.
- Evaluation of analyte concentrations in accordance with adopted screening criteria appropriate for the Site.
- Comparison of analyte concentrations to previous groundwater data.
- Prepare an updated data gap analysis report including a hydrogeological CSM.

3.1.1 Proposed Groundwater Sampling Methodology

A description of the proposed sampling program including the number of sampling locations and analytical suite is outlined in **Table 3.1** below.

Table 3.1: Stage 1 Soil – Proposed Scope of Works

Item	Details
Groundwater Sampling	Kleinfelder propose the following groundwater sampling program: • A second GME for all four wells (MW01-MW04) using the bladder pump low-flow method. • Groundwater monitoring wells will first be purged, and the physicochemical parameters (including dissolved oxygen (DO), pH, reduction-oxidation, potential (redox), electrical conductivity (EC) and temperature (°C)) recorded until stabilised (parameter records will be presented in the final report). • Groundwater samples will be collected by an environmental scientist/engineer once groundwater parameters have stabilised. The samples were collected directly into appropriate laboratory-supplied sample containers. • Samples for metal analysis will be filtered in the field prior to sampling (using 0.45 µm filters). • The following samples will be collected for quality assurance (QA)/quality control (QC): ▪ 1 x blind duplicate ▪ 1 x split triplicate ▪ 1 x rinsate sample taken from re-usable equipment • Samples will be chilled in containers for delivery to the analytical laboratories under COC. • All re-usable equipment will be decontaminated between samples using Decon 90.
Laboratory Analysis	Four primary groundwater samples will be submitted to a laboratory that has NATA accreditation to measure the following analytes in water: • Metals (including arsenic, cadmium, chromium, copper, lead, nickel and zinc) • Polycyclic aromatic hydrocarbons (PAH) • Nutrients, cations/anions, total dissolved solids (TDS) and total suspended solids (TSS) • Analysis of QA/QC samples for metals and PAH. Sample analysis will be on standard laboratory turnaround times (TAT) of 5 days.

3.1.2 Reporting

Following the completion of the proposed works, the existing data gap analysis will be updated to include the following:

- Tabulation of results against adopted criteria and historical data.
- A Site plan showing the water table contours and analyte concentrations in groundwater.
- The Site hydrogeological CSM.



If you require additional information or clarification, please contact the undersigned at (03) 9907 6000.

Sincerely,

Kleinfelder Australia Pty Ltd

Jeremy McDonnell

Project Manager

Stuart Graham

Associate Hydrogeologist/Geoscientist



APPENDIX D: JULY 2021 DATA





FIELD SHEETS





Date:	Field Manager:
27/07/21	C. Macreadie

COMMENTS:

Page of

sample Bottles Collected:

2x Amber, 1x inorg, 1x metal, 1x nutrient

QA/QC Samples Collected:

QC01 + QC02

COMMENTS: QCO1 + QCO2 collected

Sample Bottles Collected:

$2 \times A, 1 \times M, 1 \times N, 1 \times \text{inorg}$

QA/QC Samples Collected:

[illegible]

COMMENTS:

Sample Bottles Collected:

2x A, 1x M, 1x N, 1x incorg

QA/QC Samples Collected:

Well Diameter (mm):		Pre Sampling Depth To Water (mBTOC):		Field Measurements							Description	
50		0.100		7		3.528						
Time	CPM Rate	DTW (mBTOC)	Volume Purged (L)	Temp (°C)	DO (mg/L) +/- 10%	EC (us/cm) +/- 3%	TDS (mg/L) +/- 3%	pH +/- 0.05	Redox (mV) +/- 10 mV	Odour, sediment load, colour, sheen.		
Stabilisation Criteria ⁽¹⁾											Slightly turbid, cloudy, No, NS	
1:33	20:10	0.038	0.1	12.1	4.32	1452	1254.50	6.27	174.7			
1:35	40:20	0.154	0.5	12.2	1.93	1487	1280.50	5.97	173.8			
1:40	40:20	0.361	1.0	12.2	2.08	1490	1280.50	5.85	174.0			
1:45	40:20	0.369	1.5	12.1	2.00	1478	1274.00	5.77	176.5			
1:48	40:20	0.369	2.0	12.0	1.92	1473	1274.00	5.74	179.1			
1:53	40:20	0.369	2.5	12.0	1.85	1469	1274.00	6.71	182.7			
1:58	40:20	0.369	3.0	12.5	1.72	1491	1267.50	6.69	183.6			
2:03	40:20	0.369	3.5	12.8	1.70	1493	1267.50	6.69	183.6			
2:08	40:20	0.369	4.0	12.8	1.69	1494	1267.50	6.68	184.0			
Sampled @ 2:08												

Page of

(1) These parameters may be considered stable when three consecutive readings (obtained several minutes apart) are within these levels.
Source "Victorian Environmental Protection Authority, *Groundwater Sampling Guidelines*, Publication 669, April 2000".

