Ground Doctor Pty Ltd

UPSS Decommissioning Validation Report

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Selwyn Snow Resort
213A Kings Cross Road
Cabramurra, NSW

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On Behalf Of:
Selwyn Snow Resort

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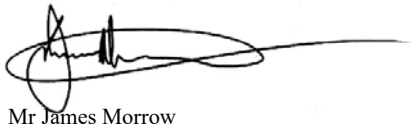
Approved By:	 Mr James Morrow Environmental Engineer Certified Environmental Practitioner No.: 1194 Site Contamination Specialist No.: SC41087
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EXECUTIVE SUMMARY

Ground Doctor Pty Ltd (Ground Doctor) was engaged by Selwyn Snow Resort to validate the decommissioning of an underground petroleum storage system (UPSS) located at the Selwyn Snow Resort, 213A Kings Cross Road, Cabramurra, NSW (the site).

The UPSS decommissioning works were undertaken in conjunction with demolition of all major structures at Selwyn Snow Resort, which were severely damaged by fire in early January 2020. Demolition work, including decommissioning of the former UPSS, was conducted by Irwin and Hartshorn Pty Ltd. Ground Doctor oversaw the UPSS decommissioning works and provided technical input to UPSS decommissioning works and associated remediation.

The objectives of the UPSS decommissioning works were to:

- Ensure the UPSS components were removed from the site so that they no longer posed a risk to safety, human health and/or the environment;
- Assess the subsurface adjacent to the UPSS infrastructure for land contamination associated with the decommissioned UPSS and quantify potential risks to human health and the environment associated with any identified impacts; and
- Remediate any hydrocarbon impacts to the extent required to render risks to human health and the environment acceptable.

Ground Doctor conducted the following work so that the project objectives could be met.

- The site setting was assessed using available desktop and validation assessment data.
- A conceptual site model (CSM) was developed based on the UPSS layout and features, petroleum hydrocarbons stored in the UPSS, subsurface conditions, existing and proposed land use at the site and land-use of adjoining land.
- The CSM and relevant NSW EPA endorsed guidance were used to develop remediation goals (validation criteria) for the UPSS area.
- UPSS decommissioning works were observed by Ground Doctor personnel. The works undertaken were documented, including records of off-site disposal of waste generated during the works.
- Validation samples were collected from natural soil on the walls and base of the UPSS excavations, and from soil excavated during the decommissioning works that was re-used on-site, in accordance with relevant NSW EPA endorsed guidance.
- Three groundwater monitoring wells were installed in the vicinity of the UPSS features in May 2020. Monitoring wells were developed after installation and were later gauged, purged and sampled.
- An additional six groundwater monitoring wells were installed around the former UPSS area and were developed in October 2020. Nine groundwater monitoring wells, including three previously installed wells, were gauged, purged and sampled in November 2020.
- Soil samples and groundwater samples were analysed by a laboratory for the presence of potential contaminants of concern related to the storage of petroleum hydrocarbons in the decommissioned UPSS.
- Data reliability was assessed by conducting a thorough review of quality control and quality assurance procedures and indicators.

- Validation sample analytical results were compared to the validation criteria.

- This UPSS Decommissioning Validation Report was prepared detailing the UPSS decommissioning methodology, the results of the validation assessment.

A UPSS comprising two 4500L USTs and associated pipework was removed from the former Selwyn Snow Resort Workshop on 15 April 2020.

Liquid generated during the work was collected and disposed by Cleanaway. The USTs were degassed and destroyed on site and were later disposed as scrap metal.

Ground Doctor assessed soil around the former UPSS locations on the day of decommissioning. Validation samples were collected for laboratory analysis. Hydrocarbon impacted soil was identified within both tank pits. This included loose soil around the tanks and soil on the base of both tank pits. A small amount of hydrocarbon impacted soil was also identified on the southern and eastern wall of the Tank 1 excavation.

Hydrocarbon impacted soil that had been removed from the UPSS excavation, and impacted soil identified on the southern and eastern walls of the Tank 1 excavation, was removed from the site on 27 May 2020. The soil was transported to the New Soil – Soil Recycling Facility located at Cootamundra, NSW, for treatment and recycling. Weighbridge dockets indicated that 41.8 tonnes of soil was removed from the site.

The UPSS excavations were backfilled with soil and rock borrowed from adjoining open areas of the site on 27 May 2020.

Following soil remediation work three groundwater monitoring wells were installed around the former UPSS location to assess potential groundwater impacts in May 2020. Following identification of groundwater impacts including LNAPL, additional groundwater assessment was conducted in October and November 2020. Nine groundwater monitoring wells were used to delineate the LNAPL plume and associated dissolved phase plume.

Ground Doctor used the available soil and groundwater validation data and conceptual understanding of the site setting to assess relevant human health risk pathways and environmental risk pathways at the site. The validation assessment results indicate that the remaining soil and groundwater impacts do not pose an unacceptable risk to human health or the environment. The former UPSS area is suitable for continued use as a ski resort within KNP. There will be no unacceptable vapour intrusion impacts to the proposed Resort Operations Centre building, which is to be constructed to the west of the identified groundwater impacts.

The relatively small LNAPL thickness identified makes the likelihood of LNAPL migration, and associated changes to dissolved phase impacts low. Given the relatively low mass of LNAPL remaining at the site, and likely difficulty in removing the LNAPL from fractured rock at a depth of 15m below ground level, the identified impacts would be best managed by monitored natural attenuation (MNA). A more appropriate remediation strategy could be adopted if MNA results identify potentially unacceptable human health or environmental risks.

Ground Doctor recommends that six monthly groundwater monitoring occur at the site for a period of at least two years to assess any changes to the identified LNAPL and dissolved phase plumes. The conclusions made in this validation assessment should be revised if significant changes to groundwater status are identified. The monitoring works should include:

- gauging and headspace screening of all wells

- bailer checking LNAPL wells (or potential LNAPL wells) to assess LNAPL thickness.

- sampling and analysis at monitoring wells of MW3, MW5, MW6, MW8 and MW9.

- analysis of groundwater samples for TRH, BTEXN and natural attenuation indicators.

1 Introduction

Ground Doctor Pty Ltd (Ground Doctor) was engaged by Selwyn Snow Resort to validate the decommissioning of an underground petroleum storage system (UPSS) located at the Selwyn Snow Resort, 213A Kings Cross Road, Cabramurra, NSW (the site).

The UPSS decommissioning works were undertaken in conjunction with demolition of all major structures at Selwyn Snow Resort, which were severely damaged by fire in early January 2020. Demolition work, including decommissioning of the former UPSS, was conducted by Irwin and Hartshorn Pty Ltd. Ground Doctor oversaw the UPSS decommissioning works and provided technical input to UPSS decommissioning works and associated remediation.

The NSW Protection of the Environment Operations (UPSS) Regulation 2019 requires UPSS decommissioning works to be validated by an appropriately qualified environmental consultant. This report outlines the methodology of the decommissioning works, validation methodology and results of the validation assessment.

1.1 Project Objectives

The objectives of the UPSS decommissioning works were to:

- Ensure the UPSS components were removed from the site so that they no longer posed a risk to safety, human health and/or the environment;
- Assess the subsurface adjacent to the UPSS infrastructure for land contamination associated with the decommissioned UPSS and quantify potential risks to human health and the environment associated with any identified impacts; and
- Remediate any hydrocarbon impacts to the extent required to render risks to human health and the environment acceptable.

1.2 Scope of Work

Ground Doctor conducted the following work so that the project objectives could be met.

- The site setting was assessed using available desktop and validation assessment data.
- A conceptual site model (CSM) was developed based on the UPSS layout and features, petroleum hydrocarbons stored in the UPSS, subsurface conditions, existing and proposed land use at the site and land-use of adjoining land.
- The CSM and relevant NSW EPA endorsed guidance were used to develop remediation goals (validation criteria) for the UPSS area.
- UPSS decommissioning works were observed by Ground Doctor personnel. The works undertaken were documented, including records of off-site disposal of waste generated during the works.
- Validation samples were collected from natural soil on the walls and base of the UPSS excavations, and from soil excavated during the decommissioning works that was re-used on-site, in accordance with relevant NSW EPA endorsed guidance.
- Three groundwater monitoring wells were installed in the vicinity of the UPSS features in May 2020. Monitoring wells were developed after installation and were later gauged, purged and sampled.

- An additional six groundwater monitoring wells were installed around the former UPSS area and were developed in October 2020. Nine groundwater monitoring wells, including three previously installed wells, were gauged, purged and sampled in November 2020.

- Soil samples and groundwater samples were analysed by a laboratory for the presence of potential contaminants of concern related to the storage of petroleum hydrocarbons in the decommissioned UPSS.

- Data reliability was assessed by conducting a thorough review of quality control and quality assurance procedures and indicators.

- Validation sample analytical results were compared to the validation criteria.

- This UPSS Decommissioning Validation Report was prepared detailing the UPSS decommissioning methodology, the results of the validation assessment.

1.3 Limitations of this Assessment

The findings of this report are based on the Scope of Work outlined in *Section 1.2* and detailed in further sections of this report. Ground Doctor performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental consulting profession. No warranties, express or implied are made.

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

Ground Doctor's assessment is limited strictly to identifying environmental issues associated with the identified features of the decommissioned UPSS. Ground Doctor assessed soil and groundwater adjacent to the decommissioned UPSS components for contaminants of concern related to storage of petrol and diesel fuel. The absence of the compounds of concern in soil and groundwater samples cannot be interpreted as a guarantee that such materials, or other potentially toxic or hazardous compounds, do not exist at the site in soil or other media.

Statements in this report regarding the suitability of the former UPSS area for continued use as a Snow Resort and National Park are made on the basis of the presence of the UPSS related contaminants of concern only, not on any other basis.

The results of this assessment are based on the site conditions identified during the decommissioning and validation works. Ground Doctor will not be liable to revise the report to account for any changes in site characteristics, regulatory requirements, guidelines or the availability of additional information, subsequent to the issue date of this report. Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report, including the data, findings and conclusions contained within it remains the intellectual property of Ground Doctor Pty Ltd. A licence to use the report for the specific purpose identified is granted to Selwyn Snow Resort subject to full payment of the agreed project fees. Ground Doctor Pty Ltd accepts no liability for use or interpretation of this report by any person or body other than Selwyn Snow Resort. This report should not be reproduced without prior approval by Selwyn Snow Resort. The report should not be amended in any way without prior approval by Ground Doctor Pty Ltd. The report should not be relied upon by other parties, who should make their own enquires.

2 Site Description

2.1 Site Location

Selwyn Snow Resort is located at 213A Kings Cross Road, Cabramurra, NSW, which is described as Lot 36 DP 46316.

The site spans two local government areas (LGAs). The northern portion of the site (including the former UPSS location) was situated within the Snowy Monaro Regional Council LGA. Parts of the site to the south of the great divide were situated in the Snowy Valleys Council LGA.

Under the Snowy River Local Environment Plan (LEP) 2013 the UPSS area was zoned "E1 – National Parks and Nature Reserves".

The site location is shown in *Figure 1* of *Annex A.* The site details are summarised in *Table 1*.

Table 1: Summary of Site Details

	Description
Street Address:	213A Kings Cross Road, Cabramurra, NSW, 2430
Lot and DP Number:	Lot 36 DP 46316
Local Government Area:	Snowy Monaro Regional Council (UPSS Location)
Land Zoning	E1 – National Parks and Nature Reserves
Relevant Land-Use	Commercial (Ski Resort Buildings) Recreational Open Space - National Park
Geographical Coordinates (Centre of UPSS):	East 630916 North 6025529 (MGA Zone 55)

2.2 Site Layout

The site occupied a large area, which was mostly open space. The site was accessed by Kings Cross Road, which traversed the western portion of the site.

The former Selwyn Snow Resort buildings were situated in the north west corner of the site. The snow resort buildings formerly included a ski hire building, a main centre which included eatery, administration and staff accommodation, a workshop, a storage shed and staff dwellings.

The UPSS location is shown relative to the former Selwyn Snow Resort buildings in in *Figure 1* of *Annex A*. The former layout of the UPSS is shown relative to the immediate surrounds in *Figure 2* of *Annex A*.

The UPSS was located adjacent to the eastern end of the former Selwyn Snow Resort Workshop. The former Workshop (and all other buildings at the Snow Resort) were destroyed by fire in January 2020. The remains of the destroyed buildings were undergoing demolition at the time of the UPSS decommissioning works.

2.3 UPSS Layout and Features

The layout of the identified UPSS features is shown relative to the immediate surrounds in *Figure 2* of *Annex A*.

The UPSS was comprised of two underground storage tanks (USTs). A 4500L tank (Tank 1) was located adjacent to the north east corner of the former Workshop. This tank had been used to store diesel fuel prior to decommissioning. A fuel dispenser had been located inside the former Workshop less than 2m from the tank. The dispenser and most of the fuel suction line connecting the dispenser to the UST was situated above ground. A vent that was approximately 0.5m high was situated above

the top of the tank. The fill / dip point was approximately 0.5m high and was situated on top of the tank.

A 4500L tank (Tank 2) was located adjacent to the south east corner of the former Workshop. This tank had been used to store petrol fuel prior to decommissioning. A fuel dispenser had been located inside the former Workshop less than 2m from the tank. The dispenser and most of the fuel suction line connecting the dispenser to the UST was situated above ground. A vent that was approximately 0.5m high was situated above the top of the tank. The fill / dip point was approximately 0.5m high and was situated on top of the tank.

A photograph of the UPSS area taken prior to the January 2020 bushfire is shown in *Annex H*.

The UPSS is believed to have been installed during construction of the former Workshop circa 1980.

2.4 Adjoining Land Uses

Land surrounding the site was part of the Kosciuszko National Park and was comprised of recreational open space.

2.5 Site Topography

Former Selwyn Snow Resort Buildings and the former UPSS were situated close to the spine of the Great Dividing Range. Topographic information available on the NSW Government Spatial Information Exchange (www.maps.six.nsw.gov.au, 6 July 2020) indicated that the UPSS was situated at an elevation of approximately 1555m AHD.

The UPSS features were situated on the northern side of the divide and drained in a northerly direction to Bullocks Head Creek (part of the Snowy River catchment). The natural ground surface in the vicinity of the UPSS sloped to the north with an average gradient of approximately 4-6%. The surface gradient was steeper further to the north of the UPSS.

2.6 Soils and Hydrogeology

The geology map "*Wagga Wagga 1:250000 Geological Series Sheet S1 55-15 (1966)"* indicated that the site was situated on "*Sandstone, Quartzite, Slate, Phyllite*" of the "*Tumut Pond Group*". There was negligible soil profile adjacent to the former tank pits. Rock was encountered less than 1m below the natural ground surface and consisted of phyllite. Phyllite encountered in both tank pits was fractured with a bias in the vertical plane and a north-south orientation.

Phyllite was encountered to the maximum depth of assessment (22m) in the UPSS area.

Ground Doctor conducted a search of the Water NSW Water groundwater works database (https://realtimedata.waternsw.com.au, 6 July 2020) for registered groundwater works located within 500m of the UPSS location. No registered groundwater works were identified in the search area.

A total of nine groundwater monitoring wells were installed in the vicinity of the former UPSS as part of the validation assessment. Groundwater was encountered in fractured rock at depths of approximately 15-19m below ground level at the UPSS location.

Groundwater elevation data obtained during the assessment indicated groundwater flow in a northerly direction towards Bullocks Head Creek.

The UPSS were situated in a drinking water catchment.

2.7 Surface Water Drainage and Underground Services

There was no formal stormwater drainage in open space surrounding the UPSS. Runoff from the UPSS area was inferred to flow in a northerly direction toward Bullocks Head Creek.

No major underground infrastructure was located close to the former UPSS locations.

3 Data Quality Objectives

The Data Quality Objective (DQO) process is a systematic planning tool based on the scientific method for establishing criteria for data quality and for developing data collection designs. The DQO process was adopted for the validation assessment to do the following.

- Identify human health and environmental risk pathways at the site so that the extent of any remediation undertaken could be based on potential risk to human health and environmental receptors.

- Establish remediation goals and validation requirements. By establishing potential risk pathways at the site prior to the commencement of decommissioning and remediation work Ground Doctor could establish remediation goals and a sampling and analytical plan to validate any works undertaken.

- Ensure that remediation works were not excessive resulting in unnecessary expense to the client and potentially causing more environmental harm than necessary.

The DQOs for the decommissioning of the UPSS are outlined in the following Sections of this report.

3.1 State the Problem

A UPSS was present in the subsurface for a period of approximately 40 years. Hydrocarbons stored and distributed from the UPSS may have been lost to the environment. Hydrocarbon impacts in surrounding and underlying soil, groundwater and/or soil vapour, can pose a risk to human health and/or the environment.

NSW SafeWork recommend that any UPSS that has not been in use for more than 12 months, and that is not planned for future use, should be decommissioned so that it does not pose an explosive hazard and/or risk to the environment.

The NSW Protection of the Environment Operations (UPSS Regulation) 2019 requires assessment of land surrounding a decommissioned UPSS for presence of hydrocarbon impacts. The environmental works are required to assess whether the decommissioned UPSS has resulted in land contamination which has potential to pose an unacceptable risk to human health and/or the environment.

3.1.1 Potential Areas of Concern

There was potential for fuel to be lost from the USTs, fuel dispensers, fuel suction lines, remote fill points and remote fill lines whilst the UPSS was in use or at the time the UPSS was damaged by fire. Fuel dispensers and fuel lines were situated above the concrete sealed floor of the former Workshop building. Losses from the dispensers or suction lines would have drained back toward the adjacent tank pits.

The UPSS features are detailed in *Section 2.4* of this report.

3.1.2 Potential Analytes of Concern

Based on typical ski resort activities and the age of the UPSS it was possible that the tanks were used to store diesel, kerosene, unleaded petrol and/or leaded petrol.

Primary contaminants of concern for assessing human health and environmental risks associated with the storage of petroleum products in the UPSS were:

- total recoverable hydrocarbons (TRH);
- benzene, toluene, ethylbenzene and total xylenes (BTEX);
- naphthalene; and
- lead.

These analytes are considered appropriate when assessing soil for contamination related to the loss of petrol (included leaded petrol), kerosene or diesel.

3.1.3 Site Conceptual Model

3.1.3.1 Soils and Hydrogeology

Soil and geology at the site are described in *Section 2.7* of this report.

3.1.3.2 Fate and Transport

Sources of contamination from the UPSS would be expected to migrate easily through permeable backfill sands or poorly consolidated fill around the USTs. If significant losses occurred hydrocarbons would be likely to migrate through fractures within the underlying fractured rock.

The extent of vertical migration of light non-aqueous phase liquids (LNAPLs) contaminants would be dependent on the amount of LNAPL lost and the duration over which losses occurred, the permeability of fractured bedrock and the depth of the water table. If LNAPL had leaked from the UPSS and reached the water table it could potentially remain as a pool of LNAPL above the water table as well as a dissolved phase plume in groundwater that has migrated away from the UPSS area.

Dissolved phase impacts were likely to flow in a general northerly direction toward Bullocks Heads Creek.

Distribution of hydrocarbon impacts in bedrock would also depend on orientation and connectivity of fractures. Field observations indicated vertically oriented fractures in bedrock running in a north-south direction.

Significant underground infrastructure was not identified in the vicinity of the UPSS. A minor service conduit was identified on the northern side of Tank 1, however, the service was situated in the upper 0.5m of the subsurface and was unlikely to have influenced migration of hydrocarbons from the UPSS.

3.1.3.3 Existing Land-Uses

At the time of this assessment the former UPSS area and surrounding land was recreational open space within Kosciuszko National Park.

The proposed design of new Snow Resort infrastructure indicates that the “Resort Operations Centre” would occupy a similar footprint to the previously demolished workshop. The “Resort Operations Centre” would fulfil the role of the previous workshop and would be used for storing and maintaining resort machinery and equipment. Lubricants and fuel would be used and stored within the building.

The Resort Operations Centre would be regarded as a commercial / industrial building within the context of contaminated land assessment.

Proposed resort design indicates that the proposed "Selwyn Visitors Centre" would be located at least 80m to the west of the former UPSS area.

Areas surrounding the proposed "Resort Operations Centre" would remain open space, but would most likely have some access restrictions to allow for machinery movement and parking.

3.1.3.4 Potential Human Health Exposure Pathways

The UPSS was situated within public open space. Vapour intrusion risks are not of concern in open space. The vapour intrusion pathway may be relevant to any proposed future buildings if the building were to be located within 10m of any identified subsurface impacts. Any future Snow Resort buildings would be categorised as "commercial" with respect to assessment of vapour intrusion risk assessment.

The validation assessment had to assess risks associated with direct contact with hydrocarbon impacted soil by the public and intrusive maintenance workers.

The assessment had to consider the potential for vapours to intrude on any existing or future subsurface infrastructure (such as service pits or sewerage) if these were present in close proximity to a hydrocarbon impacted area.

The assessment had to consider the potential for groundwater to have been affected by any identified leak from the UPSS. If groundwater had been impacted the assessment had to consider risks to human health associated with consumption of water from nearby surface water bodies. Ground Doctor had not identified any existing groundwater use within 500m of the UPSS at the time of the assessment. Downgradient surface water bodies are located within a water supply catchment and may be used by recreational users of Kosciuszko National Park.

3.1.3.5 Potential Environmental Impacts

The assessment had to consider potential ecological impacts (to flora and fauna) from any hydrocarbon impacts located within the upper 2m of the subsurface. Petroleum hydrocarbons in the upper 2m of the subsurface have potential to impact on flora and fauna. The UPSS were located in Kosciuszko National Park, which would be regarded as an "ecologically significant area" by relevant contaminated land assessment guidance.

The assessment had to consider whether groundwater at the site had been impacted by hydrocarbons and whether any identified groundwater impacts posed an unacceptable risk of harm to downgradient groundwater receptors. This may include Bullocks Head Creek to the north, or springs located between the UPSS and Bullocks Head Creek. These would be regarded as fresh water aquatic ecosystems.

3.2 Identify the Decision

To validate the UPSS decommissioning works Ground Doctor had to be satisfied that any hydrocarbon impacts to soil, groundwater and/or soil vapour at the site did not pose an unacceptable risk to human health or the environment.

Ground Doctor had to be satisfied that the lateral and vertical extent of any identified hydrocarbon impacts had been delineated and that concentrations of contaminants within soil, groundwater and/or soil vapour were well defined so that risks to potential receptors could be adequately assessed.

3.3 Identify Inputs to the Decision

Ground Doctor assessed soil located adjacent to the decommissioned UPSS infrastructure for evidence of hydrocarbon related contamination. This included visual and olfactory observations

during the decommissioning work and assessment of contaminant concentrations in soil validation samples.

If significant hydrocarbon impacts were identified in soil Ground Doctor had to assess whether underlying groundwater had also been impacted. Ground Doctor had to consider the potential for hydrocarbon impacted soil or groundwater to result in vapour intrusion risk to potential future structures within the impacted area.

