APPENDIX L

BARGE ACCESS INFRASTRUCTURE

(including subaqueous excavated rock placement assessment)

REPORT

Exploratory Works

Technical Study
Barge Access Infrastructure Report including
Subaqueous Excavated Rock Placement Assessment

Client: Snowy Hydro Limited

Reference: M&APA1804R001D5.0

Revision: 5.0/Final

Date: 13 July 2018

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Disclaimer

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1 Introduction

1.1 The project

Snowy Hydro Limited (Snowy Hydro) proposes to develop Snowy 2.0, a large scale pumped hydro-electric storage and generation project which would increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme). This would be achieved by establishing a new underground hydro-electric power station that would increase the generation capacity of the Snowy Scheme by almost 50%, providing an additional 2,000 megawatts (MW) generating capacity, and providing approximately 350,000 megawatt hours (MWh) of storage available to the National Electricity Market (NEM) at any one time, which is critical to ensuring system security as Australia transitions to a decarbonised NEM. Snowy 2.0 will link the existing Tantangara and Talbingo reservoirs within the Snowy Scheme through a series of underground tunnels and hydro-electric power station.

Snowy 2.0 has been declared to be State significant infrastructure and critical State significant infrastructure (CSSI) by the NSW Minister for Planning under the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and is defined in Clause 9 of Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). Separate applications and environmental impact statements (EIS) for different phases of Snowy 2.0 are being submitted under Part 5, Division 5.2 of the EP&A Act. This technical assessment has been prepared to support an EIS for Exploratory Works to undertake investigative works to gather important technical and environmental information for the main Snowy 2.0 project. The main project will be subject of a separate application and EIS next year.

The purpose of Exploratory Works for Snowy 2.0 is primarily to gain a greater understanding of the conditions at the proposed location of the power station, approximately 850 metres (m) below ground level. Understanding factors such as rock conditions (such as stress conditions) and ground temperature is essential to inform decisions about the precise location of the power station cavern and confirm the cavern construction methods.

Exploratory Works comprises:

- an exploratory tunnel to the site of the underground power station for Snowy 2.0;
- horizontal and other test drilling, investigations and analysis in situ at the proposed cavern location and associated areas, and around the portal construction pad, access roads and excavated rock management areas all within the disturbance footprint;
- a portal construction pad for the exploratory tunnel;
- an accommodation camp for the Exploratory Works construction workforce;
- road works and upgrades providing access and haulage routes during Exploratory Works;
- barge access infrastructure, to enable access and transport by barge on Talbingo reservoir;
- excavated rock management, including subaqueous placement within Talbingo Reservoir;
- services infrastructure such as diesel-generated power, water and communications; and
- post-construction revegetation and rehabilitation, management and monitoring.

1.2 Purpose of this report

This report supports the EIS for the Exploratory Works. It documents the concept design of the:

- barge access infrastructure;
- dredge channel; and,
- subaqueous excavated rock placement.

The report document initiatives built into the project design to avoid and minimise impacts and the mitigation and management measures proposed to address any residual impacts not able to be avoided.

1.3 Location of Exploratory Works

Snowy 2.0 and Exploratory Works are within the Australian Alps, in southern NSW. The regional location of Exploratory Works is shown on Figure 1.1. Snowy 2.0 is within both the Snowy Valleys and Snowy Monaro Regional local government areas (LGAs), however Exploratory Works is entirely within the Snowy Valleys LGA. The majority of Snowy 2.0 and Exploratory Works are within Kosciuszko National Park (KNP). The area in which Exploratory Works will be undertaken is referred to herein as the project area, and includes all of the surface and subsurface elements further discussed in Section 2.1.

Exploratory Works is predominantly in the Ravine region of the KNP. This region is between Talbingo Reservoir to the north-west and the Snowy Mountains Highway to the east, which connects Adaminaby and Cooma in the south-east to Talbingo and Tumut to the north-west of the KNP. Talbingo Reservoir is an existing reservoir that forms part of the Snowy Scheme. The reservoir, approximately 50 kilometres (km) north-west of Adaminaby and approximately 30 km east-north-east of Tumbarumba, is popular for recreational activities such as boating, fishing, water skiing and canoeing.

The nearest large towns to Exploratory Works are Cooma and Tumut. Cooma is approximately one hour and forty five minutes drive (95 km) south-east of Lobs Hole. Tumut is approximately half an hour (45 km) north of Talbingo. There are several communities and townships near the project area including Talbingo, Tumbarumba, Batlow, Cabramurra and Adaminaby. Talbingo and Cabramurra were built for the original Snowy Scheme workers and their families. Adaminaby was relocated to alongside the Snowy Mountains Highway from its original location (now known as Old Adaminaby) in 1957 due to the construction of Lake Eucumbene. Talbingo and Adaminaby provide a base for users of the Selwyn Snow Resort in winter. Cabramurra was modernised and rebuilt in the early 1970s and is owned and operated by Snowy Hydro. It is still used to accommodate Snowy Scheme employees and contractors. Properties within Talbingo are now predominantly privately owned. Snowy Hydro now only owns 21 properties within the town.

Other attractions and places of interest in the vicinity of the project area include Selwyn Snow Resort, the Yarrangobilly Caves complex and Kiandra. Kiandra has special significance as the first place in Australia where recreational skiing was undertaken and is also an old gold rush town.

The project area is shown on Figure 1.2 and comprises:

- **Lobs Hole:** Lobs Hole will accommodate the excavated rock emplacement areas, an accommodation camp as well as associated infrastructure, roads and laydown areas close to the portal of the exploratory tunnel and portal construction pad at a site east of the Yarrangobilly River;

- **Talbingo Reservoir:** installation of barge access infrastructure near the existing Talbingo Spillway, at the northern end of the Talbingo Reservoir, and also at Middle Bay, at the southern end of the reservoir, near the Lobs Hole facilities, and installation of a submarine cable from the Tumut 3 power station to Middle Bay, providing communications to the portal construction pad and accommodation camp. A program of subaqueous rock placement is also proposed;
- **Mine Trail Road** will be upgraded and extended to allow the transport of excavated rock from the exploratory tunnel to sites at Lobs Hole that will be used to manage excavated material, as well as for the transport of machinery and construction equipment and for the use of general construction traffic; and
- several sections of **Lobs Hole Ravine Road** will be upgraded in a manner that protects the identified environmental constraints present near the current alignment.

The project is described in more detail in Chapter 2.

1.4 Proponent

Snowy Hydro is the proponent for Exploratory Works. Snowy Hydro is an integrated energy business – generating energy, providing price risk management products for wholesale customers and delivering energy to homes and businesses. Snowy Hydro is the fourth largest energy retailer in the NEM and is Australia's leading provider of peak, renewable energy.

1.5 Assessment guidelines and requirements

This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for Exploratory Works, issued first on 17 May 2018 and revised on 20 June 2018, as well as relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

The SEARs must be addressed in the EIS. **Table 1** lists the matters relevant to this assessment and where they are addressed in this report.

Table 1: Relevant matters raised in SEARs.

Requirement	Section addressed
Kosciuszko National Park	An assessment of impacts on the amenity, recreational and conservation values of the Kosciuszko National Park (primarily on waterways)
Water	An assessment of the impacts of the project on the quantity and quality of the region's surface water resources, including Yarrangobilly River, Wallaces Creek and Talbingo Reservoir. An assessment of the impacts of emplacement of excavated rock within Talbingo Reservoir (including bathymetry, hydrology, water quality and downstream water users). A strategy for managing and monitoring the impacts of emplacement of excavated rock within Talbingo Reservoir.
Transport	An assessment of the transport impacts of the project on the capacity, condition, safety and efficiency of the local, national park and State road network (including Upper Lobs Hole Ravine Road, Lower Lobs Hole Ravine Road, Mine Trail Road, Middle Bay Wharf access road, and Talbingo Reservoir access roads)

To inform preparation of the SEARs, the Department of Planning and Environment (DPE) invited relevant government agencies to advise on matters to be addressed in the EIS. These matters were taken into account by the Secretary for DPE when preparing the SEARs.

1.5.1 Other Relevant Reports

This report has been prepared with reference to other technical reports that were prepared as part of the Exploratory Works EIS. The other relevant reports referenced in this report are listed below.