LOW FLOW SAMPLING LOG



Project Number:		Site Name:		Site Address:	
20220348.001A		Alenkyon		Alenkyon Recreational Reserve	
Well ID:	Date:	Field Manager:	Weather Observations:		
MW04	27/07/21	C. Macreadie	Sunny		
Well Diameter (mm):	Pre Sampling Depth To Water (mBTCO):	Flow Cell (Y or N):	Depth to Submerged Pump (m BTCO):	Post Sampling Depth to Water (mBTCO):	
50	0.621	Y	4.048	0.939	

Sample Bottles Collected:

2x A, 1x M, 1x ivorg, 1x Nutrients

QA/QC Samples Collected:

[illegible]

COMMENTS:

⁽¹⁾ These parameters may be considered stable when three consecutive readings (obtained several minutes apart) are within these levels. Source "Victorian Environmental Protection Authority, *Groundwater Sampling Guidelines*, Publication 669, April 2000".



Date:	Field Manager:
27/07/21	Callum Macreadie

COMMENTS: _____



LABORATORY REPORTS



CERTIFICATE OF ANALYSIS

Work Order : **EM2114597**
Client : **KLEINFELDER AUSTRALIA PTY LTD**
Contact : JEREMY MCDONNELL
Address : LEVEL 1, 95 COVENTRY STREET
 SOUTH MELBOURNE VIC, AUSTRALIA 3205

Telephone : ----
Project : 20220348.001A
Order number : ----
C-O-C number : ----
Sampler : Callum Macreadie
Site : Glenlyon
Quote number : EN/222
No. of samples received : 6
No. of samples analysed : 6

Page : 1 of 8
Laboratory : Environmental Division Melbourne
Contact : Gregory Gommers
Address : 4 Westall Rd Springvale VIC Australia 3171

Telephone : +61-3-8549 9600
Date Samples Received : 28-Jul-2021 10:45
Date Analysis Commenced : 29-Jul-2021
Issue Date : 02-Aug-2021 10:15



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, 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.

- EA015H: EM2114597 #1: TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits for sample #2 as sample matrix is not deemed as potable or naturally occurring water and therefore ionic balance is not applicable
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- ED045G: The presence of thiocyanate can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- EP132: Where reported, Total PAH reported as the sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene and Benzo(g,h,i)perylene.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW01	MW02	MW03	MW04	QC01
Sampling date / time					27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit		EM2114597-001	EM2114597-002	EM2114597-003	EM2114597-004	EM2114597-005
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		252	2120	1030	1290	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		357	108	141	680	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		42	2270	632	1170	----
Total Alkalinity as CaCO3	----	1	mg/L		42	2270	632	1170	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		21	<1	20	24	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		24	50	375	113	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		<1	164	62	85	----
Magnesium	7439-95-4	1	mg/L		6	183	91	102	----
Sodium	7440-23-5	1	mg/L		30	311	206	242	----
Potassium	7440-09-7	1	mg/L		<1	16	4	8	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	0.002	<0.001	0.002	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	0.001	<0.001
Copper	7440-50-8	0.001	mg/L		0.008	0.013	0.005	0.010	0.009
Nickel	7440-02-0	0.001	mg/L		0.016	0.018	0.143	0.012	0.016
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	0.003	<0.001
Zinc	7440-66-6	0.005	mg/L		0.055	0.135	0.044	0.034	0.054
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	0.02	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.52	0.02	0.36	0.04	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.52	0.02	0.36	0.06	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.5	0.6	0.1	1.0	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW01	MW02	MW03	MW04	QC01
Sampling date / time					27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit		EM2114597-001	EM2114597-002	EM2114597-003	EM2114597-004	EM2114597-005
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		1.0	0.6	0.5	1.1	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.10	0.14	0.02	0.15	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		1.95	46.8	23.6	27.1	----
∅ Total Cations	----	0.01	meq/L		1.80	37.2	19.6	23.4	----
∅ Ionic Balance	----	0.01	%		4.12	11.4	9.19	7.33	----
EP132B: Polynuclear Aromatic Hydrocarbons									
3-Methylcholanthrene	56-49-5	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
2-Methylnaphthalene	91-57-6	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
7,12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	83-32-9	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	208-96-8	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	120-12-7	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Benz(a)anthracene	56-55-3	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	50-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(e)pyrene	192-97-2	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	191-24-2	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	207-08-9	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	218-01-9	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Coronene	191-07-1	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(a,h)anthracene	53-70-3	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	206-44-0	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	86-73-7	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	91-20-3	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perylene	198-55-0	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	85-01-8	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	129-00-0	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
^ Sum of PAHs	----	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
^ Benzo(a)pyrene TEQ (zero)	----	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		56.8	55.5	67.4	52.2	52.2