The extent of any identified hydrocarbon impacts needed to be delineated so that risks to human health and the environment were properly assessed.

3.4 Define the Study Area Boundaries

The assessment was required to assess the extent of any hydrocarbon impacts associated with the decommissioned UPSS components. The assessment aimed to remediate hydrocarbon impacted soil, and/or to delineate the lateral and vertical boundaries of hydrocarbon impacts. The extent of contamination had to be known to enable a proper assessment of human health and environmental risks.

3.5 Decision Rule – Assessment Criteria

Soil and groundwater analytical data was assessed against relevant thresholds published in the National Environment Protect Council (NEPC) (1999) National Environment Protection (Assessment of Contamination) Measure (NEPM) (revised April 2013).

3.5.1 National Environment Protection (Assessment of Contamination) Measure

Soil Investigation Levels (SILs) and Groundwater Investigation Levels (GILs) published in the National Environment Protect Council (NEPC) (1999) National Environment Protection (Assessment of Contamination) Measure (NEPM) (revised April 2013) were used to assess concentrations of chemicals of concern in soil and groundwater.

The NEPM (2013) outlines three levels of Tier 1 assessment of petroleum hydrocarbon impacted soil, groundwater and soil vapour. These include the following criteria which were applied in the order listed.

1. **Health Screening Levels (HSLs)** for the assessment of potential human health impacts associated with vapour migration from hydrocarbon impacts in soil, groundwater and soil vapour.

2. **Ecological Screening Levels (ESLs)** for the assessment of potential ecological impacts associated with hydrocarbon impacts in soil.

3. **Management Limits** for the assessment of other potential impacts associated with hydrocarbon impacted soil including potential for explosive vapours to accumulate in underground infrastructure, impacts on underground service conduits and infrastructure and the potential for the formation (and potential migration) of light non-aqueous phase liquid (LNAPL).

The NEPM (2013) **Health Investigation Levels (HILs)** and **Ecological Investigation Levels (EILs)** were adopted to assess concentrations of non-petroleum contaminants of concern in soil.

The adopted NEPM (2013) screening criteria for assessing petroleum hydrocarbons in soil are presented in *Table 2*. The adopted NEPM (2013) screening criteria for assessing petroleum hydrocarbons in groundwater are presented in *Table 3*.

3.5.1.1 Health Screening Levels

The NEPM (2013) HSLs for petroleum hydrocarbons were used to assess soil and groundwater analytical results from the UPSS decommissioning validation assessment. The HSLs are used to assess potential vapour intrusion risks associated with subsurface contaminants. That is, to assess whether hydrocarbon vapours from soil and groundwater contamination have potential to migrate into an overlying or nearby building at an unacceptable concentration.

Future snow resort development would be a "commercial" land use in the context of contaminated land human health risk assessment. HSLD (commercial) would be the most appropriate HSL for assessing potential vapour intrusion risks at the site.

3.5.1.2 Ecological Screening Levels

The ESLs are designed to assess potential impacts of petroleum hydrocarbons in soil to flora and fauna The ESLs apply to soil encountered within the upper 2m of the subsurface only. The ESLs are relevant in the former UPS area as the area is intended to remain as unsealed open space. Ground Doctor adopted the most conservative ESLs for "areas of ecological significance" and "public open space".

3.5.1.3 Management Limits

Results exceeding Management Limits should trigger consideration of other potential risks to human health. These may include, potential for groundwater contamination, potential for free phase LNAPL to be present, potential for vapour to impact underground services or infrastructure and potential for land users, public or maintenance workers to come into direct contact with soil.

Ground Doctor adopted the most conservative Management Limits (for low density residential land and public open space) as a conservative assessment criteria.

3.5.1.4 Health Investigation Levels

Ground Doctor adopted Health Investigation Levels (HILs) outlined in the NEPM (2013) for assessment of lead in soil. Ground Doctor adopted HIL D (commercial/industrial land use) as a screening criteria. The HIL D threshold for lead in soil is 1500mg/kg.

3.5.1.5 Aesthetics

The NEPM (2013) requires the assessment to consider aesthetics. Aesthetic impacts can include discoloured and odorous soil and/or presence of synthetic materials such as building and demolition waste. Consideration of aesthetics must take the nature and depth of the aesthetic impacts into consideration, as well as the intended land use.

Ground Doctor considered aesthetics when assessing soil in the upper 2m of the subsurface.

Table 2: Adopted NEPM (2013) Soil Investigation Levels (SILs)

Analyte	HSL D Sand - 0-<1m	HSL D Sand - 1-<2m	HSL D Sand - 2-<4m	HSL D Sand – 4m+	ESL (Open Space)	Management Limits
TRH C6 - C10	-	-	-	-	125	700
TRH C6 - C10 less BTEX	260	370	630	NL	-	-
TRH >C10-C16	-	-	-	-	25	1000
TRH >C10 - C16 less Naph	NL	NL	NL	NL	-	-
TRH >C16-C34	NL	NL	NL	NL	300	2500
TRH >C34-C40	NL	NL	NL	NL	2800	10000
Benzene	3	3	3	3	65	-
Toluene	NL	NL	NL	NL	105	-
Ethylbenzene	NL	NL	NL	NL	125	-
Total +ve Xylenes	230	NL	NL	NL	45	-
Naphthalene	NL	NL	NL	NL	170	na

3.5.1.6 Groundwater Investigation Levels

Ground Doctor adopted Groundwater Investigation Levels (GILs) outlined in the NEPM (2013) for assessment of impacts in groundwater. The NEPM (2013) refers to the following thresholds.

- NEPM (2013) Health Screening Levels (HSLs) which are relevant for selected volatile petroleum hydrocarbons. Ground Doctor adopted HSL D (commercial/industrial land use) as the nearest proposed building would be used for this purpose. Groundwater at the site was more than 15m below ground level. Ground Doctor adopted the HSLs that applied at depths greater than 8m below ground level.

- National Health and Medical Research Council (NHMRC) (2011, amended 2017) *Australian Drinking Water Guidelines.* Recreational water guidelines (which are a multiple of the Australian Drinking Water thresholds, were also considered; and

- Default guideline values (DGVs) specified in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (August 2018) for moderately disturbed fresh water ecosystems (99% protection).

The adopted GILs are presented in *Table 3*.

3.5.2 Direct Contact with Soil and Maintenance Workers

In the event that "Management Limits" were exceeded Ground Doctor would adopt HSLs for "direct contact" and vapour exposure for "intrusive maintenance workers" published in the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE), (Friebel, E and Nadebaum, P 2011) *Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater, Technical Report Series Number 10*.

Ground Doctor adopted the HSL D, which was most applicable to a snow resort, and the HSLs for "intrusive maintenance workers". The adopted direct contact thresholds are presented in *Table 5*. The adopted vapour intrusion thresholds for intrusive maintenance workers are presented in *Table 6*.

Table 3: Adopted NEPM (2013) Groundwater Investigation Levels (GILs)

Analytes	NEPM GILs (µg/L)		
	Drinking Water (2011)	Aquatic Ecosystem – 99% Protection DGVs (2018)	HSL D Sand 8m+
TRH C6 – C10 less BTEX (F1)	-	-	7000
TRH >C10 – C16 less Naphthalene (F2)	-	-	NL
TRH >C16 – C34	-	-	NL
TRH >C34 – C40	-	-	NL
Benzene	1	600	5000
Toluene	800	110	NL
Ethylbenzene	300	80	NL
m+p-xylene	600	50	NL
o-xylene	600	200	NL
Naphthalene	-	2.5	NL
Benzo(a)pyrene	0.01	0.1	-
Fluoranthene	-	1.0	-
Phenanthrene	-	0.6	-
NL - non-limiting. The compound(s) do not pose an unacceptable vapour risk, even when NAPL is present.			

Table 4: Assumptions Used to Select Assessment Criteria

Parameter	Assumption
Land-Uses	The UPSS was located in open space within Kosciuszko National Park and within Selwyn Snow Resort. Selwyn Snow Resort has plans for a future snow resort development. The nearest building to the former UPSS will be used for commercial/industrial purposes. HSLD would be most relevant HSL to assess potential vapour intrusion risks to a future snow resort building.
Building Type	No buildings exist within the footprint of the former UPSS. For the purpose of assessment, it has been assumed that any future building would be constructed as slab on grade and that the vapour intrusion pathway would be complete.
Soil Type	There was less than 1m of soil (clayey silt) adjacent to the former UPSS. Underlying phyllite bedrock was fractured and it is assumed fractures would allow vapour migration through the subsurface. Ground Doctor adopted the most conservative HSLs that applied to sand, as these are the most conservative and best characterise fractured bedrock.
Biodegradation	Ground Doctor did not measure the presence of oxygen in the subsurface. The adopted HSLs were not increased to allow for aerobic biodegradation of hydrocarbon vapour.
Contaminants of Concern	Contaminants of concern at the UPSS location were petrol and diesel, but may also include other common hydrocarbon products such as kerosene. The assessment criteria outlined in the NEPM (2013) was based on hydrocarbon impacts associated with typical fuel mixes and are considered applicable for assessing these contaminants of concern. The NEPM HSLs, ESLs and Management limits indicate that risks to human health and the environment can be adequately characterised by considering TRH, BTEX and naphthalene only.
Depth to Groundwater	Depth to groundwater at the site was more than 14m below ground level beneath the former UPSS location.

Table 5: Adopted HSLs for Direct Contact with Soil (mg/kg)

HSL	B	T	E	X	F1	F2	F3	F4	N
HSL D	430	99000	27000	81000	26000	20000	27000	38000	11000
Intrusive Worker	1100	120000	85000	130000	82000	62000	85000	120000	29000

Table 6: Adopted HSLs for Vapour Intrusion for Intrusive Maintenance Workers (mg/kg)

Soil Type	Depth	B	T	E	X	F1	F2	F3	F4	N
Sand	0-2m	77	NL	NL	NL	NL	NL	NL	NL	NL
Sand	2-4m	160	NL	NL	NL	NL	NL	NL	NL	NL

NL – Non-limiting – The calculated concentration at which the contaminant would be deemed to have an unacceptable vapour intrusion risk exceeds the maximum theoretical saturation limit for pore water. That is if LNAPL was present in the pore space the modelled vapour intrusion risk from the compound of concern would not be unacceptable.

If the CRC CARE (2011) thresholds were exceeded then risk would be evaluated considering site specific circumstances or a management plan implemented.

The thresholds for direct contact and vapour inhalation for intrusive maintenance workers were significantly higher than the adopted NEPM (2013) HSLs, ESLs and Management Limits. The direct contact and vapour inhalation for intrusive maintenance workers thresholds would only be adopted where significant contamination was identified and could not be remediated due to site constraints.

3.5.3 Waste Classification

Analytical results for soil requiring off-site disposal were compared to thresholds published in the NSW EPA (2014) "*Waste Classification Guidelines, Part 1 – Classifying Waste*".

Field observations were also used to assess whether the soil features inclusions that may deem it a pre-classified waste (e.g. - such as the presence of asbestos containing materials, which would deem the waste "*asbestos containing waste*").

3.5.4 Soil Decision Rule

If a soil sample exceeded the most appropriate assessment criteria then further remediation work may be required at the site, or a more detailed human health risk assessment would be undertaken which assesses the human health risks based on specific conditions at the site.

If human health risks were assessed as unacceptable, remediation works and/or appropriate controls can be put in place to ensure human health risks could be made acceptable.

Similarly, where ecological assessment criteria were exceeded in areas away from site infrastructure, remediation works may be required to ensure potential ecological impacts are made acceptable.

Where Management Limits were exceeded, Ground Doctor had to consider the potential for LNAPL to be present in the subsurface at the site. Groundwater would require assessment. The potential for hydrocarbon vapour to accumulate in underground infrastructure would require assessment.

3.5.5 Waste Classification Decision Rule

The 95% upper confidence limit (95% UCL) of the average contaminant concentration must be less than the designated waste classification threshold and no single contaminant concentration should exceed the threshold by more than 250%.

3.6 Specify Limits on Decision Errors

Ground Doctor collected and analysed a number of samples that were used for quality assurance and quality control (QAQC) purposes. The adopted QAQC sampling regime and criteria for assessing the quality of analytical data are outlined in the following sections.

3.6.1 Field Duplicates

Field duplicates were collected at a minimum rate of 1 duplicate sample per 10 primary samples.

Ground Doctor adopted the following criteria with which to assess the results of duplicate sampling:

- Calculated relative percentage difference (RPD) values should be less than 50% where the reported concentrations of analytes are greater than 10 times the EQL;
- Calculated RPD values should be less than 75% where the reported concentrations of analytes are greater than 5 times the EQL but less than 10 times the EQL; and
- Calculated RPD values should be less than 100% where the reported concentrations of analytes are less than 5 times the EQL.

3.6.2 Trip Spikes

A trip spike was taken into the field during one sampling event to assess potential losses of volatile compounds during sample storage and transport. The trip spike was analysed for volatile BTEX compounds as these were most likely to be lost during sample storage and transport.

The acceptable trip spike recovery for organic compounds was 60-140%.

3.6.3 Trip Blanks

A trip blank was taken into the field during one sampling event to assess potential for cross contamination to occur during storage and transport of samples. The blank was analysed for BTEX compounds.

Reported concentrations of all analytes within trip blanks were to be less than the estimated quantification limit (EQL).

3.6.4 Rinsate Samples

Soil samples did not come into direct contact with the sampling equipment. It was not necessary to collect a rinsate sample from the excavation equipment. Groundwater samples were collected with well specific disposable bailers. A rinsate sample was not relevant as potential for cross contamination was negligible given the sampling method adopted.

3.6.5 Holding Times

Ground Doctor ensured that all soil samples analysed as part of the works were analysed within the appropriate technical holding times. Samples were transported to the laboratory by overnight courier service to minimise transit time and ensure samples remained cool during transit.

3.6.6 Lab Surrogate Recovery

Recovery of surrogates for organic compounds were to be 60-140%.

3.6.7 Lab Matrix Spikes

Matrix spike recovery for organic compounds were to be 60-140%. Matrix spike recoveries for inorganic compounds were to be 70-130%.

3.6.8 Lab Method Blanks

Reported concentrations of all analytes within lab blanks should be less than the EQL.

3.6.9 Laboratory Control Samples / Spikes

Recovery of spiked compounds in laboratory control samples and spikes were to be 60-140% for organics and between 70-130% for inorganics.

3.6.10 Laboratory Duplicates

Acceptance criteria for duplicate samples are outlined in *Section 3.6.1*.

3.7 Optimise the Design for Obtaining Data

The design for obtaining data was developed with consideration to the NEPM (2013) "*Schedule B2: Guideline on Site Characterisation*" and the NSW EPA (2014) "*Technical Note: Investigation of Service Stations*".

3.7.1 UPSS Validation Sampling Locations - Soil

Sampling rates that were adopted by Ground Doctor are summarised in *Table 7*, unless otherwise stated.

Table 7: Minimum Soil Validation Sampling Rates

Location	Sample Requirements
Tank Pit	One sample from each wall and one sample from the base of each tank pit.
Beneath Fuel Lines	One sample per 5m of underground fuel line that was located outside of the tank pit excavation.
Beneath Fuel Dispensers	One beneath each former fuel dispenser location.
Remote Fill Points	One sample beneath each remote fill point, or each cluster of remote fill points for closely spaced points.
Excavated Spoil for Reuse or Disposal	Excavated spoil was sampled at a rate of one sample per $25m^3$ with a minimum of two samples per tank pit.
Imported Fill	Imported fill was purchased from a reputable supplier of Virgin Excavated Natural Material and was not sampled.

Following removal of the tanks, samples were collected from undisturbed natural soil on each wall and the base of the tank pits. Validation sampling was conducted on 15 April 2020.

The former fuel dispensers and associated fuel suction lines were situated above the concrete sealed floor of the former workshop building. Any losses from the dispensers or the suction lines would have been contained above ground, or flow back toward the tank pit. As such, soil was not assessed directly beneath the fuel dispenser and associated fuel suction lines.

The USTs were filled directly. There were no remote fill points.

It was estimated that approximately $10m^3$ of soil was removed from the Tank 1 excavation and $20m^3$ of soil was removed from the Tank 2 excavation. Two soil samples were collected from backfill sand, soil and rock removed from each tank pit. A total of four samples of excavated soil were collected for laboratory analysis.

The UPSS excavations were backfilled using available soil and rock from the area surrounding the former UPSS. Fill was not imported to the site as part of the UPSS decommissioning and remediation works.

A small amount of hydrocarbon impacted soil was removed from the southern and eastern walls of the Tank 1 excavation on 27 May 2020. Two additional soil validation samples were collected from the walls of the remediation excavation.

Soil validation sampling locations are shown in *Figure 3* of *Annex A*.

3.7.2 UPSS Validation Sampling Locations – Groundwater

Following identification of hydrocarbon impacts in soil and fractured rock beneath each of the decommissioned tanks (see *Section 5* for more details on results), a groundwater assessment was also undertaken. Three groundwater monitoring wells were installed around the former UPSS area in May 2020. One monitoring well (MW1) was installed close to both former UST locations to assess the source area. Two additional monitoring wells (MW2 and MW3) were installed down gradient of the former UPSS components to assess the extent of groundwater impacts downgradient of the UPSS.

Following the identification of free phase LNAPL at MW2, additional groundwater assessment was conducted in October and November 2020. Six additional groundwater monitoring wells were installed in the former UPSS area. This included two additional wells close to MW2 to better define the extent of LNAPL, and four monitoring wells positioned to assess the extent of any associated dissolved phase impacts in groundwater.

3.7.3 Soil Sampling Methodology

Soil samples from excavations were collected directly from the excavator bucket for safety reasons. Care was taken to ensure the sample collected had not been in direct contact with the excavator bucket.

The sampler wore a clean pair of disposable nitrile gloves when collecting each sample. Soil samples were placed into a 125mL laboratory supplied glass jar marked with the appropriate identification, and then placed on ice inside an esky. Additional sample was collected into a plastic snap lock bag for field screening with a photo-ionisation detector (PID). Care was taken to minimise potential loss of volatile hydrocarbons including collecting the least disturbed sample, minimising head space in sample container and storing samples on ice immediately after collection.

Soil samples were logged in the field to include a description of soil type, soil colour, inclusions, the presence of odours or staining and the headspace screening result.

Soil samples were collected at depths and locations which best characterised the UPSS infrastructure being assessed. Samples collected from the walls of a tank pit were collected adjacent to or beneath the side and ends of the tanks.

3.7.4 Groundwater Monitoring Well Installation

All groundwater monitoring wells were installed by Mr Georgel Ivan (Ivan Drilling), NSW Class 6 Driller's Licence No. 2199.

Boreholes were drilled using air rotary (down hole hammer) drilling methods due to the consolidated nature of the subsurface. Boreholes were advanced until the uppermost water bearing strata was encountered. Ground Doctor collected grab samples of drill cuttings at regular intervals throughout each borehole for VOC screening with a PID.

Groundwater monitoring wells were installed in accordance with the National Uniform Drillers Licencing Committee (2012) "*Minimum Construction Requirements for Water Bores in Australia*".

Groundwater wells were constructed of screw fit 50mm ID Class 18 uPVC screen and casing. The screen was mechanically slotted. Screen and casing were delivered to the site in plastic wrapping to minimise potential for contaminants to come into contact with the screen during transport. The wells were constructed using 3-6m of screen, which was positioned at the uppermost water bearing strata.

The borehole annulus was filled with 3-7mm washed river gravel to a depth of at least 0.5m higher that the top of the screened interval. A bentonite seal at least 2m thick was placed above the gravel pack. The remainder of the borehole annulus was filled with drill cuttings. Each well was completed at ground level by concreting a protective cover over the top of the well casing.

The monitoring wells were developed on the day of installation. Where significant inflow was present, the holes were airlifted prior to removing the drill string. Following the installation of each well, the wells were surged with a bailer, bailed dry or bailed until at least 30L of water had been removed.

3.7.5 Groundwater Gauging

Prior to sampling Ground Doctor gauged each well with an interface meter to measure the depth to water below the top of the PVC casing, and whether any LNAPL was present at the water table. All wells were gauged over a short period of time to minimise potential variations due to atmospheric pressure changes and ground tides.

A PID was used to assess headspace in each monitoring well at the time of gauging. The PID inlet was placed inside the well casing immediately after the well cap was opened. The PID was left in place for approximately 20 seconds. The peak PID reading in this period was recorded.

Ground Doctor used a laser level to obtain the relative elevation of the top of the PVC casing of each monitoring well. The laser level and well gauging data was combined to calculate the relative groundwater elevation at each well. This allowed Ground Doctor assess groundwater elevation at the monitoring wells and assess the direction of groundwater flow.

3.7.6 Groundwater Sampling Methodology

Groundwater monitoring wells were sampled at least 14 days after installation.

During the May 2020 sampling round, groundwater monitoring wells were sampled using disposable bailers. A new unused disposable bailer was used in each well. Each well was purged by removing approximately 30L of water. A sample was then retrieved from the well. Additional sample was collected to measure and record field water quality parameters.

During the November 2020 sampling round, monitoring wells that were free of LNAPL were sampled using a micro-purge method. An air driven bladder pump was used to micropurge and sample the wells. Dedicated well tubing was used in each well to minimise potential cross contamination between sampling locations.

The pump inlet was positioned adjacent to the identified water bearing zone in each well. A flow cell was established at the outlet of the pump and field water quality parameters and the standing water level in the monitoring well were monitored at approximate 5 minute / 1L intervals to establish when the pumped water was representative of conditions in the aquifer adjacent to the well screen. Each well was sampled after field parameters had stabilised, which indicated that inflow to the well was representative of groundwater from the surrounding formation.

Groundwater samples were collected into appropriate sample bottles marked with relevant ID and sample details. The samples analysed for dissolved lead were filtered in the field using well dedicated disposable 45µm filters.

3.7.7 Sample Storage and Transport

Soil and groundwater samples were placed on ice inside an esky immediately after collection to minimise the potential loss of volatiles during storage and transport. The esky was maintained to ensure samples were not flooded with melt water from the ice.

Samples were sent to the analytical laboratory using an overnight courier service. Samples were left at the courier in the afternoon to minimise the time samples spent in transit.

3.7.8 Suite of Analysis

Soil and groundwater validation samples were analysed in a laboratory for the presence of TRH, BTEX, naphthalene and lead. Additional analysis for metals (arsenic, cadmium, chromium, copper, mercury, nickel and zinc) was conducted of samples of excavated soil that required off-site disposal.

Lead was not identified in groundwater during the May 2020 monitoring round. Groundwater samples collected during the subsequent groundwater monitoring round were not analysed for lead.

Groundwater samples collected during the November 2020 monitoring round were also analysed for polycyclic aromatic hydrocarbons (PAHs).