- Aquatic ecology assessment (Cardno 2018) – Appendix G of the EIS
- Excavated rock emplacement areas assessment (SGME 2018) – Appendix K of the EIS
- Noise and vibration impact assessment (EMM 2018) – Appendix T of the EIS
- Recreational user impact assessment (TRC 2018) – Appendix C of the SIA within the EIS
- Traffic and Transport Assessment Report (SCT 2018) – Appendix Q of the EIS

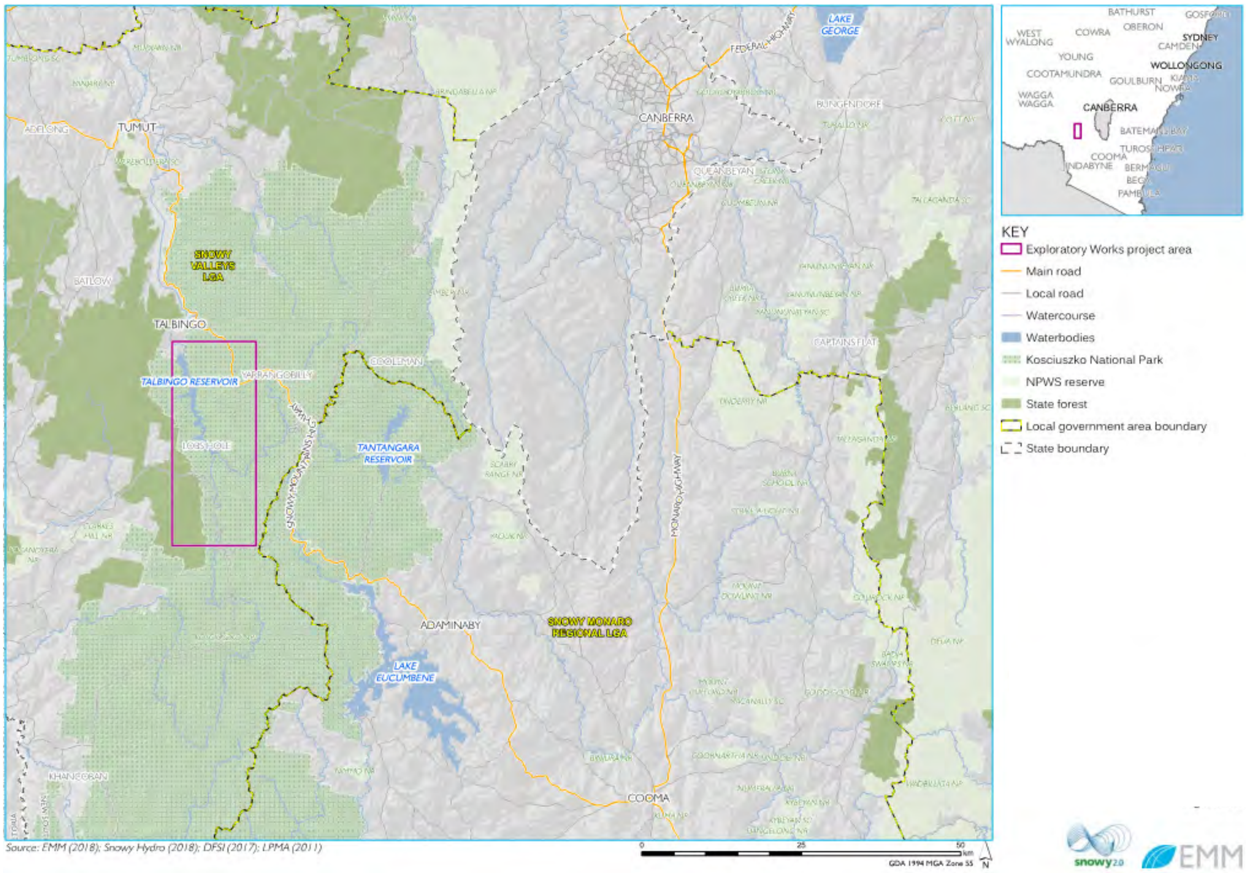

Figure 1: Regional location of Snowy 2.0 and Exploratory Works.

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Figure 2: Exploratory Works project area.

2 Project description

2.1 Overview

The Exploratory Works comprise construction associated with geotechnical exploration for the underground power station for Snowy 2.0. The Exploratory Works are shown on **Figure 3** and involve:

- establishment of an exploratory tunnel to the site of the underground power station for Snowy 2.0;
- horizontal and other test drilling, investigations and analysis in situ at the proposed cavern location and associated areas, and around the portal construction pad, access roads and excavated rock management areas all within the disturbance footprint;
- establishment of a portal construction pad for the exploratory tunnel;
- establishment of an accommodation camp for the Exploratory Works construction workforce;
- road works and upgrades providing access and haulage routes during Exploratory Works;
- establishment of barge access infrastructure, to enable access and transport by barge on Talbingo reservoir;
- excavated rock management, including subaqueous placement within Talbingo Reservoir;
- establishment of services infrastructure such as diesel-generated power, water and communications; and
- post-construction revegetation and rehabilitation, management and monitoring.

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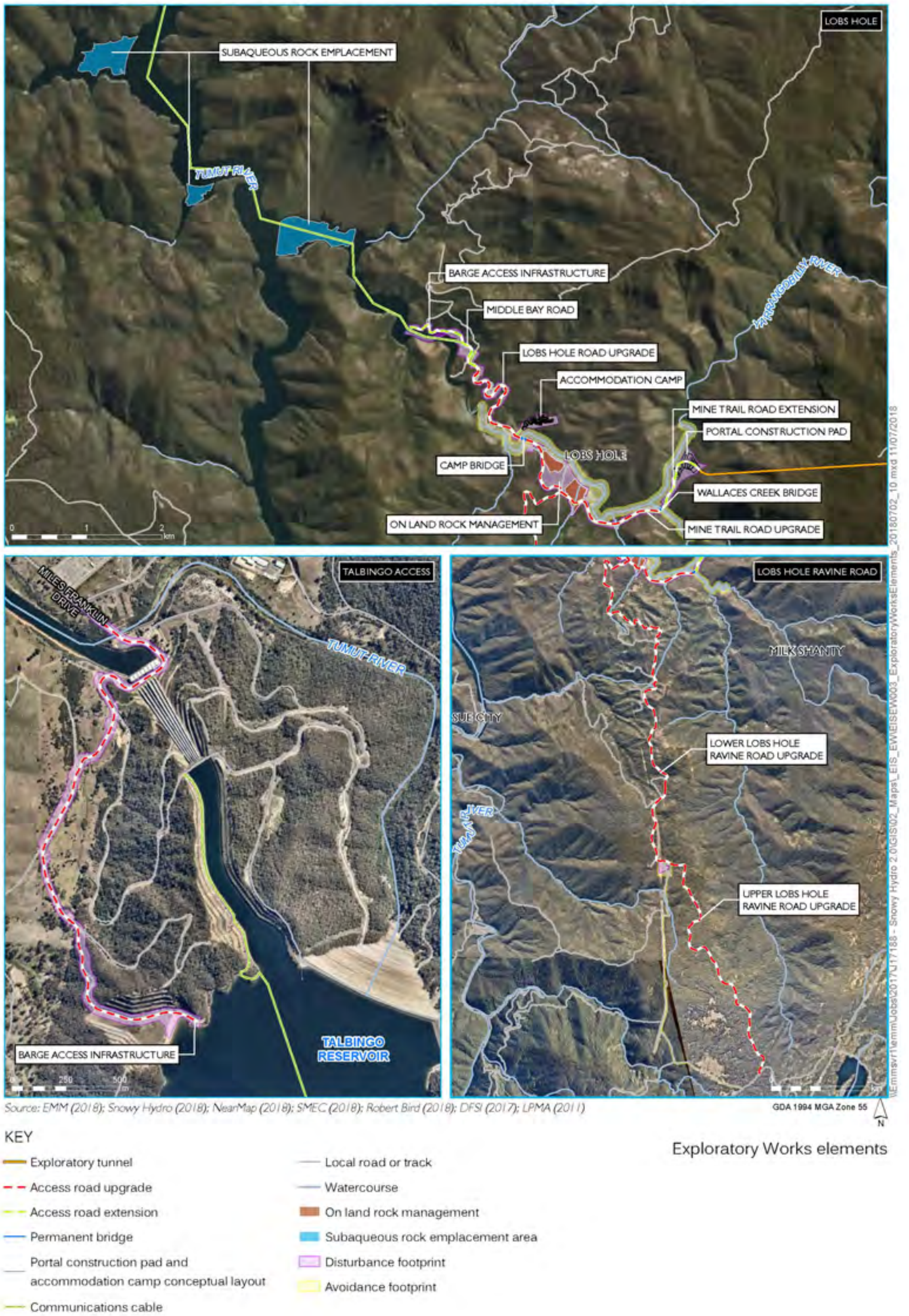


Figure 3: Exploratory Works elements

2.2 Exploratory tunnel

An exploratory tunnel of approximately 3.1 km is proposed to provide early access to the location of the largest cavern for the underground power station. This will enable exploratory drilling and help optimise the location of the cavern which, in turn, will optimise the design of Snowy 2.0.

The exploratory tunnel is proposed in the north-east section of Lobs Hole and will extend in an east-west direction with the portal construction pad to be outside the western end of the tunnel at a site east of the Yarrangobilly River, as shown on **Figure 4**.

The location of the proposed exploratory tunnel and portal construction pad is shown in **Figure 4**. The exploratory tunnel will be excavated by drill and blast methods and have an 8 x 8 m D-Shaped cross section, as shown on **Figure 5**.