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				MW01	MW02	MW03	MW04	QC01
Sampling date / time				27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00	27-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	EM2114597-001	EM2114597-002	EM2114597-003	EM2114597-004	EM2114597-005
				Result	Result	Result	Result	Result
EP132T: Base/Neutral Extractable Surrogates - Continued								
Anthracene-d10	1719-06-8	0.1	%	72.6	71.3	73.9	64.6	63.1
4-Terphenyl-d14	1718-51-0	0.1	%	82.9	82.4	80.9	70.8	68.8



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

				QC03	----	----	----	----
Sampling date / time				27-Jul-2021 00:00	----	----	----	----
Compound				CAS Number	LOR	Unit	EM2114597-006	Result
							-----	-----
							-----	-----
							-----	-----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons								
3-Methylcholanthrene	56-49-5	0.1	µg/L	<0.1	----	----	----	----
2-Methylnaphthalene	91-57-6	0.1	µg/L	<0.1	----	----	----	----
7,12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L	<0.1	----	----	----	----
Acenaphthene	83-32-9	0.1	µg/L	<0.1	----	----	----	----
Acenaphthylene	208-96-8	0.1	µg/L	<0.1	----	----	----	----
Anthracene	120-12-7	0.1	µg/L	<0.1	----	----	----	----
Benz(a)anthracene	56-55-3	0.1	µg/L	<0.1	----	----	----	----
Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.1	µg/L	<0.1	----	----	----	----
Benzo(e)pyrene	192-97-2	0.1	µg/L	<0.1	----	----	----	----
Benzo(g,h,i)perylene	191-24-2	0.1	µg/L	<0.1	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.1	µg/L	<0.1	----	----	----	----
Chrysene	218-01-9	0.1	µg/L	<0.1	----	----	----	----
Coronene	191-07-1	0.1	µg/L	<0.1	----	----	----	----
Dibenz(a,h)anthracene	53-70-3	0.1	µg/L	<0.1	----	----	----	----
Fluoranthene	206-44-0	0.1	µg/L	<0.1	----	----	----	----
Fluorene	86-73-7	0.1	µg/L	<0.1	----	----	----	----
Indeno(1,2,3-cd)pyrene	193-39-5	0.1	µg/L	<0.1	----	----	----	----
Naphthalene	91-20-3	0.1	µg/L	<0.1	----	----	----	----
Perylene	198-55-0	0.1	µg/L	<0.1	----	----	----	----
Phenanthrene	85-01-8	0.1	µg/L	<0.1	----	----	----	----
Pyrene	129-00-0	0.1	µg/L	<0.1	----	----	----	----
^ Sum of PAHs	----	0.05	µg/L	<0.05	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.05	µg/L	<0.05	----	----	----	----
EP132T: Base/Neutral Extractable Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	65.1	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC03	----	----	----	----
				Sampling date / time	27-Jul-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2114597-006	-----	-----	-----	-----
				Result	----	----	----	----	----
EP132T: Base/Neutral Extractable Surrogates - Continued									
Anthracene-d10	1719-06-8	0.1	%		71.2	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		77.5	----	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	43	135
Anthracene-d10	1719-06-8	48	138
4-Terphenyl-d14	1718-51-0	48	144

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP132B: Polynuclear Aromatic Hydrocarbons

(WATER) EP132S: Acid Extractable Surrogates

(WATER) EP132T: Base/Neutral Extractable Surrogates

QUALITY CONTROL REPORT

Work Order	: EM2114597	Page	: 1 of 6
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: JEREMY MCDONNELL	Contact	: Gregory Gommers
Address	: LEVEL 1, 95 COVENTRY STREET SOUTH MELBOURNE VIC, AUSTRALIA 3205	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61-3-8549 9600
Project	: 20220348.001A	Date Samples Received	: 28-Jul-2021
Order number	: ----	Date Analysis Commenced	: 29-Jul-2021
C-O-C number	: ----	Issue Date	: 02-Aug-2021
Sampler	: Callum Macreadie		
Site	: Glenlyon		
Quote number	: EN/222		
No. of samples received	: 6		
No. of samples analysed	: 6		



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, 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