3.7.9 Analytical Laboratory

Envirolab Services (Sydney) was used as the analytical laboratory. Envirolab has National Association of Testing Authorities (NATA) accreditation for the suite of analytes and used analytical methods which comply with the NEPM (2013) guidelines.

4 UPSS Decommissioning and Remediation Works

4.1 UPSS Decommissioning

The UPSS removal works were undertaken by Irwin and Hartshorn Pty Ltd, who were engaged directly by Selwyn Snow Resort. The UPSS decommissioning works were observed and documented by a Ground Doctor Environmental Engineer (Mr James Morrow).

The UPSS components were removed from the site on 15 April 2020. The works were conducted as follows:

- The tops of the USTs were exposed, and fuel lines disconnected from the tops of the tanks using an excavator.
- Liquid waste was removed from the tanks to the extent practicable by Cleanaway (sub-contracted by Irwin and Hartshorn Pty Ltd) using a vacuum tanker. Liquid waste collection and disposal records are presented in *Annex G*.
- Tanks were cleaned and degassed by ANC Foster Pty Ltd (sub-contracted by Irwin and Hartshorn Pty Ltd). Cleanaway removed water used to clean the tanks at the completion of cleaning.
- The degassed tanks were lifted from the ground using an excavator. The tanks were destroyed on-site and were disposed as scrap metal with UPSS pipework and metal demolition waste from the site. A tank destruction certificate is presented as *Annex F*.
- Backfill sand and loose soil and rock surrounding the tanks were removed so that the subsurface conditions could be assessed. Excavated soil was stockpiled in a designated area close to the excavations.
- Soil validation samples were collected from the walls and base of the UPSS excavations.
- The UPSS excavations were barricaded and left open pending results of soil validation sampling and analysis.

4.2 UPSS Remediation Works

Soil validation assessment results identified hydrocarbon impacts in soil removed from both tank excavations. Unacceptable soil impacts were also identified in validation samples collected from the eastern and southern walls of the Tank 1 excavation.

Irwin and Hartshorn Pty Ltd were contracted by Selwyn Snow Resort to remove additional soil from the Tank 1 excavation and to transport and dispose of hydrocarbon impacted soil at an appropriately licenced facility. The works were undertaken on 27 May 2020.

Additional soil was removed from the eastern and southern walls of the Tank 1 excavation. This soil, and stockpiled soil from the UPSS decommissioning works, was loaded onto trucks and transported to the New Soil – Soil Recycling Facility located at Cootamundra, NSW, for treatment and recycling. Weighbridge dockets indicated that 41.8 tonnes of soil was removed from the site. Soil disposal dockets are presented in *Annex G*.

Additional soil validation samples were collected from the eastern and southern walls of the Tank 1 excavation on 27 May 2020.

4.3 Groundwater Assessment

Groundwater monitoring wells (MW1-MW3) were installed at the site between 27 May 2020 and 29 May 2020. Groundwater monitoring wells were gauged, purged and sampled on sampled on 12 June 2020.

Additional monitoring wells (MW4-MW9) were installed at the site on 27-29 October 2020. All groundwater monitoring wells were gauged, purged and sampled on 18 November 2020.

5 Validation Results - Soil

5.1 Field Observations

Tank 1 was inspected at the time of removal. Ground Doctor did not observe any obvious holes in the tank. The tank was corroded. Lower sides of the tank had an oily sheen on the surface.

A diesel odour was apparent in soil removed from the Tank 1 excavation. Soil on the walls of the Tank 1 excavation had a weak diesel like odour or no odour. A strong diesel odour was present in soil at the base of the tank pit. An oily sheen was observed in fracture planes of phyllite bedrock on the base of the tank pit.

Tank 2 was inspected at the time of removal. A weld holding the southern end of the tank was found to be split open (possibly the result of explosion during the January 2020 bushfire). The tank was observed to be corroded but had no obvious holes (excluding the split end). The lower parts of Tank 2 had an oily sheen on the surface when the tank was removed from the ground.

Backfill sand and loose soil from around Tank 2 had a moderate to strong petrol odour. Soil encountered on the walls and base of the Tank 2 excavation was free of hydrocarbon odour. Soil and rock at the base of the Tank 2 excavation had a moderate petrol odour.

UPSS pipework was limited to two relatively short suction lines running between each tank and the respective fuel dispensers. The fuel lines ran above the concrete floor of the Workshop. The concrete slab was complete in the area where the fuel dispensers had been located, indicating that the fuel dispensers had been situated wholly above ground.

Tank 1 and Tank 2 were buried with the tops at the ground surface, presumably due to the presence of shallow bedrock. The upper 0.5-1.0m of soil surrounding the tanks was comprised of fill. The fill layer was free of synthetic inclusions such as building and demolition rubble indicating that it was most likely virgin excavated natural material sourced locally at the time of the Selwyn Snow Resort construction. The layer of fill was underlain by less than 0.3m of undisturbed natural soil that consisted of clayey silt and broken phyllite, grading to phyllite at depth.

Only minimal backfill sand was encountered adjacent to each tank. The backfill sand was brown decomposed granite which had the texture of fine to coarse grained sand and fine gravel.

Soil validation samples were screened in the field for the presence of volatile organic compounds using a PID. Results of PID screening are summarised in *Table 8*. Soil sampling locations are shown in *Figure 3* of *Annex A*.

PID results ranged from 0ppm to 1890ppm. PID screening results were consistent with field observations of hydrocarbon odour and staining. Elevated PID readings generally corresponded to samples with strong hydrocarbon odour, with samples from the petrol UST excavation having higher readings due to the higher volatility of petrol.

5.2 Analytical Results

Laboratory results for soil validation samples are summarised and compared to the site assessment criteria in *Tables B1 to B3* of *Annex B*.

Validation soil sampling locations are shown in *Figure 3* of *Annex A*.

The laboratory certificate of analysis is presented as *Annex D*.

Reported TRH, BTEX, naphthalene and lead concentrations are compared to the NEPM (2013) HSLs and HILs in *Table B1* of *Annex B*. Results are compared to the adopted ESLs in *Table B2* of *Annex B*. Results are compared to the adopted Management Limits in *Table B3* of *Annex B*.

Table 8 shows samples in which one or more analytes exceeds at least one of the adopted HSLs, ESLs and Management Limits.

Table 8: Summary of PID and Analytical Results

Sample ID	Sample Depth	Soil Type	PID Reading (ppm)	Exceeds HSL(s)	Exceeds ESL(s)	Exceeds Management Limit(s)
T1-N1	1.6m	Weathered Phyllite / Clayey Silt	23	-	-	-
T1-E1	1.6m	Weathered Phyllite / Clayey Silt	140	-	X	-
T1-E2	1.6m	Weathered Phyllite / Clayey Silt	0	-	-	-
T1-S1	1.6m	Weathered Phyllite / Clayey Silt	120	-	X	-
T1-S2	1.6m	Weathered Phyllite / Clayey Silt	0	-	-	-
T1-W1	1.6m	Weathered Phyllite / Clayey Silt	7	-	-	-
T1-Base1	2.3m	Weathered Phyllite / Clayey Silt	162	-	X	X
T2-N1	1.4m	Weathered Phyllite / Clayey Silt	2	-	-	-
T2-E1	1.4m	Weathered Phyllite / Clayey Silt	2	-	-	-
T2-S1	1.4m	Weathered Phyllite / Clayey Silt	1	-	-	-
T2-W1	1.4m	Weathered Phyllite / Clayey Silt	1	-	-	-
T2-Base1	2.1m	Weathered Phyllite / Clayey Silt	1750	-	X	-
T1-Spoil1	-	Weathered Phyllite / Clayey Silt	136	-	X	-
T1-Spoil2	-	Weathered Phyllite / Clayey Silt	115	-	X	-
T2-Spoil1	-	Weathered Phyllite / Clayey Silt	1890	X	X	X
T2-Spoil2	-	Weathered Phyllite / Clayey Silt	1475	X	X	X

Soil characterised by samples T1-E1 and T1-S1 was removed from the site on 27 May 2020 and additional validation samples T1-E2 and T1-S2 were used to demonstrate that concentrations of contaminants of concern on these walls of the excavation after remediation did not exceed the assessment criteria.

Excavated soil from both tanks pits (characterised by samples T1-Spoil1, T1-Spoil2, T2-Spoil1 and T2-Spoil2) was disposed off-site.

Following the remediation works only soil samples collected from the base of the tank pits (which were collected at depths greater than 2m below ground level) exceeded any of the assessment criteria.

5.3 Waste Classification

Excavated soil from the Tank 1 and Tank 2 excavations exceeded one or more of the adopted assessment criteria. The soil was classified for off-site disposal. Analytical results for samples of excavated soil (T1-Spoil1, T1-Spoil2, T2-Spoil1 and T2-Spoil2) are compared to thresholds published in the NSW EPA (2014) "*Waste Classification Guidelines, Part 1: Classifying Waste"* in *Table B4* of *Annex B.*

Reported concentrations of TRH (C_{10}-C_{36}), BTEX compounds and lead in all soil samples were less than the thresholds for "*General Solid Waste*". The reported TRH (C_6-C_9) concentrations in samples "T2-Spoil1" and "T2-Spoil 2" exceeded the "*General Solid Waste*" threshold but were less than the "*Restricted Solid Waste*" threshold.

Ground Doctor conducted a statistical assessment of reported TRH (C_6-C_9) to calculate the 95% upper confidence limit (95% UCL) of the average TRH (C_6-C_9) concentration in soil within the stockpiles. The results of the statistical assessment are shown in *Table B4* of *Annex B.* The calculated 95% UCL of the average TRH (C_6-C_9) concentration in soil exceeded the "*General Solid Waste*" threshold.

Ground Doctor did not observe any asbestos containing materials, waste tyres and medical waste within the soil assessed for off-site disposal.

Assessment of soil analytical results and field observations against NSW EPA (2014) "*Waste Classification Guidelines, Part 1: Classifying Waste"* indicates that the soil was suitable for disposal as *"Restricted Solid Waste"*.

6 Validation Results - Groundwater

6.1 Field Observations

Borehole and monitoring well construction logs are presented as *Annex I*.

Groundwater was encountered in a weathered layer in fractured rock (phyllite) at depths ranging from approximately 16-20m below ground level close to the former UPSS locations. Groundwater was encountered approximately 10-15m at monitoring locations further to the north, where the surface elevation was approximately 7-9m lower than the ground surface at the former UPSS locations.

The formation was relatively low yielding at some locations, where water inflow was only apparent by minor moisture on rock chips during drilling. At other locations yields up to 0.5L/s were estimated during airlifting of the open borehole.

The range of PID headspace screening results for drill cuttings collected from each borehole are summarised in *Table 11*. *Table 9* and *Table 11* present well headspace readings recorded during two groundwater monitoring rounds.

A minor to moderate hydrocarbon (diesel-like) odour was identified in cuttings recovered from MW1. PID screening results for cuttings from MW1 ranged from 0 to 23ppm. A PID measured well headspace in MW1 of 36ppm. A hydrocarbon odour was apparent from water removed from the well during development and purging, but water was free of LNAPL and surface sheen.

Cuttings from MW2 and MW3 were free of hydrocarbon odour throughout. PID screening results ranged from 0ppm to 2ppm in MW2 and were 0ppm throughout MW3. A PID measured well headspace of 6ppm within MW2 and 0ppm in MW3. Water removed from MW2 and MW3 during development was free of hydrocarbon odour.

Cuttings from MW4 were free of hydrocarbon odour and PID screening results were 0ppm for all soil samples. Water removed from MW4 was free of hydrocarbon odour and sheen.

Cuttings from MW5 were free of hydrocarbon odour. However, VOCs were detected by the PID at a range of 2-22ppm in soil samples collected at 8-14m below ground levels. MW5 yielded approximately 0.5L/s of water during airlifting. The borehole was airlifted for a period of approximately 15 minutes after drilling was complete. Airlifted water from MW5 was free of hydrocarbon odour and sheen. Water removed from MW5 during development and sampling was free of hydrocarbon odour and sheen.

Cuttings from MW6 were free of hydrocarbon odour and PID screening results were 0ppm for all soil samples. Water removed from MW6 was free of hydrocarbon odour and sheen.

At MW7 a weak hydrocarbon odour was identified in drill cuttings at a depth of approximately 16m and PID screening detected 3ppm of VOC in sample headspace. Hydrocarbon odour was not identified at other depths. Water removed from MW7 had a weak hydrocarbon odour (diesel like).

Cuttings from MW8 were free of hydrocarbon odour and PID screening results were 0ppm for all soil samples. Water removed from MW8 was free of hydrocarbon odour and sheen.

Cuttings from MW9 were free of hydrocarbon odour and PID screening results were 0ppm for all soil samples. Water removed from MW8 was free of hydrocarbon odour and sheen.

Well gauging data recorded on 12 June 2020 is summarised in *Table 9.*

Well gauging data recorded on 27 October 2020 is presented in *Table10.*

Well gauging data recorded on 18 November 2020 is summarised in *Table 11*. *Table 11* also includes relative elevation data for each well head and relative depth to water across the monitoring network as measured on 18 November 2020.

Table 9: Well Gauging and Groundwater Field Observations – 12 June 2020

Monitoring Well ID	Headspace PID Reading (ppm)	Depth to LNAPL (m below TOC)	Depth to Water (m below TOC)
MW1	36	-	18.66m
MW2	6	16.65m	16.71m
MW3	0	-	16.11m

TOC = Top of PVC Casing

Table 10: Well Gauging and Groundwater Field Observations – 27 October 2020

Monitoring Well ID	Headspace PID Reading (ppm)	Depth to LNAPL (m below TOC)	Depth to Water (Below TOC)
MW1	-	16.130m	16.135m
MW2	-	14.130m	14.135m
MW3	-	-	13.59m

TOC = Top of PVC Casing

Table 11: Well Gauging and Groundwater Field Observations – 18 November 2020

Monitoring Well ID	PID Soil Screening Range (ppm)	Headspace PID Reading (ppm)	Depth to LNAPL (m)	Depth to Water (Below TOC)	Laser to TOC[1]	Laser to Water[2]	Relative Elevation (to MW6)[3]
MW1	0-23	10	19.210m	19.215m	0.66m	19.87m	1.32m
MW2	0-2	41	17.210m	17.215m	2.49m	19.70m	1.49m
MW3	0-0	0	-	16.66m	3.02m	19.68m	1.51m
MW4	0-0	0	-	9.47m	9.26m	18.73m	2.46m
MW5	0-22	0	-	11.24m	8.45m	19.69m	1.50m
MW6	0-0	0	-	13.75m	7.44m	21.19m	0.00m
MW7	0-3	1	-	17.81m	1.88m	19.69m	1.50m
MW8	0-0	0	-	19.27m	0.41m	19.68m	1.51m
MW9	0-0	3	-	17.59m	2.15m	19.74m	1.45m

TOC = Top of PVC Casing
1 – Laser set at arbitrary elevation.
2 – Depth to water below laser elevation.
3 – Relative elevation of groundwater relative to the level observed in MW6 (the lowest observed).

6.1.1 June 2020 Gauging Data

Groundwater wells MW1, MW2 and MW3 were monitored on 12 June 2020.

Ground Doctor gauged approximately 60mm of LNAPL within MW2. The presence of LNAPL was confirmed with a bailer check. The LNAPL had a pale-yellow tint and an odour which indicated it was a winter blend of diesel. MW2 was bailed until a continuous layer of LNAPL was no longer present. Approximately 200mL of LNAPL was recovered from MW2. MW2 was gauged approximately 2 hours after purging and LNAPL was not identified.

Measured groundwater elevation in all wells varied by 0.19m between the highest point (MW3) and the lowest point (MW1). Triangulation of groundwater elevation data indicated a gradient in a general southerly direction. However, LANPL was identified in MW2 (to the north of the former diesel tank) and not within MW1.

6.1.2 October 2020 Gauging Data

Ground Doctor gauged MW1, MW2 and MW3 on 27 October 2020, which was when the second round of groundwater assessment commenced.

Measured groundwater elevation in all monitoring wells were approximately 2.5m higher than those measured on 12 June 2020. Approximately 5mm of LNAPL was identified in MW2. Approximately 5mm of LNAPL was identified in MW1. LNAPL was not identified in MW3.

6.1.3 November 2020 Gauging Data

Ground Doctor gauged all monitoring wells (MW1-MW9) on 18 November 2020.

Approximately 5mm of LNAPL was gauged within MW1 and MW2. The LNAPL thickness was confirmed with a bailer.

Measured groundwater elevations within MW1, MW2 and MW3 had fallen approximately 3.1m in the three-week period since the 27 October 2020 gauging round.

A laser level was used to measure the relative elevation of the top of each groundwater monitoring well. Well elevation data was combined with well gauging data to convert the gauging data to relative elevations. The gauging and level data is presented in *Table 11*.

Measured groundwater elevation was highest at MW4 and the lowest at MW6. Groundwater elevation presented in *Table 11* is relative to the level measured within MW6.

The relative groundwater elevation measure at MW1, MW2, MW3, MW5, MW7, MW8 and MW9 varied by less than 0.20m and were 1.3-1.5m higher than the water level measured at MW6. The measured groundwater elevation at MW4 was approximately 2.46m higher than that measured within MW6, and approximately 1m higher than the water level measured in all other monitoring wells.

6.1.4 Groundwater Flow Direction

The measured groundwater elevation data is difficult to interpret. Groundwater appears to be relatively level beneath the former UPSS locations, with small variations between wells likely to be associated with small scale variations within individual fractures within the phyllite subsurface. The relatively large variation in measured groundwater elevation between MW4 and MW6 may indicate the importance of north-south orientation of fracture systems within the subsurface, with variation in pressure head possible along various north-south oriented systems that have reltively poor connectivity. This conceptual assessment of water levels is consistent with observation of LNAPL in MW2 and MW1, and absence of LNAP, or significant dissolved phase impacts in nearby monitoring bores MW3, MW7 and MW9.

Presence of low TRH concentrations (see *Section 6.2*) in groundwater at MW6 indicates that MW6 is in the flow path of the dissolved phase plume. Groundwater flow to the north is consistent with that inferred from surface topography.

6.1.5 Water Quality Parameters

Stabilised field water quality parameters measured at the time of sampling are presented in *Table 12*. Field parameters were not measured at MW1 and MW2 during the November 2020 monitoring round as LNAPL was identified in these wells. The data reported for MW1 was measured during the June 2020 monitoring round.

Table 12: Groundwater Field Water Quality Parameters – 18 November 2020

Well ID	Temperature (degrees Celsius)	Dissolved Oxygen (mg/L)	Electrical Conductivity (uS/cm)	pH	Oxidation Reduction Potential (mV)
MW1*	9.4	1.69	37	5.52	+185
MW2*	-	-	-	-	-
MW3	10.7	4.45	30	5.03	+201
MW4	10.3	1.51	101	5.24	+209
MW5	10.3	5.83	32	4.68	+228
MW6	12.1	5.35	20	4.91	+206
MW7	9.6	-	54	5.19	+209
MW8	11.5	2.86	50	5.43	+195
MW9	9.8	3.16	42	5.00	+217

* – Field water quality not measured where LNAPL was identified in the sample. MW1 results recorded in June 2020.

6.2 Analytical Results

Analytical results for the water sample are summarised and compared to the assessment criteria in *Table C1* of *Annex C*. The Laboratory Certificate of Analysis for groundwater samples is presented in *Annex D*.

Reported lead concentrations in groundwater samples collected from MW1, MW2 and MW3 were less than the laboratory practical quantification limit (PQL) and the adopted assessment criteria. No further lead analysis was conducted on this basis.

The reported TRH, BTEX and naphthalene concentrations in groundwater samples from all monitoring wells were less than the adopted HSLs.

The reported TRH, BTEX and PAHs concentrations in groundwater sampled from MW3, MW4, MW5, MW6, MW8 and MW9 were less than the PQL and/or the adopted GILs.

GIL exceedances are summarised as follows:

- Reported benzene, toluene, xylene, naphthalene and phenanthrene concentrations in water sampled from MW1 exceeded the adopted Australian Drinking Water thresholds and/or thresholds for the protection of freshwater ecosystems.
- Reported benzene, xylene, naphthalene and phenanthrene concentrations in water sampled from MW2 exceeded the adopted Australian Drinking Water thresholds and/or thresholds for the protection of freshwater ecosystems.
- Reported benzene and naphthalene concentrations in water sampled from MW2 exceeded the adopted Australian Drinking Water thresholds and/or thresholds for the protection of freshwater ecosystems.

The identified GIL exceedances occurred in monitoring wells located close to the former diesel tank (Tank 1) in which LNAPL has been identified or was likely to be present close by.

7 Discussion of Results

7.1 Revised Conceptual Site Model

The revised conceptual site model is summarised as follows.

- Diesel and petrol contamination entered the subsurface at Tank 1 and Tank 2.

- Hydrocarbon impacted soil was removed from the upper 2m of the subsurface. This has addressed any residual aesthetic impacts, potential ecological impacts and potential "direct contact" with soil from KNP users or maintenance workers. Concentrations of TRH and BTEXN in soil samples collected from the base of both UPSS excavations were less than the adopted HSLs.

- Primary migration of contaminants was through fractured rock on the base of the tank pits. LNAPL (diesel) has migrated through fractures which appear to have a vertical orientation and bias in a north-south direction. LNAPL identified within MW1 and MW2 is diesel. BTEX compounds have also been detected in the dissolved phase, indicating some petrol related impacts, however, BTEX concentrations do not indicate petrol NAPL is present in the subsurface.

- There is unlikely to be a significant mass of hydrocarbon in the vadose zone as the phyllite bedrock is tight providing minimal opportunity for sorption of hydrocarbons. Hydrocarbon is likely to have flowed preferentially through a small number of fractures, rather than spread throughout the vadose zone. This inference is supported by the relatively narrow band of LNAPL and dissolved phase impacts identified in groundwater. PID screening results for drill cuttings from MW1, MW2 and MW7 (within the source area) were low (maximum reading of 23ppm in all screened samples and typically less than 5ppm).

- The water table beneath the former UPSS locations, and the proposed new resort operations building, has varied between approximately 15m and 19m below ground level over three monitoring events spanning June 2020 to November 2020.

- A thin LNAPL layer (diesel) has been identified in close proximity to the former diesel tank (Tank 1). Less than 5mm of LNAPL was identified in MW1 and MW2. Dissolved phase concentrations of petroleum hydrocarbons in water sampled from MW7 indicate LNAPL is also located close to this location. LNAPL thickness did not change during a three week period (27 October 2020 to 18 November 2020) over which a 3.1m change was observed in groundwater elevations. The inferred extent of the LNAPL plume is shown in *Figure 6* of *Annex A*.

- Groundwater elevation data is difficult to interpret with any certainty and is indicative of a complex fracture system. Relative groundwater elevation data is presented in *Figure 5* of *Annex A*. The lowest relative groundwater elevation was observed at MW6. The detection of TRH at this location indicates that the dissolved phase plume travels in a northerly direction from the former UPSS toward MW6, consistent with surface topography.