The drill and blast excavation process will be repeated cyclically throughout the tunnelling works, involving:

- Marking up and drilling blast holes in a predetermined pattern in the working face of the tunnel;
- Loading the blast holes with explosives, attaching detonators and connecting the holes into a blast sequence, and detonating the blast;
- Ventilating the tunnel to remove blast fumes and dust;
- Removing blasted rock;
- Scaling and wash down of the tunnel roof and walls to remove loosened pieces of rock;
- Geological mapping of the exposed rock faces and classification of the conditions to determine suitable ground support systems for installation;
- Installing ground support; and
- Advancing construction ventilation ducting and other utilities including power, water, compressed air and communications.

The exploratory tunnel will be shotcrete-lined with permanent anchor support, and incorporate a groundwater management system. The exploratory tunnel shape and dimensions are designed to allow two-lane traffic for the removal of excavated material, along with additional space for ventilation and drainage of groundwater inflows. Groundwater intersected during tunnelling will be contained and transferred to the portal for treatment and management. Areas identified during forward probing with the potential for high groundwater flows may require management through a detailed grouting program or similar.

The tunnel portal will be established at the western end of the exploratory tunnel and provide access and utilities to the exploratory tunnel during construction. The portal will house power, communications, ventilation and water infrastructure. The portal will also provide a safe and stable entrance to the exploratory tunnel.

It is anticipated that the exploratory tunnel will be adapted for multiple functions during construction of the subsequent stages of the Snowy 2.0 project. The exploratory tunnel will also eventually be utilized to form the main access tunnel (MAT) to the underground power station during the operational phase of Snowy 2.0, should it proceed.

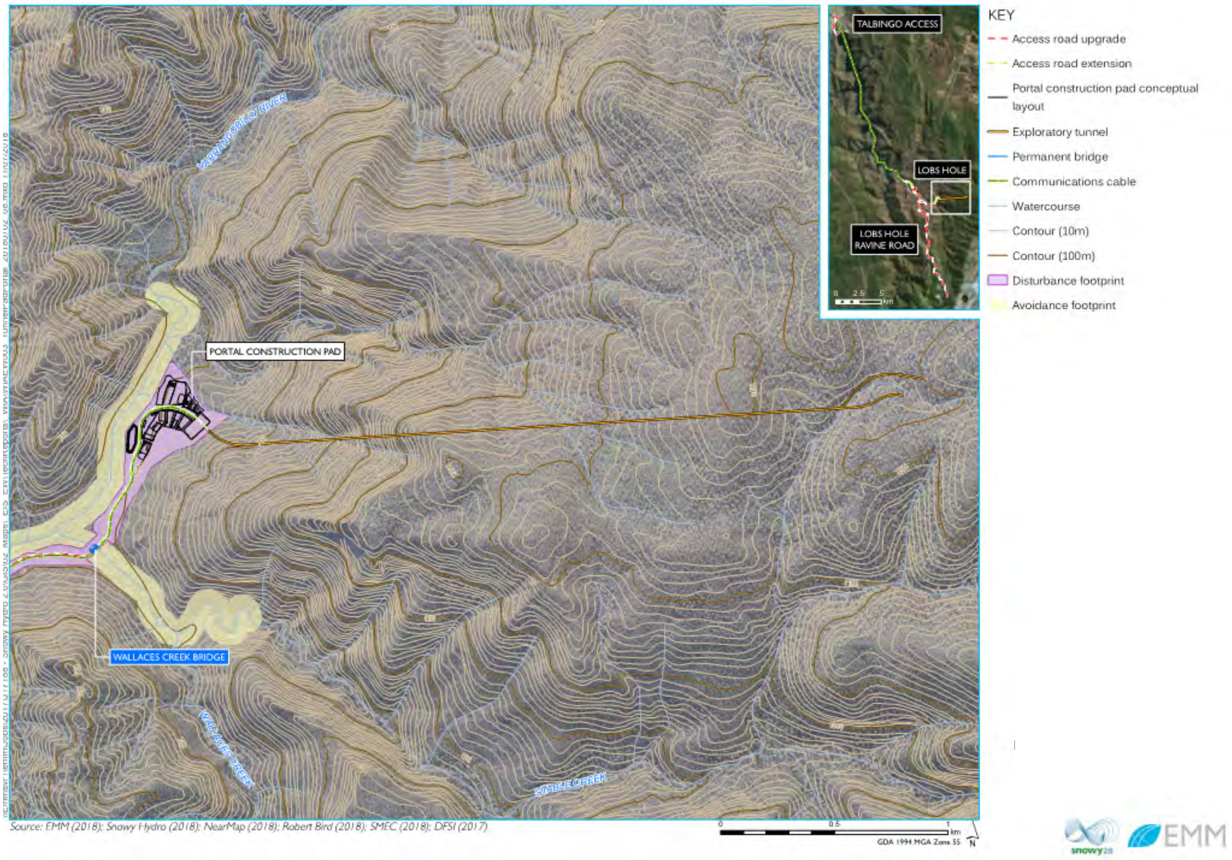


Figure 4: Exploratory tunnel location

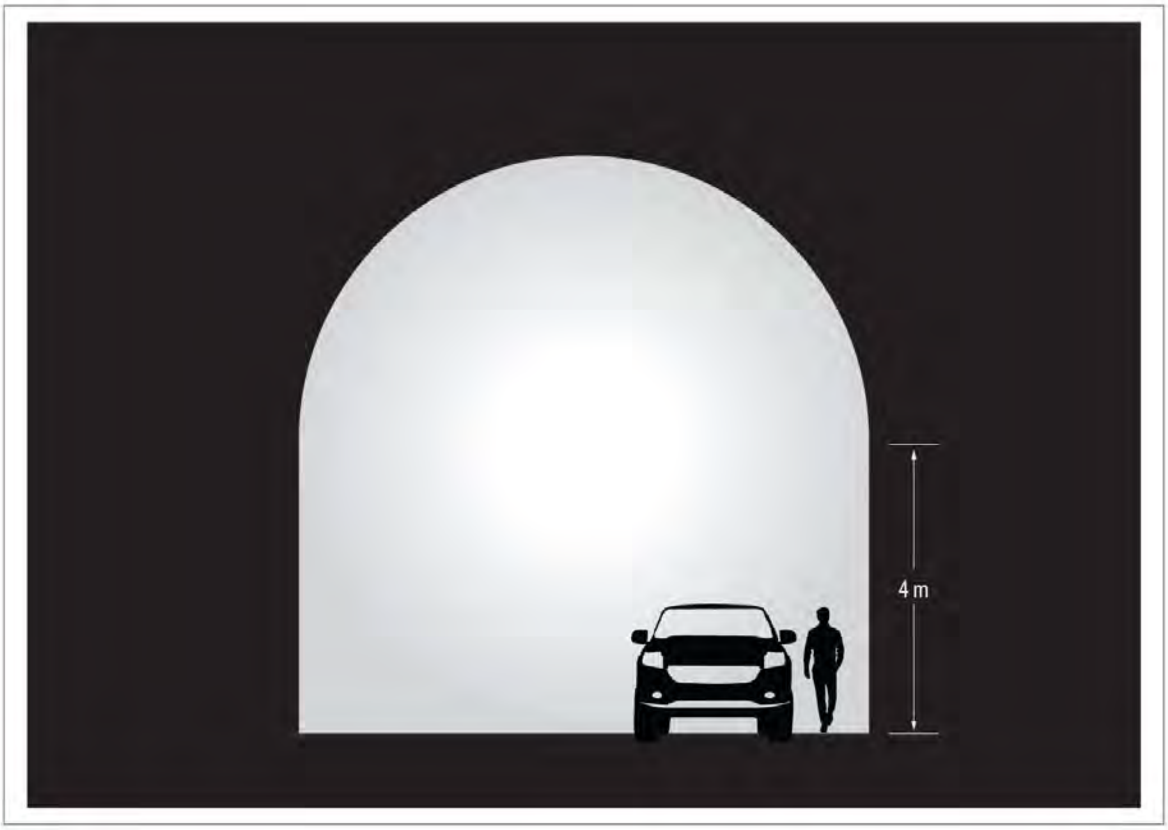
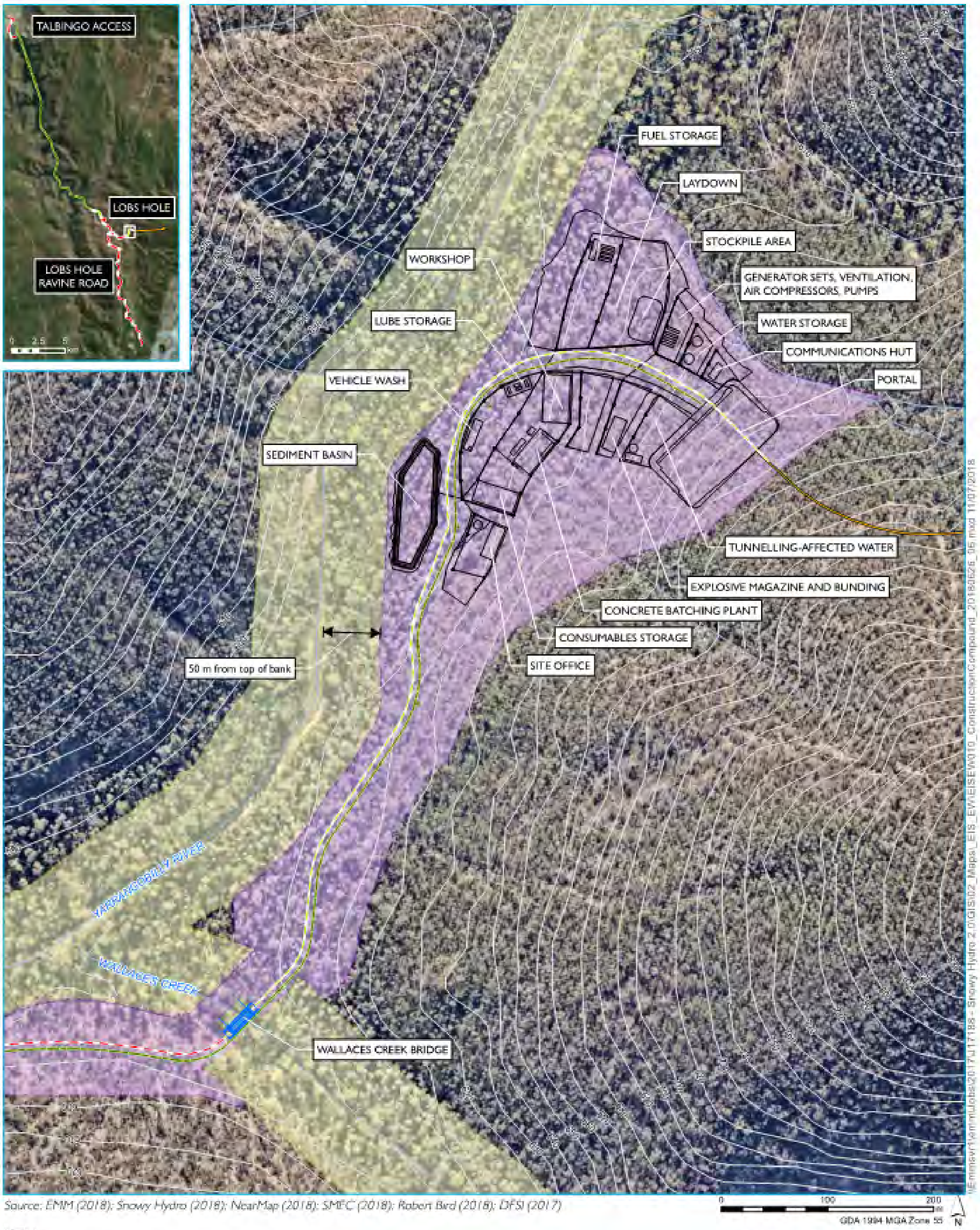