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: **WATER**

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 (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3817626)									
EM2114413-008	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	971	948	2.4	0% - 20%
EM2114442-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	10400	10500	0.7	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3817621)									
EM2114302-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	830	918	10.1	0% - 20%
EM2114297-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	357	368	3.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3817879)									
EM2114577-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1120	1120	0.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	1120	1120	0.8	0% - 20%
EM2114617-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1160	1180	1.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	1160	1180	1.6	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3817759)									
EM2114597-001	MW01	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	21	21	0.0	0% - 20%
EM2114635-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	553	551	0.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3817760)									
EM2114634-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	252	250	0.8	0% - 20%
EM2114597-001	MW01	ED045G: Chloride	16887-00-6	1	mg/L	24	24	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3817375)									
EM2114597-002	MW02	ED093F: Calcium	7440-70-2	1	mg/L	164	158	3.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	183	180	1.9	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	311	314	0.8	0% - 20%

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 Work Order : EM2114597
 Client : KLEINFELDER AUSTRALIA PTY LTD
 Project : 20220348.001A



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 (%)
ED093F: Dissolved Major Cations (QC Lot: 3817375) - continued									
EM2114597-002	MW02	ED093F: Potassium	7440-09-7	1	mg/L	16	16	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3817376)									
EM2114597-001	MW01	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.008	0.009	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.016	0.016	0.0	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.055	0.053	2.5	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3817761)									
EM2114606-006	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.01	0.0	No Limit
EM2114597-001	MW01	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: 3817797)									
EM2114298-004	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.03	0.0	No Limit
EM2114635-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	1.87	1.90	1.5	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 3817655)									
EM2114539-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.7	0.4	49.0	No Limit
EM2114597-004	MW04	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.0	1.3	22.5	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3817653)									
EM2114531-009	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.16	0.16	0.0	0% - 50%
EM2114531-018	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.44	0.36	19.4	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 3817656)									
EM2114597-004	MW04	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.15	0.18	17.1	0% - 50%

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.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)		
		LCS	Low	High	
<10	2000 mg/L	97.0	91.0	110	
<10	293 mg/L	99.0	91.0	110	
<5	150 mg/L	99.3	91.0	109	
<5	1000 mg/L	99.4	90.3	109	
----	200 mg/L	108	85.0	116	
<1	25 mg/L	105	85.8	117	
<1	500 mg/L	110	80.0	120	
<1	10 mg/L	92.2	85.0	115	
<1	1000 mg/L	103	85.0	122	
<1	5 mg/L	107	88.2	117	
<1	5 mg/L	104	85.6	114	
<1	50 mg/L	108	90.0	114	
<1	50 mg/L	103	82.8	115	
<0.001	0.1 mg/L	101	89.0	111	
<0.0001	0.1 mg/L	94.4	83.5	111	
<0.001	0.1 mg/L	98.9	83.2	109	
<0.001	0.1 mg/L	97.7	83.1	107	
<0.001	0.1 mg/L	101	84.6	108	
<0.001	0.1 mg/L	97.2	84.3	110	
<0.005	0.1 mg/L	100	86.3	112	
<0.01	0.5 mg/L	100	90.9	112	
<0.01	0.5 mg/L	106	90.0	117	
<0.1	5 mg/L	70.9	70.0	117	



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 3817760) - continued							
EM2114597-002	MW02	ED045G: Chloride	16887-00-6	400 mg/L	106	70.0	142
EG020F: Dissolved Metals by ICP-MS (QCLot: 3817376)							
EM2114597-001	MW01	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	97.2	76.6	124
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	95.8	74.6	118
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	101	71.0	135
		EG020A-F: Copper	7440-50-8	0.2 mg/L	98.5	76.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	97.1	75.0	133
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	96.3	73.0	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	129	75.0	131
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3817761)							
EM2114597-002	MW02	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	104	80.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3817797)							
EM2114300-007	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 3817655)							
EM2114634-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	83.0	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3817653)							
EM2114531-010	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	86.4	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 3817656)							
EM2114634-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	81.2	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM2114597	Page	: 1 of 7
Client	: KLEINFELDER AUSTRALIA PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: JEREMY MCDONNELL	Telephone	: +61-3-8549 9600
Project	: 20220348.001A	Date Samples Received	: 28-Jul-2021
Site	: Glenlyon	Issue Date	: 02-Aug-2021
Sampler	: Callum Macreadie	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6