- Monitoring data indicates that the dissolved phase plume is relatively narrow, defined to the east and west by MW3 and MW9, within which TRH and BTEX concentrations were less than the laboratory PQL. Similarly, TRH and BTEX concentrations at MW8 were below the laboratory PQL. PAH concentrations marginally above the laboratory PQL where detected at MW3 and MW8 indicating these monitoring wells are at the margin of the dissolved phase plume. All analytes were less than the PQL at MW4 and MW5. Concentrations of contaminants of concern do not exceed the adopted GILs at the outer monitoring wells. The inferred extent of the dissolved phase plume is shown in *Figure 6* of *Annex A*.

- Selwyn Snow Resort proposed to construct a new resort operations centre approximately 10m to the west of the former UPSS locations. The outline of the proposed building and

surrounding concrete hardstand is shown relative to monitoring well locations and the inferred plume map in *Figure 6* of *Annex A*. The building will be constructed as slab on grade. The building slab will be approximately 20m wide and the surrounding apron will make it up to 25m wide. Unsealed open space will remain on the northern, eastern and southern sides of the proposed building and driveway.

The CRC CARE (2013) Technical Report No. 23 provides guidelines for assessing sites with potential vapour intrusion risks. The guideline outlines screening distances, beyond which vapour intrusion risks will be acceptable on the basis that petroleum hydrocarbon vapour with biodegrade in the presence of oxygen. Key assumptions to apply the screening distance are that the vadose zone is not significantly impacted by petroleum hydrocarbons and oxygen can enter the subsurface. If these assumptions are met the screening distance for an LNAPL plume is 8m. The proposed resort operations centre and surrounding concrete slab will be located outside this distance both laterally and vertically, indicating the vapour intrusion risks will be acceptable.

CRC CARE (2013) indicates that oxygen can be assumed to be present in the subsurface if the diameter of an overlying slab does not exceed 15m. The proposed resort operations building will have an effective slab diameter of approximately 25m when surrounding pathways and driveways are considered.

Appendix B of CRC Care (2013) provides further guidance on concrete slab sizes that may limit presence of oxygen in the subsurface. For a diesel LNAPL source at a depth of 15m below ground level, the minimum diameter of continuous concrete slab that may inhibit oxygen in the subsurface, and potential for petroleum hydrocarbon vapour to biodegrade, is 69m.

The distance from the proposed building foundation to the identified LNAPL plume is more than 15m, which exceeds the minimum screening distance. On this basis, there is no unacceptable petroleum hydrocarbon vapour intrusion risk for the proposed development.

7.2 Assessment of Risk Pathways

Ground Doctor assessed all risk pathways identified as relevant in the conceptual site model (refer to *Section 3.1.3*). *Table 11* presents an assessment of each valid risk pathway based on the results of validation works undertaken to date. The conceptual site model is presented graphically as *Figure 7* of *Annex A*.

Table 11: Assessment of Risk Pathways

Risk Pathway	Results of Assessment	Outcome
Vapour Intrusion to Buildings	The identified hydrocarbon in MW2 was diesel, which has limited volatility. The former UPSS area is situated beneath public open space. There is no vapour intrusion risk in this setting. The proposed resort operations centre building will be located approximately 10m west of the former UPSS area and does not overly the inferred LNAPL plume or dissolved phase plumes. In addition, the slab floor of the proposed building will be situated at least 15m above the water table. Minimum screening distance guidance in CRC Care (2013) indicates that there is sufficient separation between the diesel LNAPL and the proposed new building slab to mitigate any petroleum vapour intrusion risks. See *Section 7.2* for more detailed assessment. Analytical results for soil remaining on the site (at depth greater than 2m) do not exceed HSLD assessment criteria. Analytical results for groundwater samples do not exceed HSLs for commercial or residential development. The thickness of the vadose zone (15m+) beneath the proposed building footprint.	Risk Acceptable
Vapour Intrusion for Intrusive Maintenance Work	Hydrocarbon impacted soil remaining at the former UPSS location are situated more than 2m below ground surface and are in consolidated bedrock. Risk of intrusive maintenance workers disturbing rock at this depth is limited. Analytical data for soil samples does not exceed HSLs for assessing vapour intrusion risks for intrusive maintenance workers (see Table 6).	Risk Acceptable
Direct Contact with Soil	Hydrocarbon impacted soil remaining at the former UPSS location are situated more than 2m below ground surface and are in consolidated bedrock. Concentrations of hydrocarbons in all soil samples were less than the adopted CRC CARE (2011) thresholds for direct contact with soil in a low density residential setting, open space, and for intrusive maintenance workers.	Risk Acceptable
Direct Contact with Groundwater	Groundwater is more than 15m below ground level at the former UPSS location. Direct contact pathway is not complete. The LNAPL plume and associated dissolved phase plume have been adequately delineated. Hydrocarbon impacted groundwater is more than 9m below ground level across the mapped extent of the plume.	Risk Acceptable
Human Consumption of Groundwater / Nearby Surface Water	Australian Drinking Water thresholds for BTEX and PAHs were exceeded in groundwater at MW1, MW2 and MW7. Reported concentrations of petroleum hydrocarbons in outer monitoring wells were less than the adopted Australian drinking water thresholds. Groundwater supply works are not located within 500m of the former UPSS area. Groundwater beneath the former UPSS would be expected to discharge to the surface downslope. Topography indicates this this most likely occurs at least 200m from the former UPSS area and most likely north of the former UPSS. The petroleum hydrocarbon plume would be expected to biodegrade naturally prior to discharging downslope. Analytical data indicates that the dissolved phase plume biodegrades to concentrations that are less than the Australian drinking water thresholds upgradient of any potential discharge points.	Risk Acceptable
Underground Services	Soil in the upper 2m of the subsurface within the former UPSS area was free of significant hydrocarbon impacts. Phyllite bedrock underlying the former UPSS area appears to be permeable and the depth to groundwater exceeds 15m. In this setting underground service conduits are unlikely to act as preferential migration pathways as any hydrocarbon lost to ground can readily migrate. Significant underground services were not identified during the assessment.	Risk Acceptable

Risk Pathway	Results of Assessment	Outcome
Risks to Flora and Fauna	Following remediation works, hydrocarbon impacted soil remaining at the former UPSS location are situated more than 2m below ground surface and is within phyllite bedrock. Prior to the January 2020 bushfire surrounding vegetation was not showing signs of stress related to land contamination. Groundwater is more than 15m below ground level which is below the root zone of alpine flora.	Risk Acceptable
Aesthetics	Following remediation works, hydrocarbon impacted soil remaining at the former UPSS location are situated more than 2m below ground surface and is within phyllite bedrock. On this basis there are no aesthetic issues for future KNP or snow resort users.	Risk Acceptable
Risks to Fresh Water Aquatic Ecosystems	Groundwater beneath the former UPSS would be expected to discharge to the surface downslope. Topography indicates this this most likely occurs at least 200m from the former UPSS area and most likely north of the former UPSS. Petroleum hydrocarbon plumes would be expected to biodegrade naturally prior to discharging downslope. Analytical data indicates that the dissolved phase plume biodegrades to concentrations that are less than the adopted thresholds for 99% protection of freshwater aquatic ecosystems upgradient of any potential discharge points.	Risk Acceptable
LNAPL / Explosive Risk	LNAPL identified at the site was diesel which has relatively low volatility and has little potential to combust at the <20 degrees Celcius temperatures observed in the subsurface at the site. LNAPL is at least 15m below the ground surface and the site setting and proposed future development is such that petroleum hydrocarbon vapours are expected to biodegrade prior to reaching the ground surface, or relatively shallow service pits. No development is proposed directly above the identified LNAPL plume.	Risk Acceptable

7.3 LNAPL Management

The maximum identified LNAPL thickness of 60mm occurred at MW2 in June 2020. Following removal of LNAPL during the June 2020 monitoring round the maximum observed LNAPL thickness in MW1 and MW2 was approximately 5mm.

The NSW EPA (2015) *Technical Note: Light Non-Aqueous Phase Liquid Assessment and Remediation* states:

The results of the risk assessment will guide the level of LNAPL clean-up that is required. LNAPL needs to be cleaned up to such an extent that further removal or treatment of LNAPL no longer reduces the level of risk. In any case, LNAPL clean-up should continue if the LNAPL is still spreading. The need for LNAPL clean-up would also be indicated by a dissolved phase plume that continues to spread.

Ground Doctor did not identified any unacceptable human health or environmental risks at the former UPSS site. The relatively small LNAPL thickness identified makes the likelihood of LNAPL migration, and associated changes to dissolved phase impacts low. Given the relatively low mass of LNAPL remaining at the site, and likely difficulty in removing the LNAPL from fractured rock at a depth of 15m below ground level, the identified impacts would be best managed by monitored natural attenuation (MNA). A more appropriate remediation strategy could be adopted if MNA results identify potentially unacceptable human health or environmental risks, or if LNAPL thickness was observed to increase during the MNA period.

7.4 Duty to Report Contamination

The identified LNAPL impacts have been reported to the NSW EPA. There were no additional reporting triggers encountered during the most recent round of assessment.

Ground Doctor recommends that this report is supplied to the NSW EPA to make it aware that the identified contamination has been delineated and that no unacceptable human health or environmental risks have been identified at the site.

8 Quality Assurance and Quality Control

A detailed review of quality assurance and quality control (QAQC) for this validation assessment is presented as *Annex E*.

The level of data QAQC was considered appropriate given the objective of the assessment. Results for QAQC parameters indicate that data was of acceptable quality to assess potential risks to human health and the environment associated with the decommissioned UPSS. The data could be relied upon to make the conclusions outlined in *Section 9*.

9 Conclusions

A UPSS comprising two 4500L USTs and associated pipework was removed from the former Selwyn Snow Resort Workshop on 15 April 2020.

Liquid generated during the work was collected and disposed by Cleanaway. The USTs were degassed and destroyed on site and were later disposed as scrap metal.

Ground Doctor assessed soil around the former UPSS locations on the day of decommissioning. Validation samples were collected for laboratory analysis. Hydrocarbon impacted soil was identified within both tank pits. This included loose soil around the tanks and soil on the base of both tank pits. A small amount of hydrocarbon impacted soil was also identified on the southern and eastern wall of the Tank 1 excavation.

Hydrocarbon impacted soil that had been removed from the UPSS excavation, and impacted soil identified on the southern and eastern walls of the Tank 1 excavation, was removed from the site on 27 May 2020. The soil was transported to the New Soil – Soil Recycling Facility located at Cootamundra, NSW, for treatment and recycling. Weighbridge dockets indicated that 41.8 tonnes of soil was removed from the site.

The UPSS excavations were backfilled with soil and rock borrowed from adjoining open areas of the site on 27 May 2020.

Following soil remediation work three groundwater monitoring wells were installed around the former UPSS location to assess potential groundwater impacts in May 2020. Following identification of groundwater impacts including LNAPL, additional groundwater assessment was conducted in October and November 2020. Nine groundwater monitoring wells were used to delineate the LNAPL plume and associated dissolved phase plume.

Ground Doctor used the available soil and groundwater validation data and conceptual understanding of the site setting to assess relevant human health risk pathways and environmental risk pathways at the site. The validation assessment results indicate that the remaining soil and groundwater impacts do not pose an unacceptable risk to human health or the environment. The former UPSS area is suitable for continued use as a ski resort within KNP. There will be no unacceptable vapour intrusion impacts to the proposed Resort Operations Centre building, which is to be constructed to the west of the identified groundwater impacts.

The relatively small LNAPL thickness identified makes the likelihood of LNAPL migration, and associated changes to dissolved phase impacts low. Given the relatively low mass of LNAPL remaining at the site, and likely difficulty in removing the LNAPL from fractured rock at a depth of 15m below ground level, the identified impacts would be best managed by monitored natural attenuation (MNA). A more appropriate remediation strategy could be adopted if MNA results identify potentially unacceptable human health or environmental risks.

Ground Doctor recommends that six monthly groundwater monitoring occur at the site for a period of at least two years to assess any changes to the identified LNAPL and dissolved phase plumes. The conclusions made in this validation assessment should be revised if significant changes to groundwater status are identified. The monitoring works should include:

- gauging and headspace screening of all wells
- bailer checking LNAPL wells (or potential LNAPL wells) to assess LNAPL thickness.
- sampling and analysis at monitoring wells of MW3, MW5, MW6, MW8 and MW9.
- analysis of groundwater samples for TRH, BTEXN and natural attenuation indicators.

10 References

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- Geological Survey of NSW (1966), *Wagga Wagga 1:250000 Geological Series Sheet S1 55-15,* First Edition.

- Snowy River Local Environment Plan 2013.

- National Environment Protect Council (NEPC) (1999) *National Environment Protection (Assessment of Contamination) Measure* (NEPM) (revised April 2013).

- NEPM (2013) "*Schedule B1: Guideline on Investigation Levels for Soil and Groundwater*".

- NEPM (2013) "*Schedule B2: Guideline on Site Characterisation*".

- NSW Department of Environment, Climate Change and Water (2009), "*Guidelines for Implementing the Protection of the Environment Operations (UPSS) Regulation 2008*", September 2009.

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- NSW EPA (2014) "*Waste Classification Guidelines, Part 1 – Classifying Waste",* 2014.

- NSW EPA (2014) "*Technical Note: Investigation of Service Stations*", April 2014.

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- NSW Government (6 July 2020), NSW Spatial Information Exchange Website, http://www.maps.six.nsw.gov.au.

- NSW Protection of the Environment Operations (UPSS) Regulation 2019.

- Water NSW (6 July 2020), Registered Groundwater Works Database Website, https://realtimedata.waternsw.com.au/water.stm.

Annex A

Figures

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Project Number:	2020-GD003-RP1

Figure 1

Site Features and UPSS Location

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Figure 2

Former UPSS Layout and Features

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Figure 3

UPSS Excavations and Soil Validation Sampling Locations

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Figure 4

Groundwater Monitoring Well Locations

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Project Number:	2020-GD003-RP1

Figure 5

Relative Groundwater Elevations - 18 November 2020

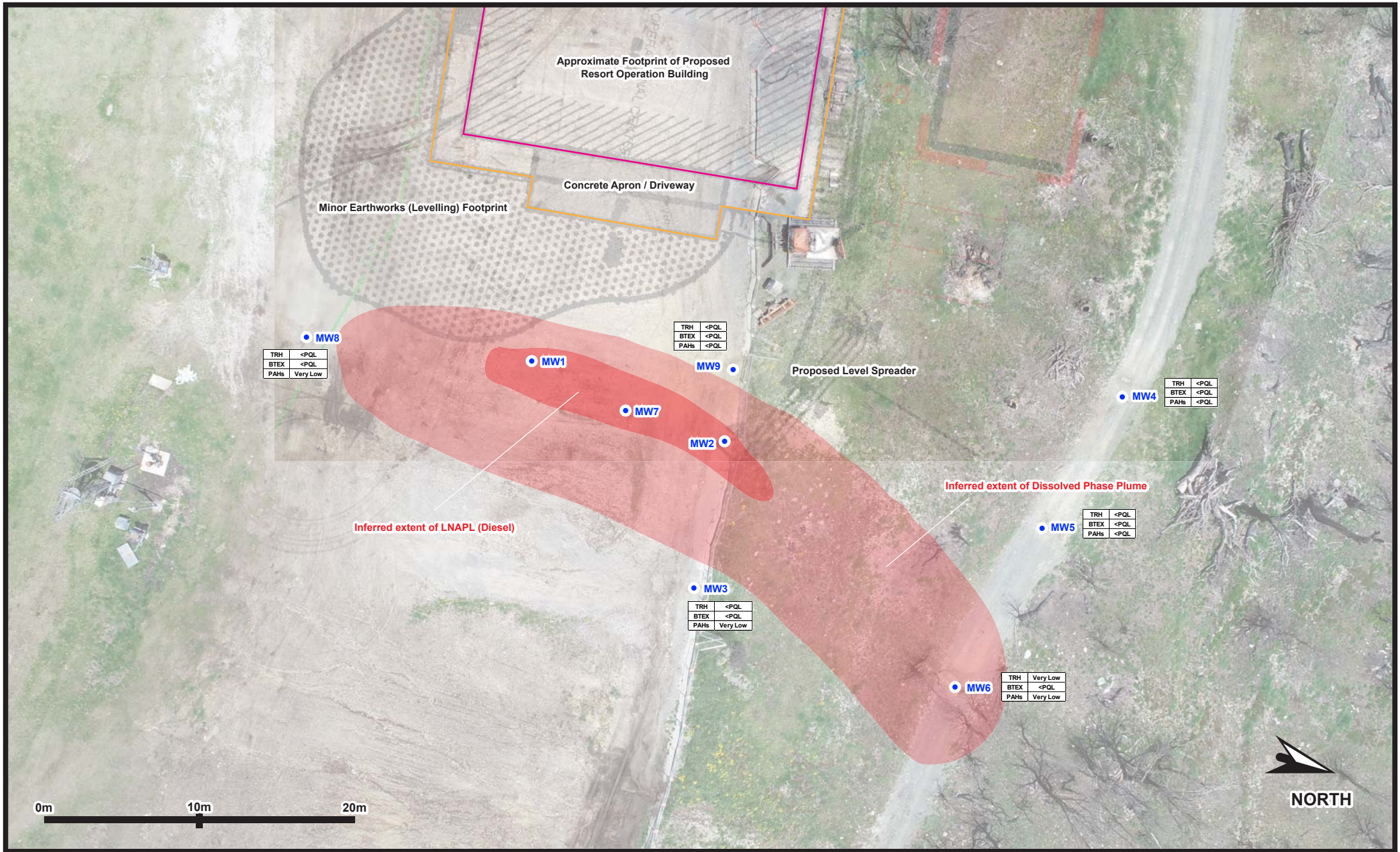

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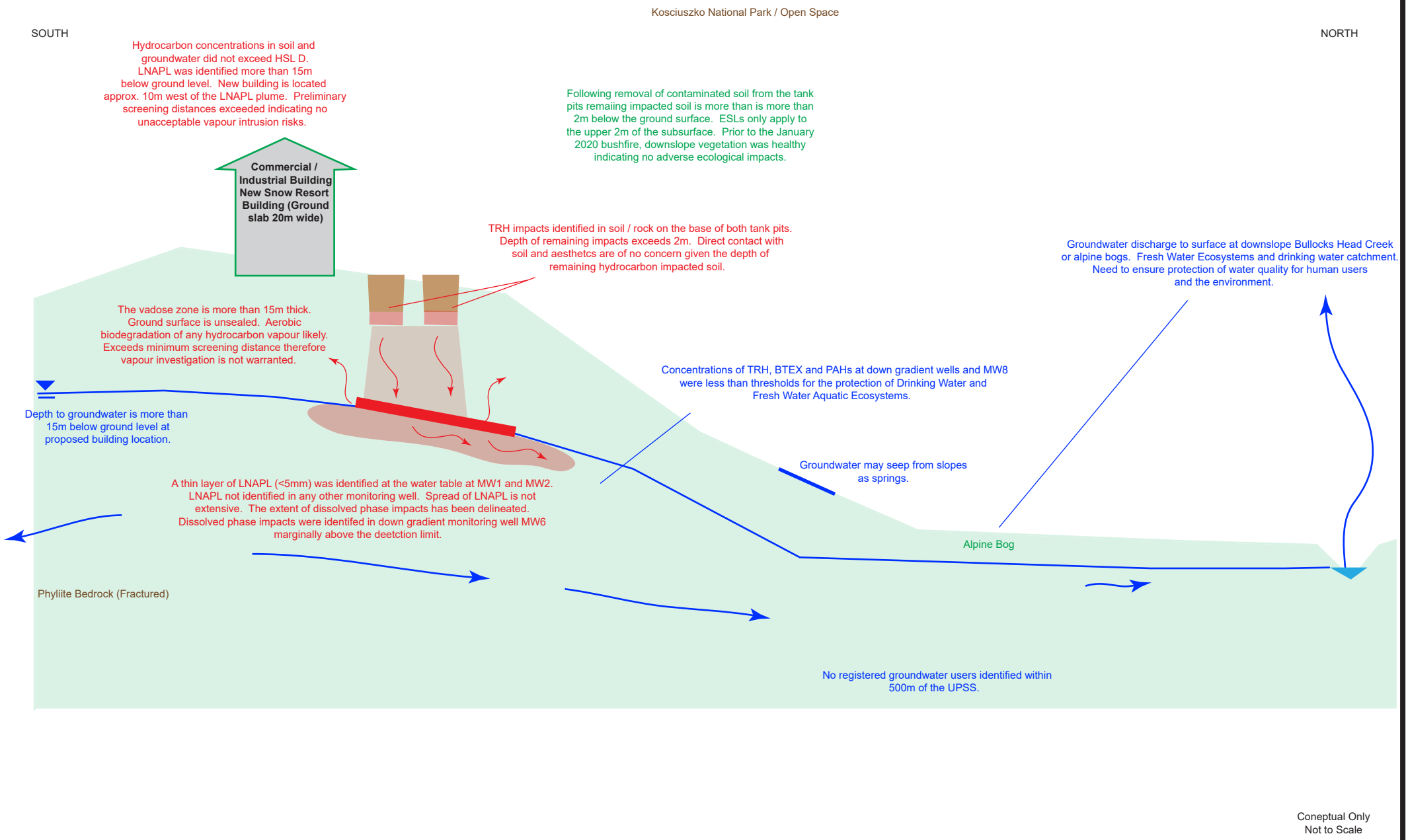
Figure 6

Inferred Extent of LNAPL and Dissolved Phase Plumes with Proposed Development Footprint Overlain



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Project Number:	2020-GD003

Figure 7

Conceptual Site Model

Annex B

Soil Analytical Results Summary Tables

TABLE B1

TRH, BTEX, Naphthalene and Lead in Soil (mg/kg) - Comparison to NEPM (1999) Vapour Intrusion Assessment Criteria and HILs

UPSS Decommissioning Works - Selwyn Snow Resort Workshop, Cabramurra, NSW

Sample ID	Sample Depth (m bgl)	Sampling Date	Benzene	Toluene	Ethylbenzene	Xylene (total)	TRH (C6-C10) Less BTEX	TRH (>C10-C16) Less Naphthalene	TRH (>C16-C34)	TRH (>C34-C40)	Naphthalene	Lead
EQL			0.2	0.5	1	1	25	50	100	100	1	1
Assessment Criteria												
HSLD - Sand - 0-<1m			**3**	**NL**	**NL**	**230**	**260**	**NL**	**NL**	**NL**	**NL**	**-**
HSLD - Sand - 1-<2m			**3**	**NL**	**NL**	**NL**	**370**	**NL**	**NL**	**NL**	**NL**	**-**
HSLD - Sand - 2-<4m			**3**	**NL**	**NL**	**NL**	**630**	**NL**	**NL**	**NL**	**NL**	**-**
HSLD - Sand - 4m+			**3**	**NL**	**NL**	**NL**	**NL**	**NL**	**NL**	**NL**	**NL**	**-**
NEPM HIL D			**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**1500**
T1-N1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**11**
T1-E1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	**920**	**540**	<100	<1	**15**
T1-E2	1.6m	27-May-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**29**
T1-S1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	**41**	**850**	**490**	<100	<1	**12**
T1-S2	1.6m	27-May-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**19**
T1-W1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**13**
T1-Base1	2.3m	15-Apr-20	<0.2	<0.5	<1	<3	**65**	**1400**	**820**	<100	<1	**7**
T1-Spoil1	-	15-Apr-20	<0.2	<0.5	<1	<3	**34**	**560**	**450**	<100	<1	**12**
T1-Spoil2	-	15-Apr-20	<0.2	<0.5	<1	<3	<25	**520**	**430**	<100	<1	**9**
T2-N1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**30**
T2-E1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**16**
T2-S1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**14**
T2-W1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1	**22**
T2-Base1	2.1m	15-Apr-20	<0.2	<0.5	<1	**5**	<25	**260**	<100	<100	<1	**10**
T2-Spoil1	-	15-Apr-20	**0.5**	**67**	**39**	**290**	**830**	**590**	**110**	<100	**34**	**24**
T2-Spoil2	-	15-Apr-20	**1**	**130**	**58**	**350**	**1200**	**710**	<100	<100	**26**	**13**

Result exceeds one or more HSLs

Result exceeds HIL

TABLE B2

TRH, BTEX and Naphthalene in Soil (mg/kg) - Comparison to NEPM (1999) ESLs Assessment Criteria

UPSS Decommissioning Works - Selwyn Snow Resort Workshop, Cabramurra, NSW

Sample ID	Sample Depth (m bgl)	Sampling Date	Benzene	Toluene	Ethylbenzene	Xylene (total)	TRH (C6-C10) Less BTEX	TRH (>C10-C16) Less Naphthalene	TRH (>C16-C34)	TRH (>C34-C40)	Naphthalene
EQL			0.2	0.5	1	3	25	50	100	100	1
Assessment Criteria											
ESLs - Sensitive Open Space - Coarse Grained Soil			**50**	**85**	**70**	**105**	**125**	**25**	**300**	**2800**	**NA**
T1-N1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-E1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	**920**	**540**	<100	<1
T1-E2	1.6m	27-May-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-S1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	**41**	**850**	**490**	<100	<1
T1-S2	1.6m	27-May-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-W1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-Base1	2.3m	15-Apr-20	<0.2	<0.5	<1	<3	**65**	**1400**	**820**	<100	<1
T1-Spoil1	-	15-Apr-20	<0.2	<0.5	<1	<3	**34**	**560**	**450**	<100	<1
T1-Spoil2	-	15-Apr-20	<0.2	<0.5	<1	<3	<25	**520**	**430**	<100	<1
T2-N1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-E1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-S1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-W1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-Base1	2.1m	15-Apr-20	<0.2	<0.5	<1	**5**	<25	**260**	<100	<100	<1
T2-Spoil1	-	15-Apr-20	**0.5**	**67**	**39**	**290**	**830**	**590**	**110**	<100	**34**
T2-Spoil2	-	15-Apr-20	**1**	**130**	**58**	**350**	**1200**	**710**	<100	<100	**26**

Result exceeds the ESL

ESLs apply to the upper 2m of the subsurface only. Results for samples >2m below surface are presented for context.