Figure 5: Exploratory tunnel cross section.

2.3 Portal construction pad

A portal construction pad for the exploratory tunnel will provide a secure area for construction activities. Infrastructure at the portal construction pad, shown in **Figure 6**, will primarily support tunnelling activities and include a concrete batching plant and associated stockpiles, site offices, maintenance workshops, construction support infrastructure, car parking, equipment laydown areas. Stockpile areas will allow for around two to three months' supply of concrete aggregate and sand for the concrete batching plant to ensure that the construction schedule for the proposed access road works do not interfere with the exploratory tunnel excavation schedule. A temporary excavated rock stockpile area is also required to stockpile material excavated during tunnel construction prior to its transfer to the larger excavated material emplacement areas.

The portal construction pad will be at the western end of the exploratory tunnel. The portal construction pad will be excavated to provide a level construction area with a near vertical face for the construction of the portal and tunnelling. The area required for the portal construction pad is approximately 100,000 m2.



KEY

- Access road upgrade
- Access road extension
- Permanent bridge
- Portal construction pad conceptual layout
- Exploratory tunnel
- Communications cable
- Watercourse
- Contour (10m)
- Disturbance footprint
- Avoidance footprint

Figure 6: Conceptual layout – portal construction pad.

2.4 Excavated rock management

It is estimated that approximately 750,000 m^3 of bulked materials will be excavated, mostly from the exploratory tunnel and portal construction pad with additional quantities from road upgrade works. Subject to geochemical testing of the rock material, excavated rock will be placed either on land or subaqueously within Talbingo Reservoir.

2.4.1 On land placement

Excavated materials will be placed in one of two rock emplacement areas at Lobs Hole as shown on **Figure 7**.

The strategy for excavated rock management is for excavated material to be emplaced at two areas with the final placement of excavated material to be determined at a later date.

Consultation with NPWS throughout the design process has identified an opportunity for the eastern emplacement area to form a permanent landform that enables greater recreational use of Lobs Hole following the completion of Snowy 2.0's construction. It is envisaged that the excavated rock emplacement area will provide, in the long-term, a relatively flat final landform suitable for camping and basic recreational facilities to be confirmed in consultation with NPWS.

The eastern emplacement area has a capacity of up to 600,000 m^3 of material. It will be approximately 25 m maximum depth and will be benched down to the northern edge of the emplacement which is setback 50 m from the Yarrangobilly River.

The western emplacement area will be used to store excavated material should it not be able to be placed within the eastern emplacement area. It is envisaged this emplacement area will be used to store excavated materials suitable for re-use within the construction of Exploratory Works or for use by NPWS in KNP maintenance activities. All remaining material placed in this emplacement area will be removed following the completion of Exploratory Works.

The guiding principles for the design, construction method and management of emplacement areas undertaken for Exploratory Works have been as follows:

- Reducing potential for acid rock drainage from the excavated rock emplacement area entering the Yarrangobilly River or forming groundwater recharge;
- Avoid known environmental constraints; and,
- Manage existing surface water flows from Lick Hole Gully.

The design and management of the emplacement areas have not yet been finalised due to the need for further investigations to determine the likely geochemical characteristics of the excavated material. Following further investigation and prior to construction of Exploratory Works a management plan will be prepared and implemented.

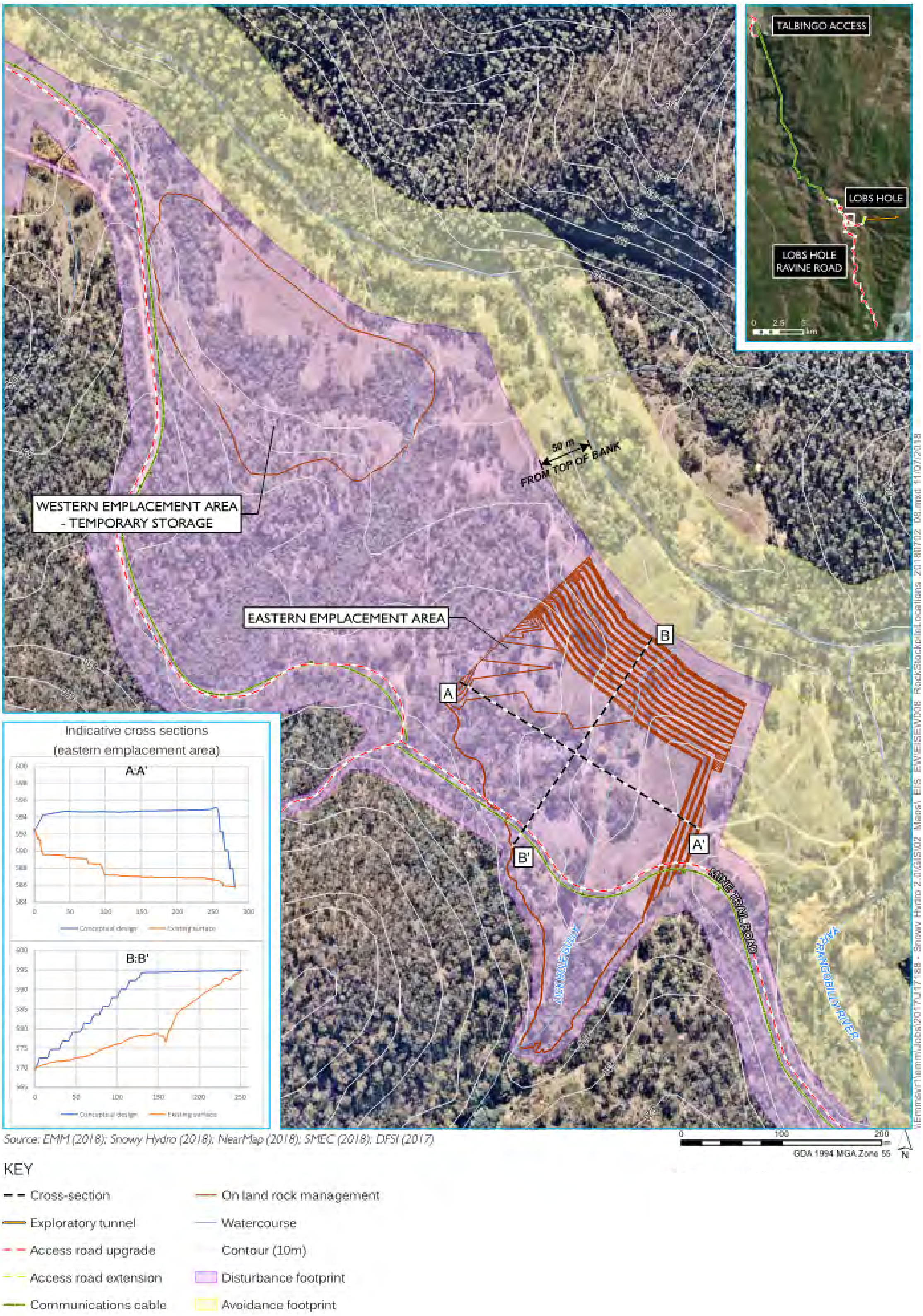


Figure 7: Conceptual layout – excavated rock emplacement areas.