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.
- Matrix Spike outliers exist - please see following pages for full details.
- 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.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	EM2114300--007	Anonymous	Nitrite + Nitrate as N	----	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	03-Aug-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	03-Aug-2021	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	10-Aug-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	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	24-Aug-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	24-Aug-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	24-Aug-2021	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) MW01, MW03, QC01,	MW02, MW04, QC03	27-Jul-2021	----	----	----	29-Jul-2021	23-Jan-2022	✓
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G) MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	29-Jul-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G) MW01, MW03,	MW02, MW04	27-Jul-2021	----	----	----	29-Jul-2021	24-Aug-2021	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G) MW01, MW03,	MW02, MW04	27-Jul-2021	29-Jul-2021	24-Aug-2021	✓	30-Jul-2021	24-Aug-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G) MW01, MW03,	MW02, MW04	27-Jul-2021	29-Jul-2021	24-Aug-2021	✓	30-Jul-2021	24-Aug-2021	✓
EP132B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP132) MW01, MW03, QC01,	MW02, MW04, QC03	27-Jul-2021	30-Jul-2021	03-Aug-2021	✓	30-Jul-2021	08-Sep-2021	✓



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: **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)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	5	40.00	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
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	0	6	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	8	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	25	12.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	5	20.00	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
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	8	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	25	8.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	5	20.00	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
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	6.67	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 Phosphorus as P By Discrete Analyser	EK067G	2	25	8.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	5	20.00	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
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	0	6	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	25	8.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

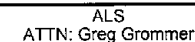
The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The 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
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. 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 liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. 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.
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 separately 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)



Analytical Methods	Method	Matrix	Method Descriptions
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)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	WATER	In house: Referenced to USEPA 3640 (GPC Cleanup), 8270 GCMS Capillary column, SIM mode. This method is compliant with NEPM Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
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)
Sep. Funnel Extraction /Acetylation of Phenolic Compounds	ORG14-AC	WATER	In house: Referenced to USEPA 3510 (Extraction) / In-house (Acetylation): A 1L sample is extracted into dichloromethane and concentrated to 1 mL with exchange into cyclohexane. Phenolic compounds are reacted with acetic anhydride to yield phenyl acetates suitable for ultra-trace analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.

URGENT

[illegible]

Received: 28/7 10:45 Carrier: carrier
C/note:
Temp: 116
Ice:   
JW

Environmental Division
Melbourne
Work Order Reference
EM2114597



Telephone : + 61-3-8549 9600

Kleinfelder Australia Pty Ltd (VIC)
Level 1, 95 Coventry St
South Melbourne
VIC 3205



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: **Jeremy McDonnell**

Report **813379-W**
Project name **GLENLYON**
Project ID **20220348.001A**
Received Date **Jul 29, 2021**

Client Sample ID			QC02
Sample Matrix			Water
Eurofins Sample No.			M21-JI51472
Date Sampled			Jul 27, 2021
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons (Trace level)			
Acenaphthene	0.00001	mg/L	< 0.00001
Acenaphthylene	0.00001	mg/L	< 0.00001
Anthracene	0.00001	mg/L	< 0.00001
Benz(a)anthracene	0.00001	mg/L	< 0.00001
Benzo(a)pyrene	0.00001	mg/L	< 0.00001
Benzo(b&j)fluoranthene	0.00001	mg/L	< 0.00001
Benzo(g,h,i)perylene	0.00001	mg/L	< 0.00001
Benzo(k)fluoranthene	0.00001	mg/L	< 0.00001
Chrysene	0.00001	mg/L	< 0.00001
Dibenz(a,h)anthracene	0.00001	mg/L	< 0.00001
Fluoranthene	0.00001	mg/L	< 0.00001
Fluorene	0.00001	mg/L	< 0.00001
Indeno(1,2,3-cd)pyrene	0.00001	mg/L	< 0.00001
Naphthalene	0.00001	mg/L	< 0.00001
Phenanthrene	0.00001	mg/L	< 0.00001
Pyrene	0.00001	mg/L	< 0.00001
Total PAH*	0.00001	mg/L	< 0.00001
2-Fluorobiphenyl (surr.)	1	%	69
p-Terphenyl-d14 (surr.)	1	%	85
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001
Copper (filtered)	0.001	mg/L	0.011
Lead (filtered)	0.001	mg/L	< 0.001
Nickel (filtered)	0.001	mg/L	0.014
Zinc (filtered)	0.005	mg/L	0.052

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
Polycyclic Aromatic Hydrocarbons (Trace level) - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water (trace)	Melbourne	Jul 29, 2021	7 Days
Heavy Metals (filtered) - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Melbourne	Jul 29, 2021	180 Days

Australia

Melbourne
6 Monterey Road
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Site # 1254

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
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Site # 23736

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IANZ # 1327

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Phone : 0800 856 450
IANZ # 1290

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Company Name: Kleinfelder Australia Pty Ltd (VIC)
Address: Level 1, 95 Coventry St
South Melbourne
VIC 3205