TABLE B3

TRH, BTEX and Naphthalene in Soil (mg/kg) - Comparison to NEPM (1999) Management Limits
UPSS Decommissioning Works - Selwyn Snow Resort Workshop, Cabramurra, NSW

Sample ID	Sample Depth (m bgl)	Sampling Date	Benzene	Toluene	Ethylbenzene	Xylene (total)	TRH (C6-C10)	TRH (>C10-C16)	TRH (>C16-C34)	TRH (>C34-C40)	Naphthalene
EQL			0.2	0.5	1	3	25	50	100	100	1
Assessment Criteria -Coarse Soil											
Management Limits - Open Space			**NA**	**NA**	**NA**	**NA**	**700**	**1000**	**2500**	**10000**	**NA**
T1-N1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-E1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	**920**	**540**	<100	<1
T1-E2	1.6m	27-May-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-S1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	**41**	**850**	**490**	<100	<1
T1-S2	1.6m	27-May-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-W1	1.6m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T1-Base1	2.3m	15-Apr-20	<0.2	<0.5	<1	<3	**65**	**1400**	**820**	<100	<1
T1-Spoil1	-	15-Apr-20	<0.2	<0.5	<1	<3	**34**	**560**	**450**	<100	<1
T1-Spoil2	-	15-Apr-20	<0.2	<0.5	<1	<3	<25	**520**	**430**	<100	<1
T2-N1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-E1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-S1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-W1	1.4m	15-Apr-20	<0.2	<0.5	<1	<3	<25	<50	<100	<100	<1
T2-Base1	2.1m	15-Apr-20	<0.2	<0.5	<1	**5**	<25	**260**	<100	<100	<1
T2-Spoil1	-	15-Apr-20	**0.5**	**67**	**39**	**290**	**1200**	**620**	**110**	<100	**34**
T2-Spoil2	-	15-Apr-20	**1**	**130**	**58**	**350**	**1800**	**740**	<100	<100	**26**

Result exceeds the Management Limit

TABLE B4

Comparison of Analytical Results with Waste Classification Thresholds (mg/kg)

UPSS Decommissioning Works - Selwyn Snow Resort Workshop, Cabramurra, NSW

Sample ID	Depth (m)	Sampling Date	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH (C6-C9)	TPH (C10-C36)	Lead
T1-Spoil1	-	15-Apr-20	<0.2	<0.5	<1	<3	25	**980**	**12**
T1-Spoil2	-	15-Apr-20	<0.2	<0.5	<1	<3	25	**920**	**9**
T2-Spoil1	-	15-Apr-20	**0.5**	**67**	**39**	**290**	**690**	**1050**	**24**
T2-Spoil2	-	15-Apr-20	**1**	**130**	**58**	**350**	**1200**	**1340**	**13**
No Samples			na	na	na	na	4	na	na
Average			na	na	na	na	485	na	na
St Dev			na	na	na	na	571	na	na
Coef Variation			na	na	na	na	1.18	na	na
T(0.05,3)			na	na	na	na	2.353	na	na
95% UCL Average			**-**	**-**	**-**	**-**	**1156**	**-**	**-**
Thresholds published in NSW EPA (2014) Waste Classification Guidelines, Part 1: Classifying Waste									
NSW EPA (2014) - General Solid Waste			**10**	**288**	**600**	**1000**	**650**	**10000**	**100**
NSW EPA (2014) - Restricted Solid Waste			**40**	**1152**	**2400**	**4000**	**2600**	**40000**	**400**

na = Not applicable when TCLP test has been performed.

Shaded cells show concentrations of analytes that exceed the waste classification thresholds.

Total contaminant concentrations expressed in mg/kg.
TCLP concnentrations expressed as mg/L.
Result shown red. Where the reported concentration was less than the EQL, the EQL was used to allow statistical assessment of results.

Annex C

Groundwater Analytical Results Summary Tables

TABLE C1

Summary of Analytical Results - TRH, BTEX, PAHs and Lead in Groundwater (ug/L) versus Assessment Criteria

UPSS Decommissioning Validation Report - Selwyn Snow Resort Workshop, Cabramurra, NSW

Borehole ID	Sampling Date	Benzene	Toluene	Ethylbenzene	m&p - xylene	o - xylene	Xylene (total)	TRH (C6-C10)	TRH (C6-C10) Less BTEX	TRH (>C10-C16)	TRH (>C10-C16) Less Naph	TRH (>C16-C34)	TRH (>C34-C40)	Naphthalene	Benzo(a)pyrene	Phenanthrene	Fluoranthene	Lead
EQL		**1**	**1**	**1**	**2**	**1**	**3**	**10**		**50**		**100**	**100**	**1**				**1**
Assessment Criteria																		
HSLD-Sand-8m+		**5000**	**NL**	**NL**	**NL**	**NL**	**NL**	**--**	**7000**	**--**	**NL**	**NL**	**NL**	**NL**	**--**	**--**	**--**	**--**
HSLC-Sand-8m+		**NL**	**NL**	**NL**	**NL**	**NL**	**NL**	**--**	**NL**	**--**	**NL**	**NL**	**NL**	**NL**	**--**	**--**	**--**	**--**
Austalian Drinking Water (2011) - Health		**1**	**800**	**300**	**600**	**600**	**600**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0.01**	**--**	**--**	**10**
Default Guideline Values (2018) - 99%		**600**	**110**	**50**	**50**	**200**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2.5**	**0.1**	**0.6**	**1**	**3.4**
NHMRC (2008) Recreational Waters		**10**	**8000**	**3000**	**6000**	**6000**	**6000**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0.1**	**--**	**--**	**100**
MW1	12-Jun-20	**48**	**220**	**40**	**110**	**94**	**204**	**1000**	**490**	**940**	**940**	**380**	**130**	**5**	**-**	**-**	**-**	<1
MW1	18-Nov-20	**59**	**180**	**83**	**220**	**300**	**520**	**2300**	**1500**	**44000**	**44000**	**26000**	**<100**	**21**	<1	**2.4**	<1.0	-
MW2	12-Jun-20	**37**	**160**	**43**	**110**	**84**	**194**	**700**	**270**	**920**	**910**	**370**	**120**	**7**	**-**	**-**	**-**	<1
MW2	18-Nov-20	**29**	**19**	**39**	**63**	**150**	**213**	**900**	**600**	**120000**	**120000**	**89000**	**130**	**30**	<1	**5.8**	<1	-
MW3	12-Jun-20	<1	<1	<1	<2	<1	<3	<10	<10	<50	<50	<100	<100	<0.2	**-**	**-**	**-**	<1
MW3	18-Nov-20	<1	<1	<1	<2	<1	<3	<10	<10	<50	<50	<100	<100	<0.2	<0.1	**0.3**	<0.1	-
MW4	18-Nov-20	<1	<1	<1	<2	<1	<3	<10	<10	<50	<50	<100	<100	<0.2	<0.1	<0.1	<0.1	-
MW5	18-Nov-20	<1	<1	<1	<2	<1	<3	<10	<10	<50	<50	<100	<100	<0.2	<0.1	<0.1	<0.1	-
MW6	18-Nov-20	<1	<1	<1	<2	<1	<3	<10	<10	<50	<50	**130**	<100	<0.2	<0.1	**0.1**	<0.1	-
MW7	18-Nov-20	**42**	<1	**9**	**12**	**97**	**109**	**350**	**190**	**700**	**690**	**210**	<100	**3.3**	<0.1	**0.2**	<0.1	-
MW8	18-Nov-20	<1	<1	<1	<2	<1	<3	<10	<10	<50	<50	<100	<100	<0.2	<0.1	**0.1**	<0.1	-
MW9	18-Nov-20	<1	<1	<1	<2	<1	<3	<10	<10	<50	<50	<100	<100	<0.2	<0.1	<0.1	<0.1	-

Shaded cell indicates concentration exceeds one or more of the assessment criteria

Annex D

Laboratory Certificates of Analysis

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow

Sample Login Details

Your reference	UPSS Decommissioning - Selwyn Snow Resort Workshop
Envirolab Reference	241046
Date Sample Received	17/04/2020
Date Instructions Received	17/04/2020
Date Results Expected to be Reported	24/04/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	18 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10.2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	Acid Extractable metalsin soil
T1-N1-1.6m	✓	✓	✓
T1-E1-1.6m	✓	✓	✓
T1-S1-1.6m	✓	✓	✓
T1-W1-1.6m	✓	✓	✓
T1-Base1-2.3m	✓	✓	✓
T1-Spoil1	✓	✓	✓
T1-Spoil2	✓	✓	✓
T2-N1-1.4m	✓	✓	✓
T2-E1-1.4m	✓	✓	✓
T2-S1-1.4m	✓	✓	✓
T2-W1-1.4m	✓	✓	✓
T2-Base1-2.1m	✓	✓	✓
T2-Spoil1	✓	✓	✓
T2-Spoil2	✓	✓	✓
DUPA	✓	✓	✓
DUPB	✓	✓	✓
TS	✓		
TB	✓		

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
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CERTIFICATE OF ANALYSIS 241046

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow
Address	PO Box 6278, Dubbo, NSW, 2830

Sample Details

Your Reference	**UPSS Decommissioning - Selwyn Snow Resort Workshop**
Number of Samples	18 Soil
Date samples received	17/04/2020
Date completed instructions received	17/04/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	24/04/2020
Date of Issue	24/04/2020

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Results Approved By
Hannah Nguyen, Senior Chemist
Josh Williams, Senior Chemist
Ridwan Wijaya, Lab Team Leader

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		241046-1	241046-2	241046-3	241046-4	241046-5
Your Reference	UNITS	T1-N1	T1-E1	T1-S1	T1-W1	T1-Base1
Depth		1.6m	1.6m	1.6m	1.6m	2.3m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	41	<25	65
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	41	<25	65
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	94	90	93	89	87

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		241046-6	241046-7	241046-8	241046-9	241046-10
Your Reference	UNITS	T1-Spoil1	T1-Spoil2	T2-N1	T2-E1	T2-S1
Depth		-	-	1.4m	1.4m	1.4m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	34	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	34	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	93	87	99	104	93

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		241046-11	241046-12	241046-13	241046-14	241046-15
Your Reference	UNITS	T2-W1	T2-Base1	T2-Spoil1	T2-Spoil2	DUPA
Depth		1.4m	2.1m	-	-	-
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
TRH C_6 - C_9	mg/kg	<25	<25	690	1,200	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	1,200	1,800	67
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	830	1,200	67
Benzene	mg/kg	<0.2	<0.2	0.5	1	<0.2
Toluene	mg/kg	<0.5	<0.5	67	130	<0.5
Ethylbenzene	mg/kg	<1	<1	39	58	<1
m+p-xylene	mg/kg	<2	3	190	240	<2
o-Xylene	mg/kg	<1	2	92	110	<1
naphthalene	mg/kg	<1	<1	34	26	<1
Total +ve Xylenes	mg/kg	<3	5	290	350	<3
Surrogate aaa-Trifluorotoluene	%	92	104	98	91	99

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		241046-16	241046-17	241046-18
Your Reference	UNITS	DUPB	TS	TB
Depth		-	-	-
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil
Date extracted	-	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020
TRH C_6 - C_9	mg/kg	93	[NA]	[NA]
TRH C_6 - C_{10}	mg/kg	190	[NA]	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	160	[NA]	[NA]
Benzene	mg/kg	<0.2	91%	<0.2
Toluene	mg/kg	2	94%	<0.5
Ethylbenzene	mg/kg	<1	92%	<1
m+p-xylene	mg/kg	12	92%	<2
o-Xylene	mg/kg	8	91%	<1
naphthalene	mg/kg	<1	[NA]	<1
Total +ve Xylenes	mg/kg	20	[NA]	[NA]
Surrogate aaa-Trifluorotoluene	%	100	95	108

svTRH (C10-C40) in Soil						
Our Reference		241046-1	241046-2	241046-3	241046-4	241046-5
Your Reference	UNITS	T1-N1	T1-E1	T1-S1	T1-W1	T1-Base1
Depth		1.6m	1.6m	1.6m	1.6m	2.3m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	22/04/2020	22/04/2020	22/04/2020	22/04/2020	22/04/2020
TRH C_{10} - C_{14}	mg/kg	<50	560	520	<50	880
TRH C_{15} - C_{28}	mg/kg	<100	910	820	<100	1,400
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	920	850	<50	1,400
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	920	850	<50	1,400
TRH >C_{16} -C_{34}	mg/kg	<100	540	490	<100	820
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	1,500	1,300	<50	2,300
Surrogate o-Terphenyl	%	94	#	#	86	#

svTRH (C10-C40) in Soil						
Our Reference		241046-6	241046-7	241046-8	241046-9	241046-10
Your Reference	UNITS	T1-Spoil1	T1-Spoil2	T2-N1	T2-E1	T2-S1
Depth		-	-	1.4m	1.4m	1.4m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	22/04/2020	22/04/2020	22/04/2020	22/04/2020	22/04/2020
TRH C_{10} - C_{14}	mg/kg	340	310	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	640	610	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	560	520	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	560	520	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	450	430	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	1,000	960	<50	<50	<50
Surrogate o-Terphenyl	%	127	132	86	88	85

svTRH (C10-C40) in Soil						
Our Reference		241046-11	241046-12	241046-13	241046-14	241046-15
Your Reference	UNITS	T2-W1	T2-Base1	T2-Spoil1	T2-Spoil2	DUPA
Depth		1.4m	2.1m	-	-	-
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	22/04/2020	22/04/2020	22/04/2020	22/04/2020	22/04/2020
TRH C_{10} - C_{14}	mg/kg	<50	310	880	1,200	910
TRH C_{15} - C_{28}	mg/kg	<100	<100	170	140	1,500
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	260	620	740	1,500
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	260	590	710	1,500
TRH >C_{16} -C_{34}	mg/kg	<100	<100	110	<100	940
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	260	730	740	2,400
Surrogate o-Terphenyl	%	86	89	98	99	#

svTRH (C10-C40) in Soil		
Our Reference		241046-16
Your Reference	UNITS	DUPB
Depth		-
Date Sampled		15-Apr-20
Type of sample		Soil
Date extracted	-	20/04/2020
Date analysed	-	22/04/2020
TRH C_{10} - C_{14}	mg/kg	210
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	170
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	170
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	170
Surrogate o-Terphenyl	%	83

Acid Extractable metals in soil						
Our Reference		241046-1	241046-2	241046-3	241046-4	241046-5
Your Reference	UNITS	T1-N1	T1-E1	T1-S1	T1-W1	T1-Base1
Depth		1.6m	1.6m	1.6m	1.6m	2.3m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
Lead	mg/kg	11	15	12	13	7

Acid Extractable metals in soil						
Our Reference		241046-6	241046-7	241046-8	241046-9	241046-10
Your Reference	UNITS	T1-Spoil1	T1-Spoil2	T2-N1	T2-E1	T2-S1
Depth		-	-	1.4m	1.4m	1.4m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
Lead	mg/kg	12	9	30	16	14

Acid Extractable metals in soil						
Our Reference		241046-11	241046-12	241046-13	241046-14	241046-15
Your Reference	UNITS	T2-W1	T2-Base1	T2-Spoil1	T2-Spoil2	DUPA
Depth		1.4m	2.1m	-	-	-
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
Lead	mg/kg	22	10	24	13	20

Acid Extractable metals in soil		
Our Reference		241046-16
Your Reference	UNITS	DUPB
Depth		-
Date Sampled		15-Apr-20
Type of sample		Soil
Date prepared	-	20/04/2020
Date analysed	-	21/04/2020
Lead	mg/kg	13

Moisture						
Our Reference		241046-1	241046-2	241046-3	241046-4	241046-5
Your Reference	UNITS	T1-N1	T1-E1	T1-S1	T1-W1	T1-Base1
Depth		1.6m	1.6m	1.6m	1.6m	2.3m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
Moisture	%	3.6	2.0	4.7	6.8	2.7

Moisture						
Our Reference		241046-6	241046-7	241046-8	241046-9	241046-10
Your Reference	UNITS	T1-Spoil1	T1-Spoil2	T2-N1	T2-E1	T2-S1
Depth		-	-	1.4m	1.4m	1.4m
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
Moisture	%	21	8.6	49	24	13

Moisture						
Our Reference		241046-11	241046-12	241046-13	241046-14	241046-15
Your Reference	UNITS	T2-W1	T2-Base1	T2-Spoil1	T2-Spoil2	DUPA
Depth		1.4m	2.1m	-	-	-
Date Sampled		15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20	15-Apr-20
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2020	20/04/2020	20/04/2020	20/04/2020	20/04/2020
Date analysed	-	21/04/2020	21/04/2020	21/04/2020	21/04/2020	21/04/2020
Moisture	%	5.4	3.8	26	6.5	25

Moisture		
Our Reference		241046-16
Your Reference	UNITS	DUPB
Depth		-
Date Sampled		15-Apr-20
Type of sample		Soil
Date prepared	-	20/04/2020
Date analysed	-	21/04/2020
Moisture	%	20

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	241046-2
Date extracted	-			23/04/2020	1	20/04/2020	20/04/2020		20/04/2020	20/04/2020
Date analysed	-			23/04/2020	1	21/04/2020	21/04/2020		21/04/2020	21/04/2020
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	88	90
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	88	90
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	76	77
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	87	88
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	95	95
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	90	96
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	88	94
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	119	1	94	93	1	99	95

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	20/04/2020	20/04/2020		[NT]	[NT]
Date analysed	-			[NT]	11	21/04/2020	21/04/2020		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	11	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	11	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	11	92	90	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	241046-2
Date extracted	-			20/04/2020	1	20/04/2020	20/04/2020		20/04/2020	20/04/2020
Date analysed	-			22/04/2020	1	22/04/2020	22/04/2020		22/04/2020	22/04/2020
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	119	#
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	100	#
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	106	129
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	119	#
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	100	#
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	106	129
Surrogate o-Terphenyl	%		Org-020	89	1	94	90	4	114	#

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	20/04/2020	20/04/2020		[NT]	[NT]
Date analysed	-			[NT]	11	22/04/2020	22/04/2020		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	11	86	85	1	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	241046-2
Date prepared	-			20/04/2020	1	20/04/2020	20/04/2020		20/04/2020	20/04/2020
Date analysed	-			21/04/2020	1	21/04/2020	21/04/2020		21/04/2020	21/04/2020
Lead	mg/kg	1	Metals-020	<1	1	11	9	20	110	88

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	20/04/2020	20/04/2020		[NT]	[NT]
Date analysed	-			[NT]	11	21/04/2020	21/04/2020		[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	22	19	15	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

TRH Soil C10-C40 NEPM - # Percent recovery for the surrogate and matrix spike is not possible to report as the high concentration of analytes in samples 241046-2,3,5,15 have caused interference.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ground Doctor Pty Ltd	**Client Project Name / Number / Site etc (ie report title):** UPSS Decommissioning - Selwyn Snow Resort Workshop	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: James Morrow		
Project Mgr: James Morrow	**PO No.:** 2020-GD003-1	
Sampler: James Morrow	**Envirolab Quote No. :**	
Address: PO Box 6278, DUBBO, NSW 2830	**Date results required:** Standard	
	Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: -- **Mob:** 0407 875 302	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax: --	**Lab comments:**	
Email: james.morrow@grounddoc.com.au		