2.4.2 Subaqueous placement

An initial program for the placement of excavated rock within Talbingo Reservoir also forms part of Exploratory Works. The program will be implemented in an appropriate section of Talbingo Reservoir in accordance with a detailed management plan based on an engineering method informed through the materials' geochemistry and reservoir's characteristics. The purpose of the program is to confirm the suitability of the emplacement method for future excavated rock material from the construction of Snowy 2.0, should it proceed.

The rock for subaqueous placement will be taken from the excavated rock emplacement areas as described above. Testing of the rock would be conducted during excavation to assess geochemical properties. Any rock assessed as unsuitable for subaqueous placement based on the prior geochemical and leachability testing would be separately stockpiled and not used in the program. Suitable (ie non-reactive material) would be transported and loaded to barge, for placement at the deposition area. Suitable placement locations have been identified for Exploratory Works and are shown indicatively on **Figure 8**.

All placement of excavated rock within the reservoir would occur within silt curtains and would be subject to a detailed monitoring regime including survey monitoring of pre-placement and post-placement bathymetry, local and remote background water quality monitoring during placement with a structured management response to monitoring results in the event of an exceedance of established triggers. The management, mitigation and monitoring measures would be refined following the ongoing investigations.

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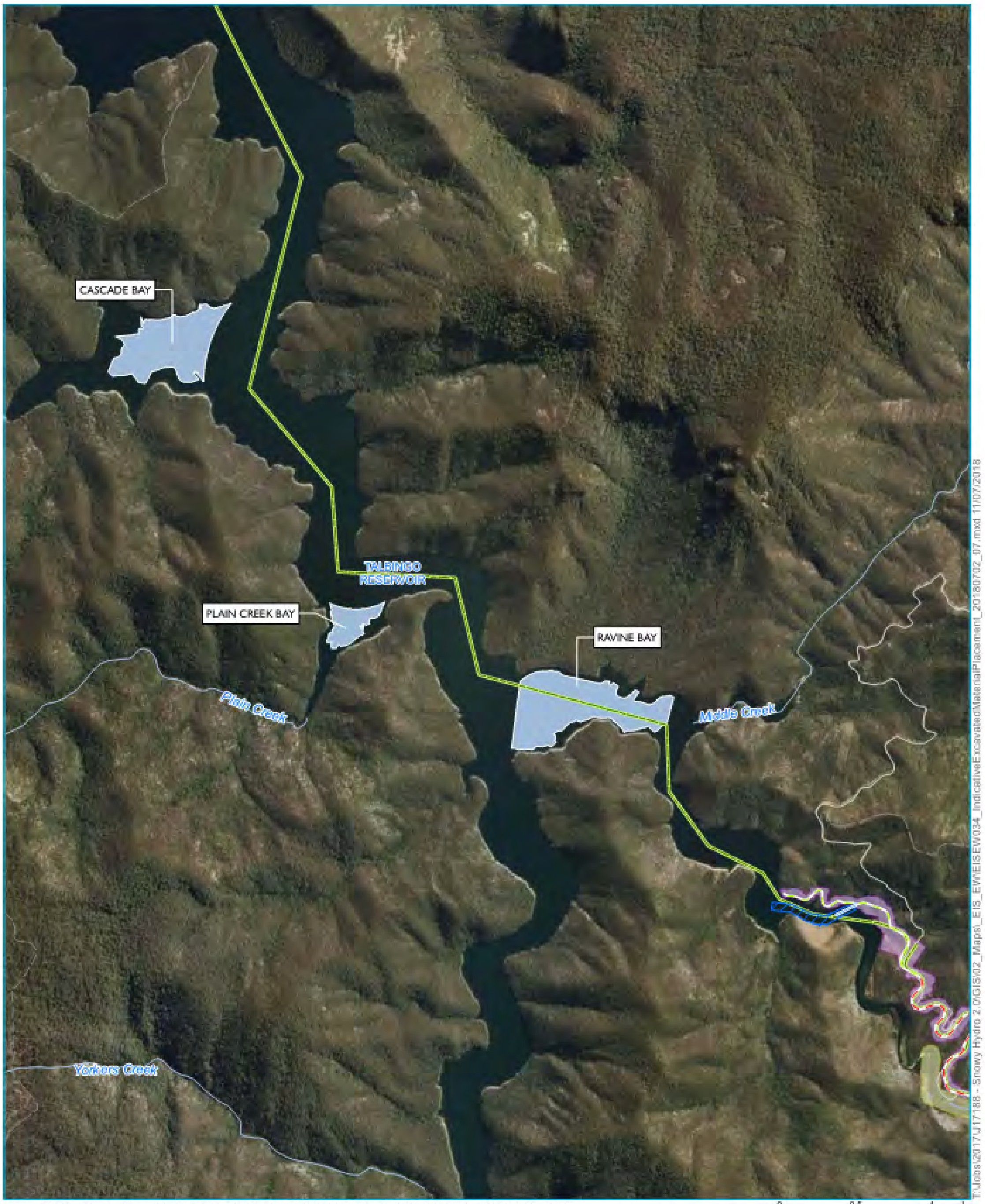

Source: EMM (2018); Snowy Hydro (2018); ESRI (2018); SMEC (2018); DFSI (2018); GA (2017); LPMA (2011)

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GDA 1994 MGA Zone 55 N

KEY

- Access road upgrade
- Access road extension
- Communications cable
- Subaqueous rock emplacement
- Major watercourse
- Local road
- Track
- Middle Bay barge access
- Disturbance area - barge infrastructure
- Disturbance footprint
- Avoidance footprint

Figure 8: Indicative location for subaqueous rock placement in Talbingo Reservoir

2.5 Accommodation camp

An accommodation camp is proposed to provide accommodation and supporting services for workers in close proximity to the exploratory tunnel. The accommodation camp layout is shown on **Figure 9** and includes ensuite rooms surrounding central facilities including a kitchen, tavern, gym, admin office, laundry, maintenance building, sewage and water treatment plants and parking that will service the Exploratory Works workforce. The accommodation camp access road will connect to the north side of Lobs Hole Road at Lobs Hole. The conceptual layout of the accommodation camp is shown on **Figure 9**.