Project Name: GLENLYON
Project ID: 20220348.001A

Order No.:
Report #: 813379
Phone: 03 9907 6000
Fax: 03 9907 6001

Received: Jul 29, 2021 9:00 AM
Due: Aug 2, 2021
Priority: 2 Day
Contact Name: Jeremy McDonnell

Eurofins Analytical Services Manager : Michael Morrison

Sample Detail						Arsenic (filtered)	Cadmium (filtered)	Chromium (filtered)	Copper (filtered)	Lead (filtered)	Nickel (filtered)	Zinc (filtered)	Polycyclic Aromatic Hydrocarbons (Trace level)
Melbourne Laboratory - NATA Site # 1254						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	QC02	Jul 27, 2021		Water	M21-JI51472	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1

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
NC	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	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Polycyclic Aromatic Hydrocarbons (Trace level)							
Acenaphthene	mg/L	< 0.00001			0.00001	Pass	
Acenaphthylene	mg/L	< 0.00001			0.00001	Pass	
Anthracene	mg/L	< 0.00001			0.00001	Pass	
Benz(a)anthracene	mg/L	< 0.00001			0.00001	Pass	
Benzo(a)pyrene	mg/L	< 0.00001			0.00001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Benzo(g,h,i)perylene	mg/L	< 0.00001			0.00001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Chrysene	mg/L	< 0.00001			0.00001	Pass	
Dibenz(a,h)anthracene	mg/L	< 0.00001			0.00001	Pass	
Fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Fluorene	mg/L	< 0.00001			0.00001	Pass	
Indeno(1,2,3-cd)pyrene	mg/L	< 0.00001			0.00001	Pass	
Naphthalene	mg/L	< 0.00001			0.00001	Pass	
Phenanthrene	mg/L	< 0.00001			0.00001	Pass	
Pyrene	mg/L	< 0.00001			0.00001	Pass	
Total PAH*	mg/L	-			0.00001	N/A	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons (Trace level)							
Acenaphthene	%	92			70-130	Pass	
Acenaphthylene	%	99			70-130	Pass	
Anthracene	%	81			70-130	Pass	
Benz(a)anthracene	%	113			70-130	Pass	
Benzo(a)pyrene	%	91			70-130	Pass	
Benzo(b&j)fluoranthene	%	105			70-130	Pass	
Benzo(g,h,i)perylene	%	98			70-130	Pass	
Benzo(k)fluoranthene	%	110			70-130	Pass	
Chrysene	%	122			70-130	Pass	
Dibenz(a,h)anthracene	%	103			70-130	Pass	
Fluoranthene	%	108			70-130	Pass	
Fluorene	%	102			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	93			70-130	Pass	
Naphthalene	%	77			70-130	Pass	
Phenanthrene	%	104			70-130	Pass	
Pyrene	%	111			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	M21-JI45817	NCP	%	92			75-125	Pass	
Cadmium (filtered)	M21-JI45817	NCP	%	85			75-125	Pass	
Chromium (filtered)	M21-JI45817	NCP	%	88			75-125	Pass	
Copper (filtered)	M21-JI45817	NCP	%	84			75-125	Pass	
Lead (filtered)	M21-JI45817	NCP	%	93			75-125	Pass	
Nickel (filtered)	M21-JI45817	NCP	%	76			75-125	Pass	
Zinc (filtered)	M21-JI45817	NCP	%	80			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	M21-JI45817	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	M21-JI45817	NCP	mg/L	< 0.0002	0.0002	16	30%	Pass	
Chromium (filtered)	M21-JI45817	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	M21-JI45817	NCP	mg/L	0.004	0.003	10	30%	Pass	
Lead (filtered)	M21-JI45817	NCP	mg/L	0.003	0.003	1.0	30%	Pass	
Nickel (filtered)	M21-JI45817	NCP	mg/L	0.067	0.067	<1	30%	Pass	
Zinc (filtered)	M21-JI45817	NCP	mg/L	0.054	0.053	2.0	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

Authorised by:

Michael Morrison	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Joseph Edouard	Senior Analyst-Organic (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](#).

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Australia

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NATA # 1261
Site # 1254

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

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Company Name: Kleinfelder Australia Pty Ltd (VIC)
Address: Level 1, 95 Coventry St
South Melbourne
VIC 3205

Project Name: GLENLYON
Project ID: 20220348.001A

Order No.:
Report #: 813379
Phone: 03 9907 6000
Fax: 03 9907 6001

Received: Jul 29, 2021 9:00 AM
Due: Aug 2, 2021
Priority: 2 Day
Contact Name: Jeremy McDonnell

Eurofins Analytical Services Manager : Michael Morrison

Sample Detail						Arsenic (filtered)	Cadmium (filtered)	Chromium (filtered)	Copper (filtered)	Lead (filtered)	Nickel (filtered)	Zinc (filtered)	Polycyclic Aromatic Hydrocarbons (Trace level)
Melbourne Laboratory - NATA Site # 1254						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	QC02	Jul 27, 2021		Water	M21-JI51472	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