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 1	BTEX													Provide as much information about the sample as you can
1	T1-N1	1.6m	15-Apr-20	Soil	x														
2	T1-E1	1.6m	15-Apr-20	Soil	x														
3	T1-S1	1.6m	15-Apr-20	Soil	x														
4	T1-W1	1.6m	15-Apr-20	Soil	x														
5	T1-Base1	2.3m	15-Apr-20	Soil	x														
6	T1-Spoil1	-	15-Apr-20	Soil	x														
7	T1-Spoil2	-	15-Apr-20	Soil	x														
8	T2-N1	1.4m	15-Apr-20	Soil	x														
9	T2-E1	1.4m	15-Apr-20	Soil	x														
10	T2-S1	1.4m	15-Apr-20	Soil	x														
11	T2-W1	1.4m	15-Apr-20	Soil	x														
12	T2-Base1	2.1m	15-Apr-20	Soil	x														
13	T2-Spoil1	-	15-Apr-20	Soil	x														
14	T2-Spoil2	-	15-Apr-20	Soil	x														
15	DUPA	-	15-Apr-20	Soil	x														
16	DUPB	-	15-Apr-20	Soil	x														
17 NR	TS	-	15-Apr-20	Soil		x													
18 NR	TB	-	15-Apr-20	Soil		x													

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 241046
Date Received: 17/4/20
Time Received: 1040
Received by: CM
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company):	Ground Doctor Pty Ltd	**Received by (company):**	AS Sydney
Print Name:	James Morrow	**Print Name:**	CYAITE MUENZA
Date & Time:	16 April 2020 1400	**Date & Time:**	17/4/20 1040
Signature:	JRM	**Signature:**	CM

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 10.2 **(if applicable)**
Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow

Sample Login Details

Your reference	UPSS Decommissioning - Selwyn Snow Resort Workshop
Envirolab Reference	241046-A
Date Sample Received	17/04/2020
Date Instructions Received	17/04/2020
Date Results Expected to be Reported	19/05/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	18 Soil
Turnaround Time Requested	2 days
Temperature on Receipt (°C)	10.2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Acid Extractable metalsin soil	On Hold
T1-N1-1.6m		✓
T1-E1-1.6m		✓
T1-S1-1.6m		✓
T1-W1-1.6m		✓
T1-Base1-2.3m		✓
T1-Spoil1	✓	
T1-Spoil2		✓
T2-N1-1.4m		✓
T2-E1-1.4m		✓
T2-S1-1.4m		✓
T2-W1-1.4m		✓
T2-Base1-2.1m		✓
T2-Spoil1	✓	
T2-Spoil2	✓	
DUPA		✓
DUPB		✓
TS		✓
TB		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 241046-A

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow
Address	PO Box 6278, Dubbo, NSW, 2830

Sample Details

Your Reference	**UPSS Decommissioning - Selwyn Snow Resort Workshop**
Number of Samples	18 Soil
Date samples received	17/04/2020
Date completed instructions received	17/04/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	19/05/2020
Date of Issue	19/05/2020

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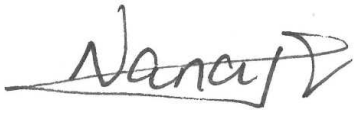
Results Approved By
Hannah Nguyen, Senior Chemist
Nancy Zhang, Laboratory Manager, Sydney

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable metals in soil				
Our Reference		241046-A-6	241046-A-13	241046-A-14
Your Reference	UNITS	T1-Spoil1	T2-Spoil1	T2-Spoil2
Depth		-	-	-
Type of sample		Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	14	13	13
Copper	mg/kg	20	43	23
Lead	mg/kg	11	19	13
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	15	27	21
Zinc	mg/kg	99	57	62

Moisture				
Our Reference		241046-A-6	241046-A-13	241046-A-14
Your Reference	UNITS	T1-Spoil1	T2-Spoil1	T2-Spoil2
Depth		-	-	-
Type of sample		Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	19/05/2020	19/05/2020	19/05/2020
Moisture	%	19	15	11

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			18/05/2020	[NT]	[NT]	[NT]	[NT]	18/05/2020	[NT]
Date analysed	-			18/05/2020	[NT]	[NT]	[NT]	[NT]	18/05/2020	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	100	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	97	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Jessica Hie

From: James Morrow <james.morrow@grounddoc.com.au>
Sent: Thursday, 14 May 2020 8:01 PM
To: Aileen Hie
Cc: Jessica Hie
Subject: Additional Analysis Request - Batch 241046

Hi Aileen,

I need M8 metals analysis on samples:

T1-Spoil1 - 6
T2-Spoil1 - 13
T2-Spoil2 - 14

241046-A
Due: 19/5/20
2 day TAT.

Are you able to do a two day turn around on this?

Kind Regards,
James Morrow
Environmental Engineer (Hydrogeologist)
Certified Environmental Practitioner No.: 1194
Site Contamination Specialist No.: SC41087

Ground Doctor Pty Ltd

Ground Doctor Pty Ltd
22 Tamworth Street
PO Box 6278
DUBBO NSW 2830

Ph: 0407 875 302
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customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow

Sample Login Details

Your reference	Selwyn Snow Resort Workshop
Envirolab Reference	243907
Date Sample Received	29/05/2020
Date Instructions Received	29/05/2020
Date Results Expected to be Reported	05/06/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.9
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	Acid Extractable metalsin soil
T1-S2	✓	✓	✓
T1-E2	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 243907

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow
Address	PO Box 6278, Dubbo, NSW, 2830

Sample Details

Your Reference	**Selwyn Snow Resort Workshop**
Number of Samples	2 soil
Date samples received	29/05/2020
Date completed instructions received	29/05/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	05/06/2020
Date of Issue	05/06/2020

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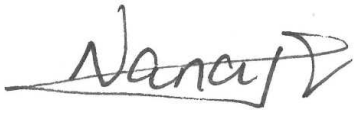
Results Approved By
Dragana Tomas, Senior Chemist
Hannah Nguyen, Senior Chemist
Josh Williams, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		243907-1	243907-2
Your Reference	UNITS	T1-S2	T1-E2
Type of sample		soil	soil
Date extracted	-	03/06/2020	03/06/2020
Date analysed	-	03/06/2020	03/06/2020
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<3	<3
Surrogate aaa-Trifluorotoluene	%	104	107

svTRH (C10-C40) in Soil			
Our Reference	UNITS	243907-1	243907-2
Your Reference		T1-S2	T1-E2
Type of sample		soil	soil
Date extracted	-	03/06/2020	03/06/2020
Date analysed	-	04/06/2020	04/06/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	89	89

Acid Extractable metals in soil			
Our Reference		243907-1	243907-2
Your Reference	UNITS	T1-S2	T1-E2
Type of sample		soil	soil
Date prepared	-	03/06/2020	03/06/2020
Date analysed	-	03/06/2020	03/06/2020
Lead	mg/kg	29	19

Moisture			
Our Reference		243907-1	243907-2
Your Reference	UNITS	T1-S2	T1-E2
Type of sample		soil	soil
Date prepared	-	03/06/2020	03/06/2020
Date analysed	-	04/06/2020	04/06/2020
Moisture	%	22	14

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date extracted	-			03/06/2020	[NT]	[NT]	[NT]	[NT]	03/06/2020	[NT]
Date analysed	-			03/06/2020	[NT]	[NT]	[NT]	[NT]	03/06/2020	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	104	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	104	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	[NT]	[NT]	[NT]	[NT]	102	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	106	[NT]
o-Xylene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
naphthalene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	102	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date extracted	-			02/06/2020	[NT]	[NT]	[NT]	[NT]	02/06/2020	[NT]
Date analysed	-			04/06/2020	[NT]	[NT]	[NT]	[NT]	04/06/2020	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	109	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	109	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
Surrogate o-Terphenyl	%		Org-020	97	[NT]	[NT]	[NT]	[NT]	116	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			03/06/2020	[NT]	[NT]	[NT]	[NT]	03/06/2020	[NT]
Date analysed	-			03/06/2020	[NT]	[NT]	[NT]	[NT]	03/06/2020	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ground Doctor Pty Ltd	Client Project Name / Number / Site etc (ie report title): UPSS Decommissioning - Selwyn Snow Resort Workshop
Contact person: James Morrow	PO No.: 2020-GD003-2
Project Mgr: James Morrow	Envirolab Quote No. :
Sampler: James Morrow	Date results required: Standard
Address: PO Box 6278, DUBBO, NSW 2830	Or choose: standard / same day / 1 day / 2 day / 3 day
	Note: Inform lab in advance if urgent turnaround is required - surcharge applies
Phone: -- Mob: 0407 875 302	Lab comments:
Fax: --	
Email: james.morrow@grounddoc.com.au	

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 1	BTEX													Provide as much information about the sample as you can
2	T1-E2	1.6m	27-May-20	Soil	x														
1	T1-S2	1.6m	27-May-20	Soil	x														

Relinquished by (company):	Ground Doctor Pty Ltd	Received by (company):	*Lab use only:*
Print Name:	James Morrow	Print Name:	Samples Received: Cool or Ambient (circle one)
Date & Time:	28/5/20 0800	Date & Time:	Temperature Received at: (if applicable)
Signature:	JRM	Signature:	Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

243907.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow

Sample Login Details

Your reference	UPSS Decommisioning - Selwyn Snow Resort Workshop
Envirolab Reference	244934
Date Sample Received	16/06/2020
Date Instructions Received	16/06/2020
Date Results Expected to be Reported	23/06/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	4 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	5.4
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	HM in water - dissolved
MW1	✓	✓	✓
MW2	✓	✓	✓
MW3	✓	✓	✓
DUPA	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 244934

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow
Address	PO Box 6278, Dubbo, NSW, 2830

Sample Details

Your Reference	**UPSS Decommisioning - Selwyn Snow Resort Workshop**
Number of Samples	4 Water
Date samples received	16/06/2020
Date completed instructions received	16/06/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	23/06/2020
Date of Issue	23/06/2020

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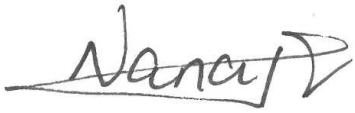
Results Approved By
Dragana Tomas, Senior Chemist
Hannah Nguyen, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water					
Our Reference		244934-1	244934-2	244934-3	244934-4
Your Reference	UNITS	MW1	MW2	MW3	DUPA
Date Sampled		12/06/2020	12/06/2020	12/06/2020	12/06/2020
Type of sample		Water	Water	Water	Water
Date extracted	-	18/06/2020	18/06/2020	18/06/2020	18/06/2020
Date analysed	-	19/06/2020	19/06/2020	19/06/2020	19/06/2020
TRH C_6 - C_9	µg/L	690	320	<10	<10
TRH C_6 - C_{10}	µg/L	1,000	700	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	490	270	<10	<10
Benzene	µg/L	48	37	<1	<1
Toluene	µg/L	220	160	<1	<1
Ethylbenzene	µg/L	40	43	<1	<1
m+p-xylene	µg/L	110	110	<2	<2
o-xylene	µg/L	94	84	<1	<1
Naphthalene	µg/L	5	7	<1	<1
Surrogate Dibromofluoromethane	%	127	124	109	117
Surrogate toluene-d8	%	98	101	96	96
Surrogate 4-BFB	%	106	104	99	98

svTRH (C10-C40) in Water					
Our Reference		244934-1	244934-2	244934-3	244934-4
Your Reference	UNITS	MW1	MW2	MW3	DUPA
Date Sampled		12/06/2020	12/06/2020	12/06/2020	12/06/2020
Type of sample		Water	Water	Water	Water
Date extracted	-	17/06/2020	17/06/2020	17/06/2020	17/06/2020
Date analysed	-	18/06/2020	18/06/2020	18/06/2020	18/06/2020
TRH C_{10} - C_{14}	µg/L	720	710	<50	<50
TRH C_{15} - C_{28}	µg/L	500	500	<100	<100
TRH C_{29} - C_{36}	µg/L	200	170	<100	<100
TRH >C_{10} - C_{16}	µg/L	940	920	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	940	910	<50	<50
TRH >C_{16} - C_{34}	µg/L	380	370	<100	<100
TRH >C_{34} - C_{40}	µg/L	130	120	<100	<100
Surrogate o-Terphenyl	%	103	83	117	108

HM in water - dissolved					
Our Reference		244934-1	244934-2	244934-3	244934-4
Your Reference	UNITS	MW1	MW2	MW3	DUPA
Date Sampled		12/06/2020	12/06/2020	12/06/2020	12/06/2020
Type of sample		Water	Water	Water	Water
Date prepared	-	17/06/2020	17/06/2020	17/06/2020	17/06/2020
Date analysed	-	17/06/2020	17/06/2020	17/06/2020	17/06/2020
Lead-Dissolved	µg/L	<1	<1	<1	<1

Method ID	Methodology Summary
Metals-022	Determination of various metals by ICP-MS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			18/06/2020	[NT]	[NT]	[NT]	[NT]	18/06/2020	[NT]
Date analysed	-			19/06/2020	[NT]	[NT]	[NT]	[NT]	19/06/2020	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	117	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	117	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	118	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	122	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	123	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	116	[NT]	[NT]	[NT]	[NT]	103	[NT]
Surrogate toluene-d8	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate 4-BFB	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			17/06/2020	[NT]	[NT]	[NT]	[NT]	17/06/2020	[NT]
Date analysed	-			18/06/2020	[NT]	[NT]	[NT]	[NT]	18/06/2020	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	112	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	113	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	112	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	113	[NT]
Surrogate o-Terphenyl	%		Org-020	110	[NT]	[NT]	[NT]	[NT]	72	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date prepared	-			17/06/2020	1	17/06/2020	17/06/2020		17/06/2020	[NT]
Date analysed	-			17/06/2020	1	17/06/2020	17/06/2020		17/06/2020	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	98	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ground Doctor Pty Ltd	**Client Project Name / Number / Site etc (ie report title):** UPSS Decommissioning - Selwyn Snow Resort Workshop	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: James Morrow		
Project Mgr: James Morrow	**PO No.:** 2020-GD003-3	
Sampler: James Morrow	**Envirolab Quote No. :**	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Address: PO Box 6278, DUBBO, NSW 2830	**Date results required:** Standard	
	Or choose: standard / same day / 1 day / 2 day / 3 day	
Phone: -- **Mob:** 0407 875 302	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax: --	**Lab comments:**	
Email: james.morrow@grounddoc.com.au		

Sample information					Tests Required													Comments
Envirolab Sample ID	**Client Sample ID or information**	**Depth**	**Date sampled**	**Type of sample**	Combo 1	BTEX												**Provide as much information about the sample as you can**
1	MW1	-	12-Jun-20	Water	x													
2	MW2	-	12-Jun-20	Water	x													
3	MW3	-	12-Jun-20	Water	x													
4	DUPA	-	12-Jun-20	Water	x													

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 244934
Date Received: 16/6
Time Received: 10:41
Received by: AB
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company):	**Ground Doctor Pty Ltd**	**Received by (company):**	ELS
Print Name:	**James Morrow**	**Print Name:**	Andy Zhang
Date & Time:	15/06/2020 1400	**Date & Time:**	16/6 10:41
Signature:	**JRM**	**Signature:**	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 5.9 **(if applicable)**
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow

Sample Login Details

Your reference	UPSS Decommissioning - Selwyn Snow Resort Workshop
Envirolab Reference	256268
Date Sample Received	20/11/2020
Date Instructions Received	20/11/2020
Date Results Expected to be Reported	27/11/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	10 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	1.2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water - Low Level
MW1	✓	✓	✓
MW2	✓	✓	✓
MW3	✓	✓	✓
MW4	✓	✓	✓
MW5	✓	✓	✓
MW6	✓	✓	✓
MW7	✓	✓	✓
MW8	✓	✓	✓
MW9	✓	✓	✓
MW40	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 256268

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow
Address	PO Box 6278, Dubbo, NSW, 2830

Sample Details

Your Reference	**UPSS Decommissioning - Selwyn Snow Resort Workshop**
Number of Samples	10 Water
Date samples received	20/11/2020
Date completed instructions received	20/11/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	27/11/2020
Date of Issue	26/11/2020

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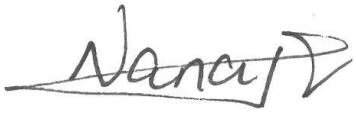
Results Approved By
Dragana Tomas, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		256268-1	256268-2	256268-3	256268-4	256268-5
Your Reference	UNITS	MW1	MW2	MW3	MW4	MW5
Date Sampled		18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	20/11/2020	20/11/2020	20/11/2020	20/11/2020	20/11/2020
Date analysed	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
TRH C_6 - C_9	µg/L	1,000	300	<10	<10	<10
TRH C_6 - C_{10}	µg/L	2,300	900	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	1,500	600	<10	<10	<10
Benzene	µg/L	59	29	<1	<1	<1
Toluene	µg/L	180	19	<1	<1	<1
Ethylbenzene	µg/L	83	39	<1	<1	<1
m+p-xylene	µg/L	220	63	<2	<2	<2
o-xylene	µg/L	300	150	<1	<1	<1
Naphthalene	µg/L	20	13	<1	<1	<1
Surrogate Dibromofluoromethane	%	124	122	124	121	120
Surrogate toluene-d8	%	100	100	99	99	99
Surrogate 4-BFB	%	105	103	101	101	103

vTRH(C6-C10)/BTEXN in Water						
Our Reference		256268-6	256268-7	256268-8	256268-9	256268-10
Your Reference	UNITS	MW6	MW7	MW8	MW9	MW40
Date Sampled		18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	20/11/2020	20/11/2020	20/11/2020	20/11/2020	20/11/2020
Date analysed	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
TRH C_6 - C_9	µg/L	<10	90	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	350	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	190	<10	<10	<10
Benzene	µg/L	<1	42	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	9	<1	<1	<1
m+p-xylene	µg/L	<2	12	<2	<2	<2
o-xylene	µg/L	<1	97	<1	<1	<1
Naphthalene	µg/L	<1	6	<1	<1	<1
Surrogate Dibromofluoromethane	%	119	125	123	120	123
Surrogate toluene-d8	%	99	99	97	99	100
Surrogate 4-BFB	%	104	103	101	99	100

svTRH (C10-C40) in Water						
Our Reference		256268-1	256268-2	256268-3	256268-4	256268-5
Your Reference	UNITS	MW1	MW2	MW3	MW4	MW5
Date Sampled		18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Date analysed	-	24/11/2020	24/11/2020	24/11/2020	24/11/2020	24/11/2020
TRH C_{10} - C_{14}	µg/L	26,000	80,000	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	45,000	140,000	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	420	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	44,000	120,000	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	44,000	120,000	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	26,000	89,000	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	130	<100	<100	<100
Surrogate o-Terphenyl	%	#	#	83	94	93

svTRH (C10-C40) in Water						
Our Reference		256268-6	256268-7	256268-8	256268-9	256268-10
Your Reference	UNITS	MW6	MW7	MW8	MW9	MW40
Date Sampled		18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Date analysed	-	24/11/2020	24/11/2020	24/11/2020	24/11/2020	24/11/2020
TRH C_{10} - C_{14}	µg/L	<50	550	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	120	410	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	700	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	690	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	130	210	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	89	100	89	92	97

PAHs in Water - Low Level						
Our Reference		256268-1	256268-2	256268-3	256268-4	256268-5
Your Reference	UNITS	MW1	MW2	MW3	MW4	MW5
Date Sampled		18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Date analysed	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Naphthalene	µg/L	21	30	<0.2	<0.2	<0.2
Acenaphthylene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Fluorene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Phenanthrene	µg/L	2.4	5.8	0.3	<0.1	<0.1
Anthracene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Pyrene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Chrysene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<2.0	<2.0	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<1.0	<1.0	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	23	36	0.27	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	81	86	89	105	92

PAHs in Water - Low Level						
Our Reference		256268-6	256268-7	256268-8	256268-9	256268-10
Your Reference	UNITS	MW6	MW7	MW8	MW9	MW40
Date Sampled		18/11/2020	18/11/2020	18/11/2020	18/11/2020	18/11/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Date analysed	-	23/11/2020	23/11/2020	23/11/2020	23/11/2020	23/11/2020
Naphthalene	µg/L	<0.2	3.3	<0.2	<0.2	<0.2
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	0.2	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	0.3	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	0.2	0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	0.13	4.0	0.13	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	98	99	100	97	99

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			20/11/2020	7	20/11/2020	20/11/2020		20/11/2020	[NT]
Date analysed	-			23/11/2020	7	23/11/2020	23/11/2020		23/11/2020	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	7	90	91	1	118	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	7	350	340	3	118	[NT]
Benzene	µg/L	1	Org-023	<1	7	42	42	0	116	[NT]
Toluene	µg/L	1	Org-023	<1	7	<1	<1	0	115	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	7	9	9	0	116	[NT]
m+p-xylene	µg/L	2	Org-023	<2	7	12	12	0	122	[NT]
o-xylene	µg/L	1	Org-023	<1	7	97	95	2	124	[NT]
Naphthalene	µg/L	1	Org-023	<1	7	6	7	15	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	109	7	125	123	2	101	[NT]
Surrogate toluene-d8	%		Org-023	99	7	99	100	1	99	[NT]
Surrogate 4-BFB	%		Org-023	102	7	103	100	3	103	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			23/11/2020	3	23/11/2020	23/11/2020		23/11/2020	[NT]
Date analysed	-			24/11/2020	3	24/11/2020	24/11/2020		24/11/2020	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	3	<50	<50	0	107	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	3	<100	<100	0	103	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	3	<100	<100	0	77	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	3	<50	<50	0	107	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	3	<100	<100	0	103	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	3	<100	<100	0	77	[NT]
Surrogate o-Terphenyl	%		Org-020	102	3	83	87	5	74	[NT]

QUALITY CONTROL: PAHs in Water - Low Level						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			23/11/2020	[NT]	[NT]	[NT]	[NT]	23/11/2020	[NT]
Date analysed	-			23/11/2020	[NT]	[NT]	[NT]	[NT]	23/11/2020	[NT]
Naphthalene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	72	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	79	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	92	[NT]	[NT]	[NT]	[NT]	91	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

TRH Water(C10-C40) NEPM - # Percent recovery for the surrogate/matrix spike is not possible to report as the high concentration of analytes in sample/s 256268-1,2 have caused interference.