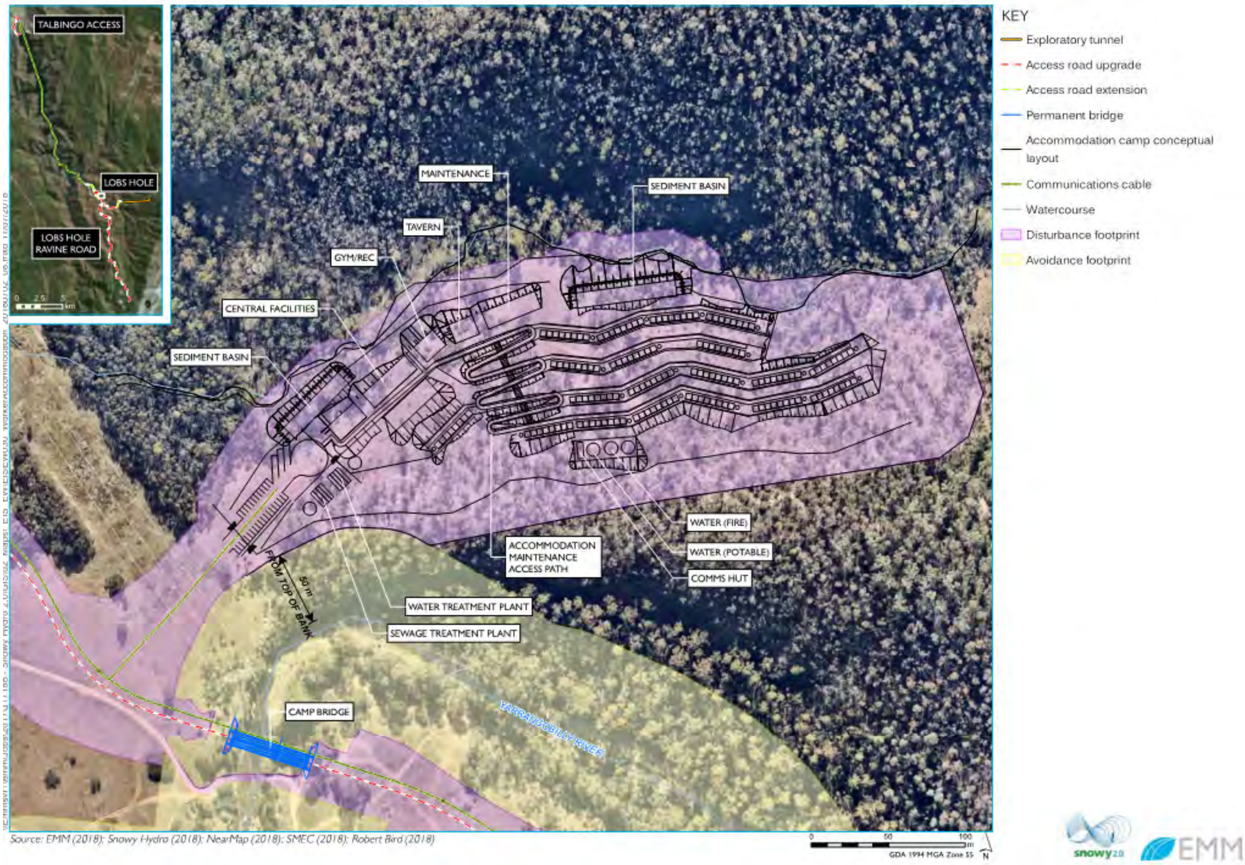

Figure 9: Conceptual layout – accommodation camp.

2.6 Road and access provisions

Existing road and access will need to be upgraded to a suitable standard to:

- Provide for the transport of excavated rock material between the exploratory tunnel and the excavated rock emplacement areas;
- Accommodate the transport of oversized loads as required; and
- Facilitate the safe movement of plant, equipment, materials and construction staff to the portal construction pad.

Given the topographic constraints of the area, the standard of the existing roads and the environmental values associated with KNP, the option of barging larger and oversized loads to the site is available. This is discussed further at **Section 2.7**.

2.6.1 Access road works

The access road upgrades will be designed based on access for a truck and dog trailer. The proposed road works are shown in **Figure 10** and described in **Table 2**. It is expected that the majority of materials and equipment will travel along the Snowy Mountains Highway, Link Road and Lobs Hole Ravine Road, with some required to travel on Miles Franklin Drive via Talbingo to Talbingo Dam Wall and be transferred via a barge to site. The primary haul routes for construction material on site are provided in **Figure 11**. Where existing roads are replaced by new access roads or road upgrades, the existing roads will be removed and rehabilitated in line with the rehabilitation strategy for Exploratory Works.

Table 2: Access road works summary.

Roadwork area	**Overview**
Upper Lobs Hole Ravine Road upgrade	Minor upgrades to 7.5 km section of existing road. Only single lane access will be provided. No cut and fill earthworks or vegetation clearing will be undertaken.
Lower Lobs Hole Ravine Road upgrade	Upgrades to 6 km section of existing road involving cut and fill earthworks in some sections. Only single lane access will be provided.
Lobs Hole Road upgrade	Upgrade to 7.3 km section of existing road providing two-way access.
Mine Trail Road upgrade	Upgrade to 2.2 km section of existing track to two-way access.
Middle Bay Road	Establishment of a new two-way road providing access to the exploratory tunnel portal.
Spillway Road	Upgrade of a 3 km section of existing road to provide two-way access to the proposed Spillway barge ramp.

While no cut and fill earthworks or vegetation clearing is proposed along Upper Lobs Hole Ravine Road, a laydown area is proposed within and adjacent to the existing transmission line easement. This area will be used to store relevant materials required for the road works to the lower section of Lobs Hole Ravine Road.

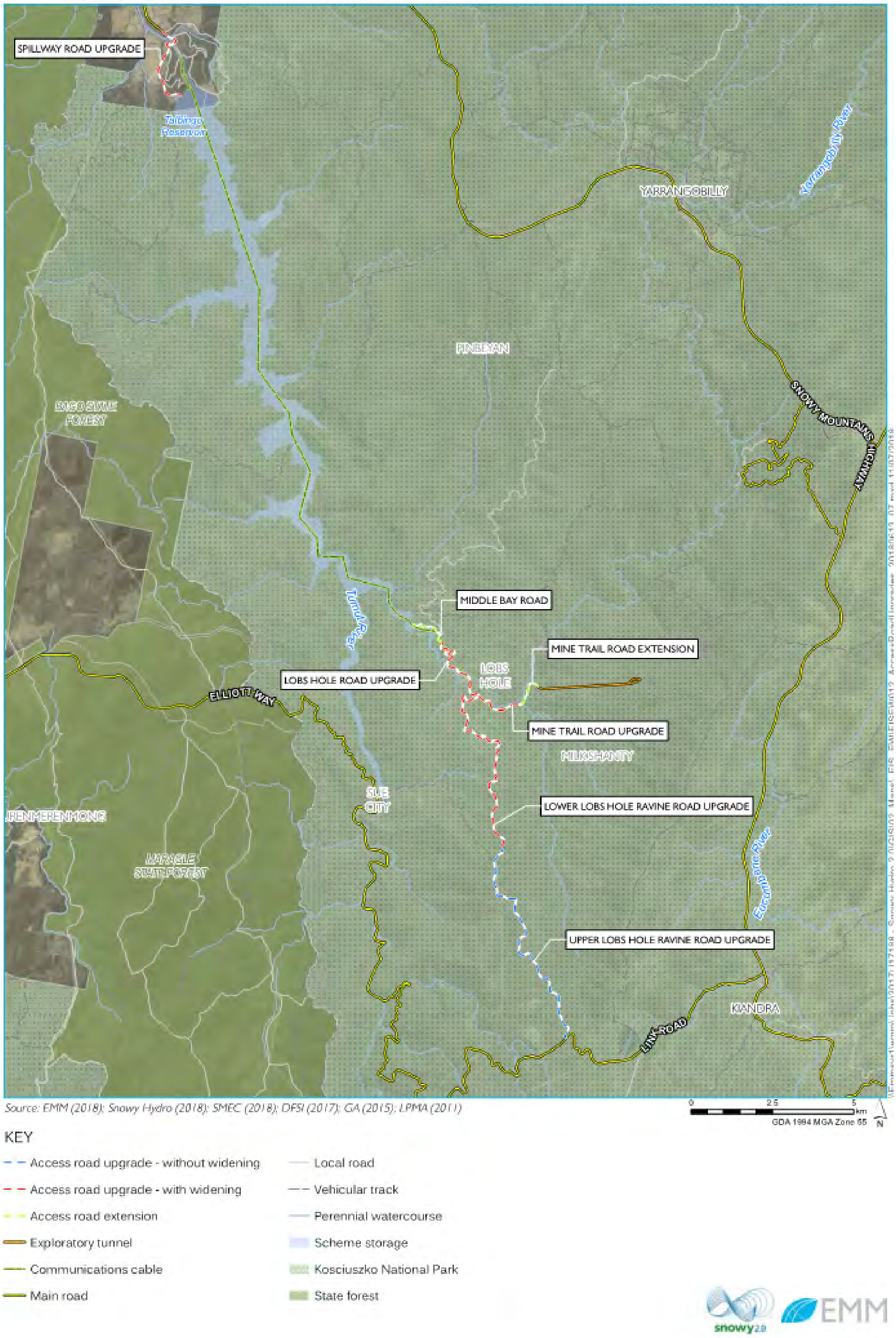

Figure 10: Access road upgrades and establishment.

2.6.2 Watercourse crossings

Bridge construction will be required at two locations as described in **Table 3**. The locations of these bridge works are shown in **Figure 11**.

Table 3: Watercourse crossing summary.

Bride works area	Overview
Camp bridge	An existing crossing on Yarrangobilly River will be used as a temporary crossing while a new permanent bridge is built as part of Lobs Hole Road upgrade. The existing crossing will require the crossing level to be raised with rocks to facilitate vehicle passage. The rocks used to raise the crossing level will be removed and the crossing no longer used once the permanent bridge has been constructed. The new bridge (Camp Bridge) will be a permanent crossing and used for both Exploratory Works and Snowy 2.0 main works, should it proceed.
Wallaces Creek bridge	Establishment of a new permanent bridge at Wallaces Creek as part of the Mine Trail Road extension. Establishment of this bridge will require an initial temporary pre-fabricated 'Bailey bridge' to be constructed, which will be removed before the end of Exploratory Works.

Figure 11: Excavated material haul route.

The design for permanent bridges at both crossings will consist of steel girders with a composite deck. This is the most common type of permanent bridge constructed in and around the existing Snowy Scheme. Lightweight steel girders are easy to transport and will therefore allow for efficiencies in the construction schedule and permit the use of smaller scale lifting equipment at the construction site.