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Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: Kleinfelder Australia Pty Ltd (VIC)
Contact name: Jeremy McDonnell
Project name: GLENLYON
Project ID: 20220348.001A
Turnaround time: 2 Day
Date/Time received: Jul 29, 2021 9:00 AM
Eurofins reference: 813379

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ Sample Temperature of a random sample selected from the batch as recorded by Eurofins Sample Receipt : 3.9 degrees Celsius.
- ✓ 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

Logged in for 1 day TAT, please advise to change TAT.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Michael Morrison on phone : 03 8564 5933 or by email: MichaelMorrison@eurofins.com

Results will be delivered electronically via email to Jeremy McDonnell - jmcdonnell@kleinfelder.com.

Note: A copy of these results will also be delivered to the general Kleinfelder Australia Pty Ltd (VIC) email address.

URGENT



Received: 28/10/45 Carrier: carrier
C/note:
T/imp: 11/6
1cc

Environmental Division
Melbourne
Work Order Reference
EM2114597



Telephone : + 61-3-8549 9600

813379
colony ES

Date: May 2019

RE: Eurofins Sample Receipt Advice - Report 813379 : Site GLENLYON (20220348.001A)

Jeremy McDonnell <JMcDonnell@Kleinfelder.com>

Thu 29/07/2021 10:26 AM

To: #AU_CAU001_EnviroSampleVic <EnviroSampleVic@eurofins.com>

Cc: Cal Macreadie <CMacreadie@kleinfelder.com>; Michael Morrison <MichaelMorrison@eurofins.com>

📎 3 attachments (331 KB)

813379_COC.pdf; 813379_sample_receipt_coc.pdf; 813379_summary.pdf;

EXTERNAL EMAIL*

Hi Michael,

The analysis has been requested for 48 hr turnaround if you can please update.

Regards,

Jeremy McDonnell, BSc, MEnvSus
Project ManagerLevel 1, 95 Coventry St
South Melbourne, VIC 3205
o| + (61) 3 9907 6000
d| + (61) 3 9907 6012
m| + (61) 408 156 078813379
Cal Macreadie EF
29/7/21

This email may contain confidential information. If you have received this email—including any attachments—in error, please notify the sender promptly and delete the email and any attachments from all of your systems.

From: EnviroSampleVic@eurofins.com <EnviroSampleVic@eurofins.com>**Sent:** Thursday, 29 July 2021 10:12 AM**To:** Jeremy McDonnell <JMcDonnell@Kleinfelder.com>**Cc:** Cal Macreadie <CMacreadie@kleinfelder.com>**Subject:** Eurofins Sample Receipt Advice - Report 813379 : Site GLENLYON (20220348.001A)

External Email

Dear Valued Client,



Appendix C: Auditor's derivation of site-specific benzo(a)pyrene TEQ HIL

Appendix C1
Derivation of Site-Specific Investigation Levels: Oral and Dermal Bioaccessibility Adjustments Only
HIL C - Recreational

Summary of Exposure Parameters		Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate	- Young children (0-5 years)	IR _{SC}	mg/day	50	50% of HIL A assumption, Schedule B7, Table 5
	- Adults	IR _{SA}	mg/day	25	50% of HIL A assumption, Schedule B7, Table 5
Surface Area of Skin	- Young children (0-5 years)	SA _C	cm ² /day	2700	As per enHealth (2012)
	- Adults	SA _A	cm ² /day	6300	As per enHealth (2012) for male and female combined
Soil-to-Skin Adherence Factor		AF	mg/cm ² /day	0.5	Schedule B7, Table 5
Time Spent Outdoors		ET _O	hours	2	Schedule B7, Table 5
Time Spent Indoors		ET _I	hours	0	Schedule B7, Table 5
Lung Retention Factor		RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor		PEF _O	(m ³ /kg)	2.6E+07	As per Equation 21 based assumptions presented in Schedule B7
Outdoor Air-to-Soil Gas Attenuation Factor		α	-	0.05	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight	- Young children (0-5 years)	BW _C	kg	15	Schedule B7, Table 5
	- Adults	BW _A	kg	70	Schedule B7, Table 5
Exposure Frequency		EF	days/year	365	Schedule B7, Table 5
Exposure Duration	- Young children (0-5 years)	ED _C	years	6	Schedule B7, Table 5
	- Adults	ED _A	years	29	Schedule B7, Table 5
Averaging Time (non-carcinogenic)		AT _T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)		AT _{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Young Child Aged 2-3 years																	
Compound	Toxicity Reference Value Oral (TRV _O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV _D) (mg/kg/day)	Oral Bioavailability BA _O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI _O) (% of TDI)	Toxicity Reference Value Inhalation (TRV _I) (mg/m ³)	Background Intake Inhalation (BI _I) (% of TC)		Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m ³) (eqn 12)	Derived Interim Soil Gas HIL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqn 3)	Dermal (eqn 6)	Dust (eqn 9)					