PAH_W:
The PQL has been raised due to interferences from analytes (other than those being tested) in sample/s w256268-1,2.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ground Doctor Pty Ltd	**Client Project Name / Number / Site etc (ie report title):** UPSS Decommissioning - Selwyn Snow Resort Workshop
Contact person: James Morrow	
Project Mgr: James Morrow	**PO No.:** 2020-GD003-4
Sampler: James Morrow	**Envirolab Quote No. :**
Address: PO Box 6278, DUBBO, NSW 2830	**Date results required:** Standard
	Or choose: standard / same day / 1 day / 2 day / 3 day
Phone: -- **Mob:** 0407 875 302	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*
Fax: --	**Lab comments:**
Email: james.morrow@grounddoc.com.au	

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Sample information					Tests Required													Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH / BTEX / PAH (low)													Provide as much information about the sample as you can
1	MW1	-	18-Nov-20	Water	x	** - sample contains minor product drops.												Sample contains product
2	MW2	-	18-Nov-20	Water	x	** - sample contains minor product drops.												
3	MW3	-	18-Nov-20	Water	x													
4	MW4	-	18-Nov-20	Water	x													
5	MW5	-	18-Nov-20	Water	x													
6	MW6	-	18-Nov-20	Water	x													
7	MW7	-	18-Nov-20	Water	x													
8	MW8	-	18-Nov-20	Water	x													
9	MW9	-	18-Nov-20	Water	x													
10	MW40	-	18-Nov-20	Water	x													

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 256268
Date Received: 20/11/2020
Time Received: 1040
Received By: RJ
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company):	Ground Doctor Pty Ltd	**Received by (company):** EL	
Print Name:	James Morrow	**Print Name:** Ray	
Date & Time:	19/11/20 1200	**Date & Time:** 20/11/2020 1040	
Signature:	JRM	**Signature:**	

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 1.2 (if applicable)
Transported by: Hand delivered / Courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow

Sample Login Details

Your reference	November 2020 QAQC
Envirolab Reference	256274
Date Sample Received	20/11/2020
Date Instructions Received	20/11/2020
Date Results Expected to be Reported	27/11/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	1.4
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	BTEX in Water
TS	✓
TB	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 256274

Client Details

Client	Ground Doctor Pty Ltd
Attention	James Morrow
Address	PO Box 6278, Dubbo, NSW, 2830

Sample Details

Your Reference	**November 2020 QAQC**
Number of Samples	2 water
Date samples received	20/11/2020
Date completed instructions received	20/11/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	27/11/2020
Date of Issue	23/11/2020

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Results Approved By
Dragana Tomas, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

BTEX in Water			
Our Reference		256274-1	256274-2
Your Reference	UNITS	TS	TB
Date Sampled		17/11/2020	17/11/2020
Type of sample		water	water
Date extracted	-	20/11/2020	20/11/2020
Date analysed	-	23/11/2020	23/11/2020
Benzene	µg/L	108%	<1
Toluene	µg/L	120%	<1
Ethylbenzene	µg/L	102%	<1
m+p-xylene	µg/L	118%	<2
o-xylene	µg/L	119%	<1
Surrogate Dibromofluoromethane	%	119	116
Surrogate toluene-d8	%	100	99
Surrogate 4-BFB	%	103	99

Method ID	Methodology Summary
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: BTEX in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			20/11/2020	[NT]	[NT]	[NT]	[NT]	20/11/2020	[NT]
Date analysed	-			23/11/2020	[NT]	[NT]	[NT]	[NT]	23/11/2020	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	118	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	120	[NT]
Surrogate Dibromofluoromethane	%		Org-023	115	[NT]	[NT]	[NT]	[NT]	110	[NT]
Surrogate toluene-d8	%		Org-023	99	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate 4-BFB	%		Org-023	101	[NT]	[NT]	[NT]	[NT]	103	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ground Doctor Pty Ltd	Client Project Name / Number / Site etc (ie report title): November 2020 - QAQC	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: James Morrow		
Project Mgr: James Morrow	PO No.: 2020-GD019-2	
Sampler: James Morrow	Envirolab Quote No. :	
Address: PO Box 6278, DUBBO, NSW 2830	Standard TAT Or choose: standard / same day / 1 day / 2 day / 3 day *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: -- Mob: 0407 875 302		
Fax: --	Lab comments:	
Email: james.morrow@grounddoc.com.au		

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 1	TRH, BTEXN	BTEX												Provide as much information about the sample as you can
7	1 TS	-	17-Nov-20	Water			x												
8	2 TB	-	17-Nov-20	Water			x												

Relinquished by (company):	Ground Doctor Pty Ltd	Received by (company): ES	*Lab use only:*
Print Name:	James Morrow	Print Name: Ray	Samples Received: Cool or Ambient (circle one)
Date & Time:	19/11/20 1200	Date & Time: 20/11/2020 0940	Temperature Received at: 1-2 . (if applicable)
Signature:	JRM	Signature: TP	Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 256274.

~~256269~~

256274.

Date Received: 20.11.20.
Time Received: 1a40.
Received By:
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Annex E

Review of
Quality Assurance and Quality Control

REVIEW OF QUALITY ASSURANCE AND QUALITY CONTROL
UPSS DECOMMISSIONING REPORT – SELWYN SNOW RESORT WORKSHOP

Ground Doctor QAQC

Item	Comments
Field Personnel	The works were undertaken by Mr James Morrow. James collected all data and conducted field sampling and prepared the report. James has 20 years of experience working as an Environmental Engineer specialising in contaminated land assessment. James is a CEnvP Certified Site Contamination Specialist.
Soil Sampling Locations and Numbers	Soil validation samples were collected at locations and depths which adequately assessed all components of the decommissioned UPSS components. Sample numbers where in general accordance with minimum sampling density recommended for assessing UPSS decommissioning works outlined in the NSW EPA (2014) *Technical Note: Investigation of Service Station Sites.*
Soil Sampling Methodology	Soil validation samples were collected from the excavator bucket. The sampler collected the least disturbed soil within the excavator bucket and ensured the soil sampled had come into direct contact with the excavator bucket. The sampler wore a clean pair of disposable gloves when collecting each sample to minimise risks of cross contamination during sampling.
Groundwater Well Installation	Wells were installed by a licensed driller in accordance with relevant standards for the construction of monitoring wells. Screw fit casing was used. Casing was delivered to the site wrapped in plastic. The wells were screened adjacent to the water bearing strata and above or close to the water table to maximise the chance of identifying LNAPL. Wells were developed thoroughly after installation to remove fines introduced during the drilling process and the clean the gravel pack.
Groundwater Monitoring Well Locations	Ground Doctor measured relative groundwater elevation to assess the likely direction of groundwater flow. Water level data was no conclusive on its own. Identification of LNAPL at MW2 and MW1 indicates that these monitoring wells were correctly located to assess the source area. The detection of dissolved phase TRH at MW6 indicated groundwater flow in a general northerly direction, consistent with surface topography. MW8 was placed on the southern side of the former UPSS locations to assess whether flow could also be occurring to the south. Absence of petroleum hydrocarbons in groundwater sampled at MW8 indicates there was unlikley to be significant migration of contaminants in a southerly direction. The network of 9 monitoring wells characterised the source area and the extent of the dissolved phase plume..
Groundwater Sampling	In the June 2020 monitoring round, wells were sampled using disposable bailers. Ground Doctor proposed to use a low-flow sampling technique. However, given the identification of LNAPL at MW2 bailer sampling was used to avoid contamination of low flow sampling equipment. Wells were purged thoroughly prior to sampling. Care was taken to ensure minimal agitation of the water column during sample retrieval. A new disposable bailer and cord was used in each well to prevent cross contamination. All monitoring wells except MW1 and MW2 were sampled using a low flow bladder pump during the November 2020 monitoring round. Wells were purged until field water quality parameters and well drawdown stabilised, indicating the sample was representative of groundwater from the surrounding formation. Single use disposable tubing was used at each sampling location to minimise potential cross contamination. MW1 and MW2 were sampled with disposable bailers as LNAPL was detected at these monitoring wells.
Analytes of Concern	Soil samples were analysed for the analytes of concern listed in the NEPM (2013) guidelines. Soil samples were analysed for TRH, BTEX, naphthalene and lead. Groundwater samples collected during the November 2020 monitoring round were analysed for TRH, BTEX and PAHs. Groundwater samples collected from MW1, MW2 and MW3 were also analysed for lead as part of the June 2020 monitoring round. Lead was not detected in any wells and was therefore no a contaminants of concern in subsequent groundwater assessment.

Item	Comments
Instruments and Calibration	A PID was used to assess soil samples in the field. The PID was zeroed in fresh air and spanned with a 100ppm isobutylene calibration standard at the commencement of each day of use. A water quality meter was used during each groundwater monitoring round. The water quality meters were hired from Airmet Scientific on both monitoring occasions and were calibrated by them prior to the 1 day hire.
Equipment Decontamination	The excavator bucket was not decontaminated between sample locations. Rather, care was taken to collect soil samples from test pits that had not come into direct contact with the excavator bucket. A new disposable bailer and cord was used in each well to prevent cross contamination. Well dedicated single use disposable tubing was used in each monitoring well to minimise potential cross contamination. A single use disposable Teflon bladder was used inside the bladder pump at each location. The bladder pump was washed between sampling locations using a damp cloth. An equipment rinsate sample was not collected. Assessment of analytical data indicates that there was little potential for cross contamination to have occurred between wells that were sampled using low flow equipment. Wells were sampled from the outside in. MW7 was sampled last and was the only monitoring well that was low flow sampled in which elevated petroleum hydrocarbons were detected.
Sample Preservation, Storage and Transport	Soil samples were placed into new laboratory supplied jars and bottles marked with appropriate identification. Groundwater samples were collected into appropriate bottle with the correct preservative. Samples for dissolved metals were field filtered. Samples were placed on ice inside an esky immediately after sampling. Samples were kept on ice during storage on site and at the Ground Doctor office prior to dispatch to the laboratory. Samples were transported to Envirolab (Sydney) by overnight courier service, to minimise transit time and ensure samples remained cool during transit.
Field Duplicates	A total of 16 primary soil samples soil samples were collected during the UPSS decommissioning validation assessment. Two field duplicate soil samples were analysed by Envirolab. Results for soil duplicate sample analysis and calculated RPDs are presented in Table E1 (attached). Assessment of RPDs indicates some variation between primary and duplicate samples outside of the ideal range. The elevated RPDs are attributed to sample heterogeneity. Most of the samples collected were comprised of weathered rock (phyllite) and fine grained materials within fractures of the rock. The concentrations of hydrocarbon absorbed by a large piece of rock, compared to a fine grained soil would vary significantly. Once hydrocarbons enter fractured rock, assessment of groundwater becomes more important. The soil data, combined with field observations, inform the assessment and prompted investigation of groundwater. A total of 12 primary groundwater samples were collected and analysed as part of the validation assessment. Two field duplicate water samples were collected. Results for groundwater duplicate sample analysis and calculated RPDs are presented in Table E1 (attached). Concentrations of all analytes in both the primary and duplicate water samples were less than the laboratory practical quantification limits indicating good agreement.
Trip Blank	A Trip Blank (TB) accompanied samples in the field and to the analytical laboratory for 2 of 4 sample batches. The trip blanks were analysed for BTEX. Analytes were not reported within the trip blank (see Table E1 Attached). The absence of analytes in the trip blank samples indicated that cross contamination was unlikely to have occurred during sample storage and transit.
Trip Spikes	A Trip Spike (TS) accompanied samples in the field and to the analytical laboratory for 2 of 4 sample batches. The trip spike was analysed for BTEX. Reported recoveries of BTEX compounds are presented in Table E1 (attached). Recoveries ranged from 91-120%, which were within the desired range. The results indicated that volatile components were adequately preserved during sample storage and transit.

Laboratory QAQC

Item	Comments
Batch ID	241046 - Envirolab
Sample Receipt	Samples were received on ice and were 10.2 degrees Celsius upon receipt. Samples were received in appropriate sample containers.
Holding Times	Soil samples were analysed within technical holding times.
Analytical Procedures	Soil samples were analysed using NATA accredited analytical methods and those recommended in the NEPM (2013).
Surrogate Recovery	Ranged 83-132% and were within the target range for organics of 60-140%. Surrogate recoveries were not reported for some samples due to interference from petroleum hydrocarbon impacts.
Matrix Spike	Ranged 77-129% and were within the target range for organics of 60-140% and 70-130% for inorganics. Matrix spike recoveries were not reported for some matrix spike samples due to interference from petroleum hydrocarbon impacts.
Method Blank	Method blank samples were analysed as part of the batch. Reported concentrations of all analytes within the method blank were less than the EQL.
Laboratory Control Sample	Were within the target range of 60-140% for organics and 70-130% for inorganics.
Laboratory Duplicate	Calculated RPDs for the lab duplicate samples were within the desired range and ranged 0-4%.
Detection Limits	The detection limits of all compounds of concern in soil were below the adopted assessment criteria.

Item	Comments
Batch ID	243907 - Envirolab
Sample Receipt	Samples were received on ice and were 7.9 degrees Celsius upon receipt. Samples were received in appropriate sample containers.
Holding Times	Soil samples were analysed within technical holding times.
Analytical Procedures	Soil samples were analysed using NATA accredited analytical methods and those recommended in the NEPM (2013).
Surrogate Recovery	Ranged 89-107% and were within the target range for organics of 60-140%. 0
Matrix Spike	Not reported due to small batch size.
Method Blank	Method blank samples were analysed as part of the batch. Reported concentrations of all analytes within the method blank were less than the EQL.
Laboratory Control Sample	Were within the target range of 60-140% for organics and 70-130% for inorganics.
Laboratory Duplicate	Not reported due to small batch size.
Detection Limits	The detection limits of all compounds of concern in soil were below the adopted assessment criteria.

Item	Comments
Batch ID	244934 - Envirolab
Sample Receipt	Samples were received on ice and were 5.4 degrees Celsius upon receipt. Samples were received in appropriate sample containers.
Holding Times	Water samples were analysed within technical holding times.
Analytical Procedures	Water samples were analysed using NATA accredited analytical methods and those recommended in the NEPM (2013).
Surrogate Recovery	Ranged 72-127% and were within the target range for organics of 60-140%.
Matrix Spike	Not reported due to small batch size.
Method Blank	Method blank samples were analysed as part of the batch. Reported concentrations of all analytes within the method blank were less than the EQL.
Laboratory Control Sample	Range 99-123% and were within the target range of 60-140% for organics and 70-130% for inorganics.
Laboratory Duplicate	Calculated RPDs for the lab duplicate samples were within the desired range and were 0%.
Detection Limits	The detection limits of all compounds of concern in water were below the adopted assessment criteria.

Item	Comments
Batch ID	256268 - Envirolab
Sample Receipt	Samples were received on ice and were 1.2 degrees Celsius upon receipt. Samples were received in appropriate sample containers.
Holding Times	Water samples were analysed within technical holding times.
Analytical Procedures	Water samples were analysed using NATA accredited analytical methods and those recommended in the NEPM (2013).
Surrogate Recovery	Ranged 81-105% and were within the target range for organics of 60-140%. Surrogate recoveries were not reported for samples MW1 and MW2 as elevated TRH concentrations in the sample made it impossible to calculate the surrogate recovery.
Matrix Spike	Not reported due to small batch size.
Method Blank	Method blank samples were analysed as part of the batch. Reported concentrations of all analytes within the method blank were less than the EQL.
Laboratory Control Sample	Range 72-124% and were within the target range of 60-140% for organics and 70-130% for inorganics.
Laboratory Duplicate	Calculated RPDs for the lab duplicate samples were within the desired range and were 0-15%, which was within the target range.
Detection Limits	The detection limits of all compounds of concern except benzo(a)pyrene in water were below the adopted assessment criteria. The detection limits had to be raised in samples MW1 and MW2 due to elevated TRH concentrations.

TABLE E1

Relative Percentage Difference Results - TRH, BTEX and Lead in Soil (mg/kg)

UPSS Decommissioning Works - Selwyn Snow Resort Workshop, Cabramurra, NSW

Sample ID	Sample Depth (m bgl)	Sampling Date	Benzene	Toluene	Ethylbenzene	Xylene (total)	TRH (C6-C10) Less BTEX	TRH (>C10-C16) Less Naphthalene	TRH (>C16-C34)	TRH (>C34-C40)	Naphthalene	Lead
T1-Base1	2.3m	15-Apr-20	<0.2	<0.5	<1	<3	**65**	**1400**	**820**	<100	<1	**7**
DUPA	-	15-Apr-20	<0.2	<0.5	<1	<3	**67**	**1500**	**940**	<100	<1	**20**
RPD %			-	-	-	-	**3**	**7**	**14**	**-**	**-**	**96**
T2-Base1	2.1m	15-Apr-20	<0.2	0.5	<1	**5**	25	**260**	<100	<100	<1	**10**
DUPB	-	15-Apr-20	<0.2	**2**	<1	**20**	**160**	**170**	<100	<100	<1	**13**
RPD %			-	**120**	-	**120**	**146**	**42**	-	-	-	**26**
Trip Spike	-	15-Apr-20	91%	94%	92%	91%	--	--	--	--	--	--
Trip Blank	-	15-Apr-20	<1	<1	<1	<1	--	--	--	--	--	--
MW3	-	12-Jun-20	<1	<1	<1	<3	<10	<50	<100	<100	<1	<1
DUPA	-	12-Jun-20	<1	<1	<1	<3	<10	<50	<100	<100	<1	<1
RPD %			--	--	--	--	--	--	--	--	--	--
Trip Spike	-	17-Nov-20	108%	120%	102%	119%	--	--	--	--	--	--
Trip Blank	-	17-Nov-20	<1	<1	<1	<1	--	--	--	--	--	--
MW4	-	18-Nov-20	<1	<1	<1	<3	<10	<50	<100	<100	<1	<1
MW40	-	18-Nov-20	<1	<1	<1	<3	<10	<50	<100	<100	<1	<1
RPD %			--	--	--	--	--	--	--	--	--	--

Shaded result exceeds adopted QA assessment criteria

Red Value - Where the reported concentration of a sample is less than the EQL half of the EQL is used to calculate the RPD

Annex F

Tank Destruction Certificate

Irwin&Hartshorn ptyltd
abn 69 074 330 082

12 alderson place
hume act 2620

phone 02 6260 1588
fax 02 6260 1236

Certificate Of Tank Disposal

Date: 16.04.2020

To whom it may concern,

This certificate is to certify that the below mentioned Underground Storage Tanks were removed and disposed of in accordance with the AS4976-2008.The tanks were washed, Degassed and ripped open prior to exhumation, loading and transportation to our Hume Depot for cutting into scrap size for recycling at Sims Hume depot. This was carried Out using an excavator with hydraulic shear attachments.

Exhumation location : Selwyn Snow Resort Kings Cross Rd Cabramurra

TANK SIZE 1 x 4,500 Litre diesel
1 x 4,500 Litre petrol

Tanks were loaded and transported to Hume depot and cut into scrap size for Disposal at Sims Metal Hume for recycling.

Signed

Tony Irwin
Company Licence no 2013731
Nominee Licence 19863638
NSW DE 201360

ANC Foster Pty. Ltd.
ABN 48 079 145 529 Address 64 Barry Avenue, Mortdale, NSW, 2223
Telephone 02 9533 1011 Facsimile: 02 9533 2372 Email aancfost@bigpond.net.au
Environmental Contractors *Specialists in Petroleum Installations and Remediations

Date ...15th April 2020.....

Company ...Irwin & Hartshorn Pty. Limited.

...12 Alderson Place.....

...HUME ACT 2620.....

Site ...Selwyn Ski Resort.....

.....213a KingsCross Road.....

....CABRAMURRA NSW 2629....

A.N.C. Foster Pty. Limited declare that the nominated underground fuel storage tank (UFST) ...4,500 litre No. 1 Has been high pressure washed and degassed for off the site disposal at....9.30....(am) / pm the nominated tank LEL was ..0....%.

No Hot Works are to be undertaken or applied to the nominated tank including Oxy / Acetylene, Angle Grinders or Naked Flames

Use of Hot Works may cause explosion, resulting in physical injury or death.
The UFST may of contained lead fuel products

The nominated tank is not to be sold or used to contain / store water or food products.

Charles Foster

.....

15/04/20

.....

Charles Foster (Director) DATE (dd/mm/yyyy)

ANC Foster Pty. Ltd.
ABN 48 079 145 529 Address 64 Barry Avenue, Mortdale, NSW, 2223
Telephone 02 9533 1011 Facsimile: 02 9533 2372 Email aancfost@bigpond.net.au
Environmental Contractors *Specialists in Petroleum Installations and Remediations

Date ...15th April 2020.....

Company ...Irwin & Hartshorn Pty. Limited.

...12 Alderson Place.....

...HUME ACT 2620.....

Site ...Selwyn Ski Resort.....

.....213a KingsCross Road.....

....CABRAMURRA NSW 2629....

A.N.C. Foster Pty. Limited declare that the nominated underground fuel storage tank (UFST) ...4,500 litre No. 2. Has been high pressure washed and degassed for off the site disposal at....10.20 am// pm the nominated tank LEL was ..0...%.

No Hot Works are to be undertaken or applied to the nominated tank including Oxy / Acetylene, Angle Grinders or Naked Flames

Use of Hot Works may cause explosion, resulting in physical injury or death.
The UFST may of contained lead fuel products

The nominated tank is not to be sold or used to contain / store water or food products.

.....

Charles Foster (Director)

15/04/20

DATE (dd/mm/yyyy)

Annex G

Waste Disposal Records

CLEANAWAY
Making a sustainable future possible

COLLECTION ADVICE
No. 015575

Nationwide Oil Pty Ltd
ABN 95 066 383 364
6 Davis Road, Wetherill Park NSW 2164
Telephone: 13 13 39 Facsimile: (02) 9609 2219

Customer No.: _____ Date: 15/4/20

CUSTOMER DETAILS

Name: IHT Canberra

Address: Selwyn Snow Resort
Clean up

SERVICE TYPE:

Collection ☒ Delivery ☐ Depot Transfer ☐

PRODUCT	VOLUME
WASTE OIL	3400 Lts
LOW GRADE DISTILLATE	
OILY WATER	
MISC.	