2.7 Barge access infrastructure

To provide an alternative to road access, a barge option is proposed, not only for bulky and heavy equipment but for materials and also in case of emergency. During Exploratory Works, barges will be loaded at the northern barge ramp (Talbingo barge ramp), travel about 18 km along Talbingo Reservoir and be unloaded at the southern barge ramp (Middle Bay barge ramp) before returning to the north. Some loads may also be transported in the reverse direction.

Barge access infrastructure will comprise two dedicated barge ramps at Middle Bay and Talbingo Spillway, with a slope of approximately 1 vertical to 10 horizontal (1V: 10H) at each location. A navigation channel is also required adjacent to the Middle Bay barge ramp. Construction will involve:

- Geophysical and geotechnical investigation of the barge access area to inform detailed design;
- Site establishment and excavation of barge access area;
- Installation of precast concrete panels at the ramp location;
- Installation of bollards for mooring lines; and
- Minor dredging to allow barge access at the reservoir minimum operating level.

To facilitate construction, laydown areas are proposed adjacent to the Middle Bay barge ramp and adjacent to the water inlet pipeline. Laydown will also be used within the footprint of the Talbingo barge ramp.

Dredged material will be placed as part of the subaqueous placement program or within one of the designated on land rock emplacement areas. The infrastructure proposed for the Talbingo Spillway barge ramp and Middle Bay barge ramp is provided in **Figure 12**.

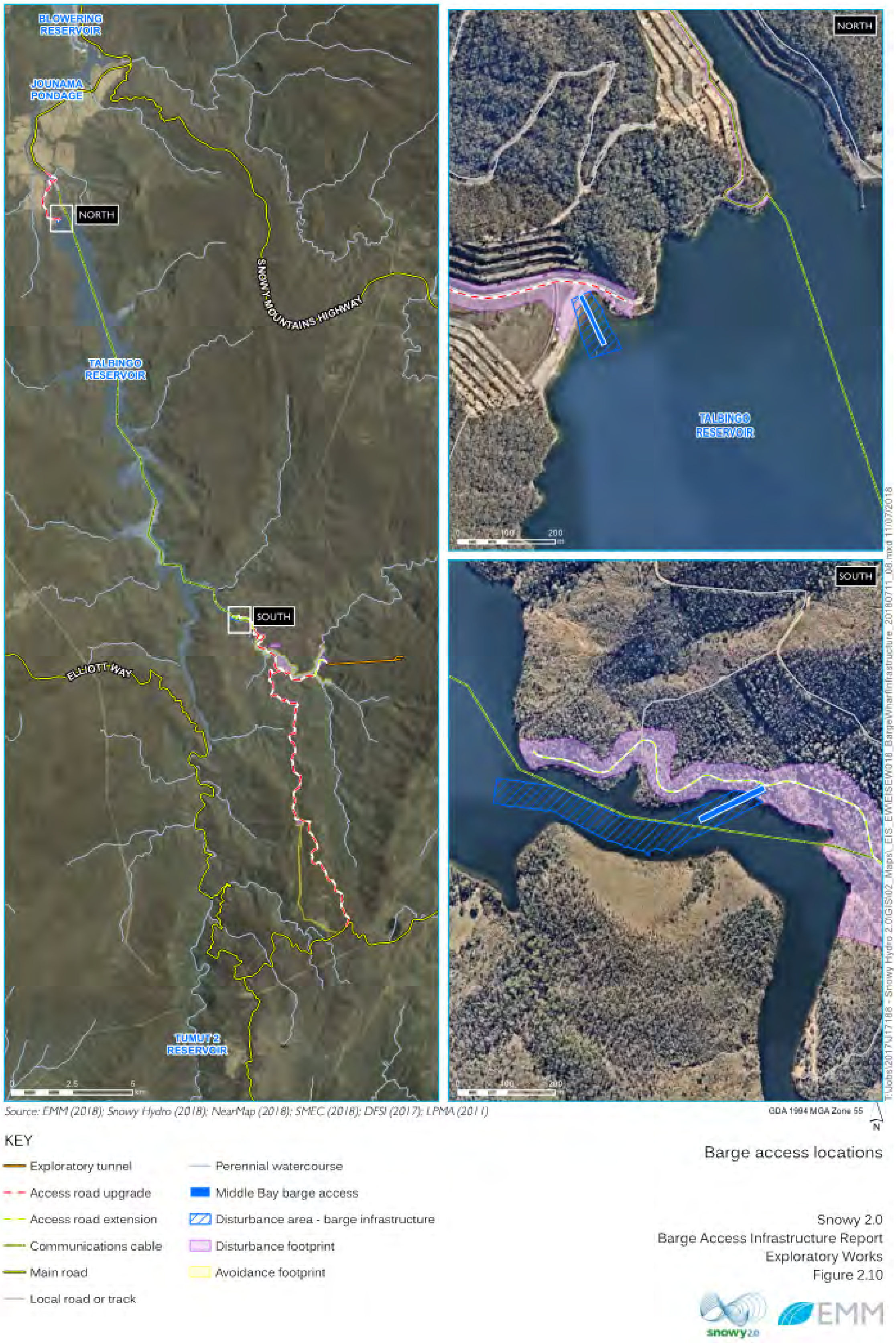

Figure 12: Barge access locations.

2.8 Services and infrastructure

Exploratory Works will require additional power and communication infrastructure. Water services are also needed and include a water services pipeline and water and waste water (sewage) treatment facilities. A summary of services required is provided at **Table 4**.

Table 4: Summary of service infrastructure.

Services infrastructure	Description
Power	Power will be provided at the portal construction pad and accommodation camp by diesel generators, with fuel storage provided at the portal construction pad.
Communication	Communication will be provided via fibre optic link. The fibre optic service has been designed to incorporate a submarine cable from Tumut 3 power station across Talbingo Reservoir to Middle Bay, and then via a buried conduit within the access roads to the accommodation camp and the portal construction pad.
Water and waste water (sewage)	A water services pipeline is proposed for the supply and discharge of water for Exploratory Works which will pump water between Talbingo Reservoir and the exploratory tunnel portal, portal construction pad and accommodation camp.
	A package water treatment plant is proposed at the accommodation camp to provide potable water to the accommodation camp and portal construction pad facilities and will be treated to a standard that complies with the Australian Drinking Water Guidelines. The accommodation camp water supply will be pumped via the water pipeline from Talbingo Reservoir at Middle Bay.
	A package waste water (sewage) treatment plant (STP) is proposed at the accommodation camp for Exploratory Works waste water. The STP will produce effluent quality comparable to standard for inland treatment facilities in the region (eg Cabramurra). Following treatment waste water will be discharged to Talbingo reservoir via the water services pipeline connecting the accommodation camp to Talbingo Reservoir. Waste water from the exploratory tunnel and concrete batching plant will be either re-used on site or sent to the waste water treatment plant for treatment prior to discharge.

2.9 Construction activities and schedule

2.9.1 Geotechnical investigation

To assist the design development for the portal construction pad, accommodation camp, Middle Bay Road, Spillway Road, and Lobs Hole Ravine Road, further survey of ground conditions is required. A program of geotechnical investigations including geophysical survey, construction of test pits, and borehole drilling within the disturbance footprint, will be undertaken as part of construction activities. Excavation of test pits in areas where information on relatively shallow subsurface profiles is required, or where bulk sampling is required for laboratory testing. Borehole drilling is required to facilitate the detailed design of cuttings, bridge foundations, retaining wall foundations, and drainage structures.

2.9.2 Construction activities

A disturbance footprint has been identified for Exploratory Works. The extent of the disturbance footprint is shown on and shows the area required for construction, including the buildings and structures, portal construction pad, road widenings and bridges, laydown areas, and rock emplacement areas. Typical construction activities that will occur within the footprint are summarised in **Table 5**.

Table 5 Construction Activities

Activity	Typical method
Geophysical and geotechnical investigation	Geophysical surveys will generally involve: • Laying a geophone cable at the required location and establishing seismic holes; • Blasting of explosives within seismic holes; and • In-reservoir geophysics surveys will use an air gun as the seismic source. Geotechnical surveys will generally involve: • Establishing a drill pad including clearing and setup of environmental controls where required; • Drilling a borehole to required depth using a tracked or truck mounted drill rig; and • Installing piezometers where required for future monitoring program. • Geophysical and geotechnical investigation within Talbingo Reservoir will be carried out using barges and subject to environmental controls.
Site establishment for portal construction pad, accommodation camp, rock placement areas and laydown areas	Site establishment will generally involve: • Identifying and flagging areas that are to be avoided during the Exploratory Works period; • Clearing of vegetation within the disturbance footprint, typically using chainsaws, bulldozers and excavators; • Civil earthworks to create a stable and level area suitable for establishment. This will involve a cut and fill approach where required to minimise the requirement for imported material; • Installing site drainage, soil erosion and other permanent environmental controls where required; • Surface finishing, compacting only existing material where possible, or importing additional material. Where suitable, this material will be sourced locally (eg from upgrade works to Lobs Hole Ravine Road); and • Set up and commissioning of supporting infrastructure, including survey marks.
Road works	Upgrades of existing tracks (no widening) will generally involve: • Identifying and flagging areas that are to be avoided during the Exploratory Works period; and • Removing high points, infilling scours, levelling of rutting, and compacting surfaces. • Extension or widening of existing tracks will generally involve: • Identifying and flagging areas that are to be avoided during the Exploratory Works period; • Installing site drainage, soil erosion and other permanent environmental controls where required; • Clearing and earthworks within the disturbance footprint; and • Placing road pavement material on the roadway.
Bridge works	Establishment of permanent bridges will generally involve: • Installing erosion and sedimentation controls around watercourses and installing scour protection as required; • Establishing temporary diversions within the watercourse where required, including work to maintain fish passage; • Establishing temporary bridges to facilitate permanent bridge construction; • Constructing permanent bridges including piling, establishment of abutments and piers; and • Removal and rehabilitation of temporary bridges and diversions.
Barge access works	Establishment of barge access infrastructure will generally involve: • Installing sediment controls; • Excavating and dredging of barge ramp area and navigation channel; • Installing precast concrete planks and bollards; and • Set up and commissioning of supporting infrastructure.