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

Non-Threshold Effects - Lifetime Exposures [young child and adult]																	
Compound	Toxicity Reference Value Oral (TRV _O) (mg/kg/day) ⁻¹	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SF _d) (mg/kg/day) ⁻¹	Oral Bioavailability BA _O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV _I) (mg/m ³) ⁻¹		Target Risk (TR)	Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m ³) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqns 4 and 5)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)					
benzo(a)pyrene	0.5	1	0.5	14%	0.01		1.43E-01		1E-05	3.3E+02	7.6E+01	1.1E+05			61.6	60	1
benzo(a)pyrene (Early-Life)	0.5	1	0.5	14%	0.01		1.43E-01		1E-05	8.1E+01	2.8E+01	4.3E+04			20.5	20	1

1 Refer to Appendix A for discussion on different calculations conducted for benzo(a)pyrene and basis for HIL adopted

Appendix C2
Derivation of Site-Specific Investigation Levels: Bioaccessibility and Exposure Frequency Adjustments
HIL C - Recreational

Summary of Exposure Parameters		Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate	- Young children (0-5 years)	IR _{SC}	mg/day	50	50% of HIL A assumption, Schedule B7, Table 5
	- Adults	IR _{SA}	mg/day	25	50% of HIL A assumption, Schedule B7, Table 5
Surface Area of Skin	- Young children (0-5 years)	SA _C	cm ² /day	2700	As per enHealth (2012)
	- Adults	SA _A	cm ² /day	6300	As per enHealth (2012) for male and female combined
Soil-to-Skin Adherence Factor		AF	mg/cm ² /day	0.5	Schedule B7, Table 5
Time Spent Outdoors		ET _O	hours	2	Schedule B7, Table 5
Time Spent Indoors		ET _I	hours	0	Schedule B7, Table 5
Lung Retention Factor		RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor		PEF _O	(m ³ /kg)	2.6E+07	As per Equation 21 based assumptions presented in Schedule B7
Outdoor Air-to-Soil Gas Attenuation Factor		α	-	0.05	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight	- Young children (0-5 years)	BW _C	kg	15	Schedule B7, Table 5
	- Adults	BW _A	kg	70	Schedule B7, Table 5
Exposure Frequency		EF	days/year	104	Schedule B7, Table 5
Exposure Duration	- Young children (0-5 years)	ED _C	years	6	Schedule B7, Table 5
	- Adults	ED _A	years	29	Schedule B7, Table 5
Averaging Time (non-carcinogenic)		AT _T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)		AT _{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Young Child Aged 2-3 years																	
Compound	Toxicity Reference Value Oral (TRV _O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV _D) (mg/kg/day)	Oral Bioavailability BA _O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI _O) (% of TDI)	Toxicity Reference Value Inhalation (TRV _I) (mg/m ³)	Background Intake Inhalation (BI _I) (% of TC)		Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m ³) (eqn 12)	Derived Interim Soil Gas HIL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqn 3)	Dermal (eqn 6)	Dust (eqn 9)					

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

Non-Threshold Effects - Lifetime Exposures [young child and adult]																	
Compound	Toxicity Reference Value Oral (TRV _O) (mg/kg/day) ⁻¹	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SF _d) (mg/kg/day) ⁻¹	Oral Bioavailability BA _O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV _I) (mg/m ³) ⁻¹		Target Risk (TR)	Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m ³) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqns 4 and 5)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)					
benzo(a)pyrene	0.5	1	0.5	14%	0.01		1.43E-01		1E-05	1.2E+03	2.7E+02	4.0E+05			216.3	200	1
benzo(a)pyrene (Early-Life)	0.5	1	0.5	14%	0.01		1.43E-01		1E-05	2.8E+02	9.7E+01	1.5E+05			72.0	70	1

1 Refer to Appendix A for discussion on different calculations conducted for benzo(a)pyrene and basis for HIL adopted

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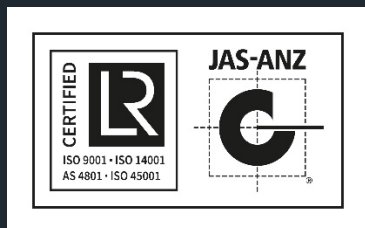
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