TOTAL $ _____ **ALL AMOUNTS INCLUDE GST**

FACILITY EPA LICENCE 854
TRANSPORT EPA LICENCE 7100

Customer's Signature: _____

Driver's Signature: J Winter Vehicle Reg: AM530O

White Copy - Customer Yellow Copy - Office Copy Blue Copy - Book

600641011215

FILE COPY

ORIGINAL COPY

TAX INVOICE/STATEMENT

DATE:	ORDER NUMBER:	TAX INVOICE NUMBER
15/04/20		ADJ 136556

FROM: JKMB WASTE SERVICES	TO: IHT CANBERRA
ABN (Supplier): 63613203615	ABN (Recipient):
GST No: Mt Selwyn	(New Zealand Only)

QTY	DESCRIPTION	EACH	GST	TOTAL
	Pickup & disposal of 3400 LTS			
	of waste fuel &		$	3400-00
	oily water			
	+			
	4 hourly rate for transport		$	480-00
	@ $120 P/H			
			$	3880-00

SUB TOTAL

GST

SIGNED:

TOTAL INCLUSIVE OF GST $3880-00

*Indicates taxable supply
Spirax 555

COPY

Cootamundra Waste Transfer Facility

,Cootamundra,NSW,2590

Transaction Report By Customer

From 27/05/2020 to 27/05/2020

Customer	Date	Time	Docket	Product	Job	Order Number	Payments	In/Out	Rego	Gross	Tare	Net	Price	Cost	GST	EPA	Garbage Charge	Garbage GST	Total	Comment
WASTE SCIENCE	27/05/2020	1:16 PM	1278914	CONTAMINATED SOIL	NA		ACCOUNT	IN	YMT63Q	41.82	19.76	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	27/05/2020	1:20 PM	1278915	CONTAMINATED SOIL	NA		ACCOUNT	IN	YGY89P	36.58	16.86	19.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
				Summary			**Transactions**		**2**	**78.40**	**36.62**	**41.78**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
Total							**Transactions**		**2**	**78.40**	**36.62**	**41.78**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	

Tax Invoice (Reprint)
Cootamundra Waste Transfer Facility
PO Box 420
Cootamundra NSW 2590
PHONE : 0269402100
ABN : 47475920639

Docket No. : 1278914
Load Type : Second
Operator : Cootamundra.User
Rego No. : YMT63Q
Time Out : 27/05/2020 1:16:31 PM
Customer : WASTE SCIENCE
Direction : IN
Source : NA
Destination : NA
Product : CONTAMINATED SOIL
Category : NA

Gross : 41.82t
Tare : 19.76t
Net : 22.06t

Price/t : $0.00
Min. Cost : $0.00
Cost : $0.00
GST : $0.00
Amount Due : $0.00
Paid By : ACCOUNT

Signature : _____

Tax Invoice (Reprint)
Cootamundra Waste Transfer Facility
PO Box 420
Cootamundra NSW 2590
PHONE : 0269402100
ABN : 47475920639

Docket No. : 1278915
Load Type : Second
Operator : Cootamundra.User
Rego No. : YGY89P
Time Out : 27/05/2020 1:20:00 PM
Customer : WASTE SCIENCE
Direction : IN
Source : NA
Destination : NA
Product : CONTAMINATED SOIL
Category : NA

Gross : 36.58t
Tare : 16.86t
Net : 19.72t

Price/t : $0.00
Min. Cost : $0.00
Cost : $0.00
GST : $0.00
Amount Due : $0.00
Paid By : ACCOUNT

Signature : _____

Annex H

Photographic Log of Works

The former Workshop prior to the January 2020 bushfires. Fill pipes and vent pipes are either side of the driveway. Tank 1 on the right side and Tank 2 on the left side.

The exposed top of Tank 1 prior to removal.

Liquid waste was collected and disposed by Cleanaway prior to tank removal.

Aerial photo showing the concrete floor of the former workshop. Exposed tops of Tank 1 and Tank 2 are visible on the left hand side of the slab.

Tank excavations and stockpiled soil on the afternoon of 15 April 2020 following tank removal and soil validation sampling.

Soil profile on the southern wall of the Tank 1 excavation. Phyllite bedrock was encountered less than 1m below the ground surface.

Loading out hydrocarbon impacted soil on 27 May 2020 for off-site disposal.

Excavation were backfilled with soil and rock borrowed from the immediate surrounds.

Groundwater monitoring well installation works – 28 May 2020.

Looking northward across the former UPSS area toward Bullocks Head Creek. Monitoring wells are marked by wooden stakes with yellow paint on top. Groundwater elevation data indicates groundwater flow in the direction the photograph is taken.

A small amount of LNAPL (diesel) was identified on the surface of groundwater within MW2.

Annex I

Groundwater Monitoring Well Construction Logs

Borehole ID: MW1

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
PO Box 6278
DUBBO NSW 2830

ph: 0407 875 302
fx: (02) 8607 8122
admin@grounddoc.com.au

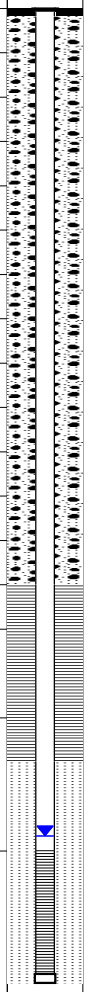
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0		**FILL:** Mix of Clayey Silt and Phyllite Cobbles, Brown, Moist. Reworked natural material from surrounding area.	0.5
1		**PHYLLITE:** Grey, light brown and brown, fractured, dry.	
2		Weathered to 8.8m bgl. Hard 8.8m+.	
3		Moist cuttings 6-7.5m. Hole did not make water after it was left open.	
4		Soft weathered layer 20-22m. Hole made water after pause at 22m rod change.	
5			
6		Moderate hydrocarbon odour 6-10m. Weak hydrocarbon odour 10m+	
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22		**End of Hole at 22m in Phyllite.**	22.0
23			
24			
25			
26			
27			
28			
29			
30			

SAMPLE

Sample ID	PID / Odour
0-1m	0ppm
1-2m	0ppm
2-3m	0ppm
3-4m	0ppm
4-5m	0ppm
5-6m	10ppm
6-7m	23ppm
7-8m	15ppm
8-9m	10ppm
9-10m	1ppm
10-11m	4ppm
11-12m	2ppm
12-13m	1ppm
13-14m	2ppm
14-16m	2ppm
16-19m	1ppm

CONSTRUCTION



Well Diagram

Materials Used

- Well head completed with irrigation box at ground surface.
- 50mm ID Class 18 PVC Blank Casing (0.1-19.0m bgl).
- Annulus backfilled with drill cuttings (0.5-13.0m bgl).
- Annulus backfilled with bentonite (13.0-17.0m bgl).
- Annulus backfilled with 3-7mm washed river gravel (17.0-22.0m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (19.0-22.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 27 May 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW2

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
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DUBBO NSW 2830

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SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0		**CLAYEY SILT:** Brown, moist.	0.3
1		**PHYLLITE:** Grey, light brown and brown, fractured, dry.	
2		Weathered to 9.0m bgl. Hard 9.0m+.	
3		Soft weathered layer 19-22m. Hole made water after pause at 22m rod change.	
4			
5		No hydrocarbon odour throughout.	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22		**End of Hole at 22m in Phyllite.**	22.0
23			
24			
25			
26			
27			
28			
29			
30			

SAMPLE

Sample ID	PID / Odour
0-1m	0ppm
1-2m	0ppm
2-3m	0ppm
3-4m	0ppm
4-5m	0ppm
5-6m	0ppm
6-7m	0ppm
7-8m	0ppm
8-9m	0ppm
9-10m	0ppm
10-12m	0ppm
12-14m	0ppm
14-16m	2ppm
16-18m	2ppm
18-20m	1ppm
20-22m	1ppm

CONSTRUCTION

Well Diagram

Materials Used

- Well head completed with irrigation box at ground surface.
- 50mm ID Class 18 PVC Blank Casing (0.1-19.0m bgl).
- Annulus backfilled with drill cuttings (0.5-11.0m bgl).
- Annulus backfilled with bentonite (11.0-16.0m bgl).
- Annulus backfilled with 3-7mm washed river gravel (16.0-22.0m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (19.0-22.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 28 May 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW3

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
PO Box 6278
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SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0		**CLAYEY SILT:** Brown, moist.	0.3
1		**PHYLLITE:** Grey, light brown and brown, fractured, dry.	
2		Weathered to 9.0m bgl. Hard 9.0m+.	
3		Soft weathered layer 17-19m. Hole made water after pause at 19m rod change.	
4			
5		No hydrocarbon odour throughout.	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			19.0
19		**End of Hole at 19m in Phyllite.**	
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

SAMPLE

Sample ID	PID / Odour
0-2m	0ppm
2-4m	0ppm
4-6m	0ppm
6-8m	0ppm
8-10m	0ppm
10-12m	0ppm
12-14m	0ppm
14-16m	0ppm
16-18m	0ppm
18-19m	0ppm

CONSTRUCTION

Materials Used

- Well head completed with irrigation box at ground surface.
- Annulus backfilled with drill cuttings (0.5-9.0m bgl).
- 50mm ID Class 18 PVC Blank Casing (0.1-16.0m bgl).
- Annulus backfilled with bentonite (9.0-12.0m bgl).
- Annulus backfilled with 3-7mm washed river gravel (12.0-19.0m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (16.0-19.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 29 May 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW4

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
PO Box 6278
DUBBO NSW 2830

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admin@grounddoc.com.au

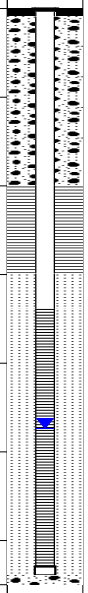
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0		**CLAYEY SILT:** Brown, moist.	0.3
1		**PHYLLITE:** Grey, light brown and brown, fractured, dry.	
2		Soft layer 9-10m bgl. Damp cuttings at 10m rod change.	
3		Intermittent fractures 10-13m.	
4		Hole airlifted for 15 minutes at completion of drilling. Estimated yield 0.1L/s.	
5		No hydrocarbon odour throughout.	
6			
7			
8			
9			
10			
11			
12			
13		**End of Hole at 13m in Phyllite.**	13.0
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

SAMPLE

Sample ID	PID / Odour
0-2m	0ppm
2-4m	0ppm
4-6m	0ppm
6-8m	0ppm
8-10m	0ppm
10-12m	0ppm
12-13m	0ppm

CONSTRUCTION



Well head completed with steel road box at ground surface.

Annulus backfilled with drill cuttings (0.2-4.0m bgl).

50mm ID Class 18 PVC Blank Casing (0.1-6.8m bgl).

Annulus backfilled with bentonite (4.0-6.0m bgl).

50mm ID Class 18 PVC Machine Slotted Screen (6.8-12.8m bgl).

Annulus backfilled with 3-5mm washed river gravel (6.0-12.8m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 27 October 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW5

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
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SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0		**CLAYEY SILT:** Brown, moist.	0.3
1		**PHYLLITE:** Grey, light brown and brown, fractured, dry.	
2		Soft dark brown layer 11.5-12.5m. Moist cuttings at 13m rod change.	
3		Intermittent fracturing 13-15m. Hole made water at 14m during drilling.	
4		Hole was airlifted for approximately 15 minutes at completion of drilling. Estimated yield was 0.5L/s.	
5		Airlifted water was free of sheen and hydrocarbon odour.	
6		No hydrocarbon odour throughout. Low PID readings 8-14m bgl.	
7			
8			
9			
10			
11			
12			
13			
14			15.0
15		**End of Hole at 15m in Phyllite.**	
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

SAMPLE

Sample ID	PID / Odour
0-2m	0ppm
2-4m	0ppm
4-6m	0ppm
6-8m	0ppm
8-10m	22ppm
10-12m	8ppm
12-14m	2ppm
14-15m	0ppm

CONSTRUCTION

Materials Used

- Well head completed with steel road box at ground surface.
- 50mm ID Class 18 PVC Blank Casing (0.1-9.0m bgl).
- Annulus backfilled with drill cuttings (0.2-6.0m bgl).
- Annulus backfilled with bentonite (6.0-8.0m bgl).
- Annulus backfilled with 3-5mm washed river gravel (8.0-15.0m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (9.0-15.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 27 October 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW6

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
PO Box 6278
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admin@grounddoc.com.au

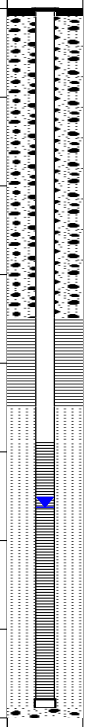
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0		**CLAYEY SILT:** Brown, moist.	0.3
1		**PHYLLITE:** Grey, light brown and brown, fractured, dry.	
2		Soft darker layer 14-16m. No obvious water strike. Hole made water after 10 minute rest at 16m rod change.	
3		Hole was airlifted for approximately 15 minutes at completion of drilling. Estimated yield was <0.05L/s.	
4		Airlifted water was free of sheen and hydrocarbon odour.	
5		No hydrocarbon odour throughout.	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			16.0
16		**End of Hole at 16m in Phyllite.**	
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

SAMPLE

Sample ID	PID / Odour
0-2m	0ppm
2-4m	0ppm
4-6m	0ppm
6-8m	0ppm
8-10m	0ppm
10-12m	0ppm
12-14m	0ppm
14-16m	0ppm

CONSTRUCTION



Materials Used

- Well head completed with steel road box at ground surface.
- 50mm ID Class 18 PVC Blank Casing (0.1-9.0m bgl).
- Annulus backfilled with drill cuttings (0.2-6.0m bgl).
- Annulus backfilled with bentonite (6.0-8.0m bgl).
- Annulus backfilled with 3-5mm washed river gravel (8.0-15.0m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (9.0-15.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 27 October 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW7

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
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admin@grounddoc.com.au

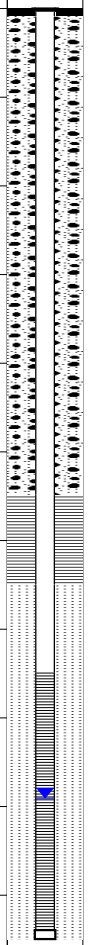
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0–2		**FILL:** Old tank pit. Fill was comprised of clayey silt and broken phyllite.	2.0
2–21		**PHYLLITE:** Grey, light brown and brown, fractured, dry. Soft weathered layer 15-16m. No obvious sign of water in drill cuttings. Soft layer 20.5-21.0m bgl. Hole made water after pause at 22m rod change. Estimate yield <0.05L/s. Weak hydrocarbon oodur in cuttings at 16m bgl.	
21		**End of Hole at 21m in Phyllite.**	21.0

SAMPLE

Sample ID	PID / Odour
0-2m	0ppm
2-4m	0ppm
4-6m	0ppm
6-8m	0ppm
8-10m	0ppm
10-12m	0ppm
12-14m	0ppm
14-16m	3ppm
16-18m	1ppm
18-20m	0ppm

CONSTRUCTION



Materials Used

- Well head completed with steel roadbox at ground surface.
- 50mm ID Class 18 PVC Blank Casing (0.1-15.0m bgl).
- Annulus backfilled with drill cuttings (0.2-11.0m bgl).
- Annulus backfilled with bentonite (11.0-13.0m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (15.0-21.0m bgl).
- Annulus backfilled with 3-5mm washed river gravel (13.0-21.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 28 October 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW8

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
PO Box 6278
DUBBO NSW 2830

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admin@grounddoc.com.au

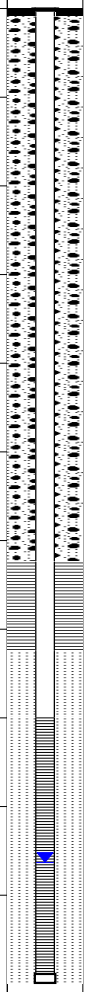
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0		**Clayey SILT:** Dark brown, soft, moist.	0.5
1		**PHYLLITE:** Grey, light brown and brown, fractured, dry.	
2		Minor fracture layer 19.0-19.5m bgl. No obvious sign of water inflow in drill cuttings.	
3		Hole made water after pause at 22m rod change. Estimate yield <0.05L/s.	
4			
5		No hydrocarbon odour throughout.	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			22.0
		End of Hole at 22m in Phyllite.	
23			
24			
25			
26			
27			
28			
29			
30			

SAMPLE

Sample ID	PID / Odour
0-2m	0ppm
2-4m	0ppm
4-6m	0ppm
6-8m	0ppm
8-10m	0ppm
10-12m	0ppm
12-14m	0ppm
14-16m	0ppm
16-18m	0ppm
18-20m	0ppm

CONSTRUCTION



Materials Used

- Well head completed with steel roadbox at ground surface.
- 50mm ID Class 18 PVC Blank Casing (0.1-16.0m bgl).
- Annulus backfilled with drill cuttings (0.2-12.5m bgl).
- Annulus backfilled with bentonite (12.5-14.5m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (16.0-22.0m bgl).
- Annulus backfilled with 3-5mm washed river gravel (14.5-22.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 28 October 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Borehole ID: MW9

Project No.: 2020-GD003

Project Name: Selwyn Snow Resort UPSS Decommissioning

Client: Selwyn Snow Resort

Site Address: 213A Kings Cross Road, Cabramurra, NSW

Ground Doctor Pty Ltd

22 Tamworth Street
PO Box 6278
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admin@grounddoc.com.au

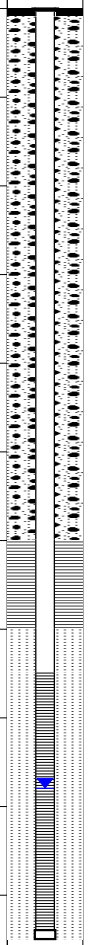
SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Depth/Elev.
		Ground Surface	0.0
0–1		**FILL:** Road embankment. Fill was comprised of clayey silt and broken phyllite.	1.0
1–21		**PHYLLITE:** Grey, light brown and brown, fractured, dry. Orange-brown zone 6-12m bgl. Soft with dark brown cuttings 19.5-21.0m. Dust dropped at 20.5m bgl and hole made good water at 21m. Hole airlifted for approximately 15minutes at completion of drilling. Estimate yield 0.3L/s. No hydrocarbon odour in cuttings throughout.	
21		**End of Hole at 21m in Phyllite.**	21.0

SAMPLE

Sample ID	PID / Odour
0-2m	0ppm
2-4m	0ppm
4-6m	0ppm
6-8m	0ppm
8-10m	0ppm
10-12m	0ppm
12-14m	0ppm
14-16m	0ppm
16-18m	0ppm
18-20m	0ppm

CONSTRUCTION



Materials Used

- Well head completed with steel roadbox at ground surface.
- 50mm ID Class 18 PVC Blank Casing (0.1-15.0m bgl).
- Annulus backfilled with drill cuttings (0.2-12.0m bgl).
- Annulus backfilled with bentonite (12.0-14.0m bgl).
- 50mm ID Class 18 PVC Machine Slotted Screen (15.0-21.0m bgl).
- Annulus backfilled with 3-5mm washed river gravel (14.0-21.0m bgl).

Drilled By: Ivan Drilling (Georgel Ivan)

Drill Method: Air Rotary (DHH)

Drill Date: 28 October 2020

Hole Size: 90mm

Datum:

Sheet: 1 of 1

Annex **J**

Groundwater Monitoring Well Sampling Records

Site Name:	**Mt Selwyn Workshop UPSS Decommissioning Validation Report**
Project Number:	**2020-GD003-RP2**
Sampling Dates:	**18-Nov-20**

MW1

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
-	-	-	-	-	-	-	-
							.
Comments / Observations:							
Approximately 3mm of LNAPL (diesel) in well. Approximately 15L bailed prior to grab sample collection using a disposable bailer.							
No parameters measured due to presence of LNAPL.							

MW2

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
-	-	-	-	-	-	-	-
							.
Comments / Observations:							
Approximately 3mm of LNAPL (diesel) in well. Approximately 15L bailed prior to grab sample collection using a disposable bailer.							
No parameters measured due to presence of LNAPL.							

MW3

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
0	1817	16.74	16.5	7.19	50	5.63	176
1	1825	16.75	14.5	1.64	48	5.58	175
2	1837	16.76	13.1	0.74	52	5.38	175
3	1843	16.79	11.9	1.74	46	5.11	186
4	1851	16.79	12.3	2.65	40	5.23	180
5	1858	16.8	11.6	3.85	34	5.07	190
6	1904	16.82	10.8	4.12	33	5.04	200
7	1910	16.83	10.7	4.45	30	5.03	201
							.
Comments / Observations:							
Purged water was clear and colourless.							
Water free of hydrocarbon sheen and oodur.							

MW4

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
0	1512	9.51	13.3	3.05	99	5.43	196
1	1518	9.51	10.8	1.58	100	5.23	206
2	1521	9.50	10.4	1.4	99	4.87	225
3	1525	9.50	10.3	1.36	99	5.14	209
4	1530	9.50	10.3	1.43	100	5.1	208
5	1534	9.50	10.6	1.44	100	5.20	209
6	1539	9.50	10.3	1.50	101	5.27	208
7	1543	9.50	10.3	1.51	101	5.24	209
							.
Comments / Observations:							
Purged water was clear and colourless.							
Water free of hydrocarbon sheen and oodur.							

MW5

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
0	1557	11.25	17.4	7.98	32	5.34	192
1	1603	11.25	10.8	5.9	33	4.81	209
3	1608	11.25	10.4	6.07	33	4.78	214
4	1612	11.25	10.6	5.41	32	4.68	221
5	1616	11.25	10.3	5.48	32	4.6	223
6	1620	11.25	10.4	5.90	32	4.65	225
7	1625	11.25	10.2	5.79	32	4.65	230
8	1630	11.25	10.3	5.83	32	4.68	228
							.
Comments / Observations:							
Purged water was clear and colourless.							
Water free of hydrocarbon sheen and oodur.							

MW6

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
1	1419	13.80	10.5	5.21	26	4.48	222
2	1422	13.81	11.1	55.8	23	4.54	218
3	1425	13.82	12.0	5.65	23	4.86	199
4	1432	13.82	11.4	4.46	22	4.77	210
5	1440	13.82	11.9	5.11	20	5.02	198
6	1446	13.82	11.9	5.39	20	4.91	206
7	1452	13.82	12.1	5.35	20	4.91	206
							.
Comments / Observations:							
Minor silt content (grey).							
Water free of hydrocarbon sheen and oodur.							

MW7

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
0	2059	17.88	10.3	4.06	41	4.99	225
1	2104	17.88	9.8	0.93	86	5.4	210
2	2110	17.88	9.8	0.18	79	5.28	209
3	2115	17.88	9.9	-	71	5.3	206
4	2120	17.88	10	-	63	5.17	209
5	2126	17.88	9.7	-	55	5.15	210
6	2132	17.88	9.6	-	54	5.18	208
7	2138	17.88	9.6	-	54	5.19	209
							.
Comments / Observations:							
Purged water was clear and colourless.							
Water free of hydrocarbon sheen. Weak hydrocarbon oodur. DO meter malfunction last 20minutes of purge.							

MW8

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
0	1655	19.37	15.6	5.03	39	5.39	202
1	1704	19.40	12.6	2.86	48	5.32	203
2	1712	19.40	12.1	2.39	54	5.52	191
3	1720	19.40	11.4	2.4	55	5.43	194
4	1731	19.40	10.9	2.71	53	5.4	196
5	1739	19.40	11.1	2.87	51	5.42	195
6	1746	19.40	11.6	2.82	51	5.42	14
7	1753	19.40	11.5	2.86	50	5.43	195
							.
Comments / Observations:							
Purged water was clear and colourless.							
Water free of hydrocarbon sheen and oodur.							

MW9

Purge Volume (L)	Time	DTW (mbtoc)	Temp (oC)	DO (ppm)	EC (uS/cm)	pH	Redox (mV)
0	1930	17.60	12.6	4.91	42	5.15	194
1	1937	17.60	10.3	2.98	43	4.89	210
2	1944	17.60	10.1	3.09	44	5.01	215
3	1950	17.60	10	3.06	43	5.06	208
4	1954	17.60	9.9	3.08	43	5.03	211
5	2002	17.60	9.9	2.94	43	5.07	211
6	2009	17.60	9.9	3.15	42	4.98	217
7	2015	17.60	9.8	3.16	42	5	217
							.
Comments / Observations:							
Purged water was clear and colourless.							
Water free of hydrocarbon sheen and oodur.							