Activity	Typical method
Exploratory tunnel construction	The drill and blast excavation process will be repeated cyclically throughout the tunnelling works, involving: • Marking up and drilling blast holes in a predetermined pattern in the working face of the tunnel; • Loading the blast holes with explosives, attaching detonators and connecting the holes into a blast sequence, and detonating the blast; • Ventilating the tunnel to remove blast fumes and dust; • Removing blasted rock; • Scaling and wash down of the tunnel roof and walls to remove loosened pieces of rock; • Geological mapping of the exposed rock faces and classification of the conditions to determine suitable ground support systems for installation; • Installing ground support; and • Advancing construction ventilation ducting and other utilities including power, water, compressed air and communications.

2.9.3 Ancillary construction areas

Ancillary facilities and laydown areas have been identified within the conceptual layout for the portal construction pad and accommodation camp. A number of other indicative construction and laydown areas have also been identified to support Exploratory Works. A summary of these sites are:

- Upper Lobs Hole Ravine Road laydown area;
- Rock emplacement area laydown, storage and ancillary uses;
- Barge access infrastructure laydown areas at Talbingo and Middle Bay; and
- Other minor laydown areas as needed during site establishment of watercourse crossings.

All laydown areas are within the project area and clearance footprint identified for Exploratory Works.

In addition, an area near Camp Bridge has been identified to be used for a plant nursery and organic stockpile area. No clearing of vegetation is required in this area.

2.9.4 Construction workforce requirements

2.9.4.1 Staffing levels

It is currently expected that workforce for Exploratory Works will be approximately 200 people in total at peak construction. Workers are anticipated to work a ‘swing’ shift, for example two weeks on and one week off. These workers will be accommodated within the accommodation camp at Lobs Hole when rostered on.

The majority of the workforce will work on a fly-in fly-out and drive-in drive-out basis. It is expected that the majority of workers will fly in and out of either Cooma Airport or Canberra Airport and then travel to site via bus.

During construction of the accommodation camp, workers will be accommodated at Cabramurra. Some workers may also be accommodated at Snowy Hydro existing accommodation units at Talbingo during construction of the Talbingo barge ramp. No accommodation will be required outside of Cabramurra, the construction accommodation camp or Talbingo for the Exploratory Works workforce.

2.9.4.2 Hours of operation

It is expected that construction of the exploratory tunnel and haulage of rock material between the tunnel and excavated rock stockpile locations at Lobs Hole will be 24 hours a day, seven days a week for the duration of the tunnel drilling and blasting operation. Other construction activities, including the establishment works, road and infrastructure works, will normally work a 12 hour day, seven days a week.

The transport of materials along the haul route from Snowy Mountains Highway, Link Road and Upper Lobs Hole Ravine Road will only occur during day time hours (except during emergency), to avoid impacts to threatened species (Smoky Mouse). Transport by barge will be 24 hours a day, seven days a week.

2.9.4.3 Timing and staging

Exploratory Works are expected to take about 34 months, with the exploratory tunnel expected to be completed by late 2021.

It is expected that the construction works will be completed largely in parallel. However, road and access works are expected to be completed within the first six months from commencement. The proposed staging of construction activities are highlighted in **Table 6**.

Table 6: Indicative staging of construction.

Construction works	2018	2019	2020	2021
Access roads				
Portal construction pad				
Accommodation camp				
Services infrastructure				
Barge access infrastructure				
Tunnelling				
Excavated rock management				

2.10 Site rehabilitation

All Exploratory Works align with components of the main works for Snowy 2.0. However, should Snowy 2.0 not be approved or not progress, the project area will need to be rehabilitated, and project elements decommissioned in consultation with NPWS. Anticipated rehabilitation activities are summarised in **Table 7**.

Table 7: Planned Exploratory Works rehabilitation activities.

Exploratory Works element	Indicative rehabilitation activities
Exploratory tunnel	Tunnel to remain open, and allowed to flood in lower portion provided groundwater impacts are negated.
Exploratory tunnel portal area	Permanent portal facade to be constructed, portal to be sealed from entry.
Portal construction pad and associated infrastructure	To be demobilised and all infrastructure removed. Site to be revegetated and returned to “original state”.
Excavated rock emplacement areas	Emplaced excavated rock in the western emplacement area to be removed offsite and area to be revegetated and returned to “original state”. The eastern emplacement area could remain in-situ and the landform rehabilitated as agreed with NPWS.
Accommodation camp	To be demobilised and all infrastructure removed. Site to be revegetated and returned to “original state”.
Road access works	No remediation required as works are to be designed to be permanent.
Barge access infrastructure	No remediation works required as wharf and loading ramps are designed as permanent. Wharf can be removed if desired.
Services and infrastructure	To be demobilised and all infrastructure removed. Site to be revegetated and returned to “original state”.

2.11 Decommissioning

Should Snowy 2.0 not proceed following the commencement or completion of Exploratory Works, elements constructed are able to be decommissioned and areas rehabilitated. Given works are within KNP, Snow Hydro will liaise closely with NPWS to determine the extent of decommissioning and types of rehabilitation to be undertaken. This approach will be taken to ensure that decommissioning allows for integration with future planned recreational use of these areas and to maintain the values of KNP.

2.12 Key aspects relevant to report herein

Potential hydrodynamics, water quality, aquatic ecology and reservoir navigation issues have been identified from reviewing the proposed Exploratory Works and associated activities. Aquatic ecology is closely related to hydrodynamic and water quality issues. The following aspects are considered relevant to this report:

<u>Hydrodynamics</u>

- Construction of barge access infrastructure – placement of structures in the reservoir at Middle Bay and potential for impact on flows from Yarrangobilly River; and,
- Subaqueous placement of excavated rock – reduction in water depths at the placement locations and potential for impact on hydrodynamics in the reservoir.

<u>Water Quality</u>

- Construction of barge access infrastructure and dredging – disturbance of reservoir bed sediment potentially leading to elevated turbidity;
- Subaqueous placement of excavated rock – potential for elevated turbidity; and,
- Operation of floating plant and equipment – potential for oil and fuel spills.
- Potential to impact on downstream water users.

Aquatic Ecology

- Construction of barge access infrastructure and dredging – disturbance of reservoir bed sediment leading to loss of habitat;
- Removal of woody debris (ie submerged dead trees) to provide safe navigation in the reservoir – loss of habitat. However, woody debris that requires removal would be placed in suitable locations in the reservoir to preserve habitat; and,
- Subaqueous placement of excavated rock – potential for smothering benthic habitat. However, placement of rock would provide habitat heterogeneity and avoid shallow areas of higher habitat value.

While these aspects result from the proposed infrastructure and subaqueous placement of excavated rock, the assessment of impacts are included in more detail in the aquatic ecology assessment (Cardno 2018).

Navigation impacts

- Construction of barge access infrastructure and dredging – closure of some parts of the foreshore including the informal boat launching ramp at Middle Bay and relocation of the Talbingo spillway swimming enclosure; and,
- Operation of floating plant and equipment – increased marine traffic.

Impacts to recreational users are included in more detail in the recreational user impact assessment (TRC 2018).

3 Site conditions

The proposed locations for barge access infrastructure are:

1. Talbingo Spillway; and,
2. Middle Bay, on the Yarrangobilly arm of the reservoir.

Site conditions at these locations will be discussed herein. The need for barge access infrastructure is outlined in **Section 4** and alternative locations are considered in **Section 5**.

3.1 Water level variation

The Minimum Operating Level (MOL) and Full Supply Level (FSL) in Talbingo Reservoir are 534.4 m AHD[1] and 543.2 m AHD respectively. Daily water level data noting the maximum and minimum water level for each day is available from 1999 to 2018. A time series of the water level is presented in **Figure 13** and a probability exceedance graph of the water level is presented in **Figure 14**.

The graphs indicate that historically, the water level has been within 3 m of the full supply level approximately 80% of the time. The water level fluctuates throughout the year, largely as a result of the operation of the Snowy Hydro scheme, and there is no marked seasonality.

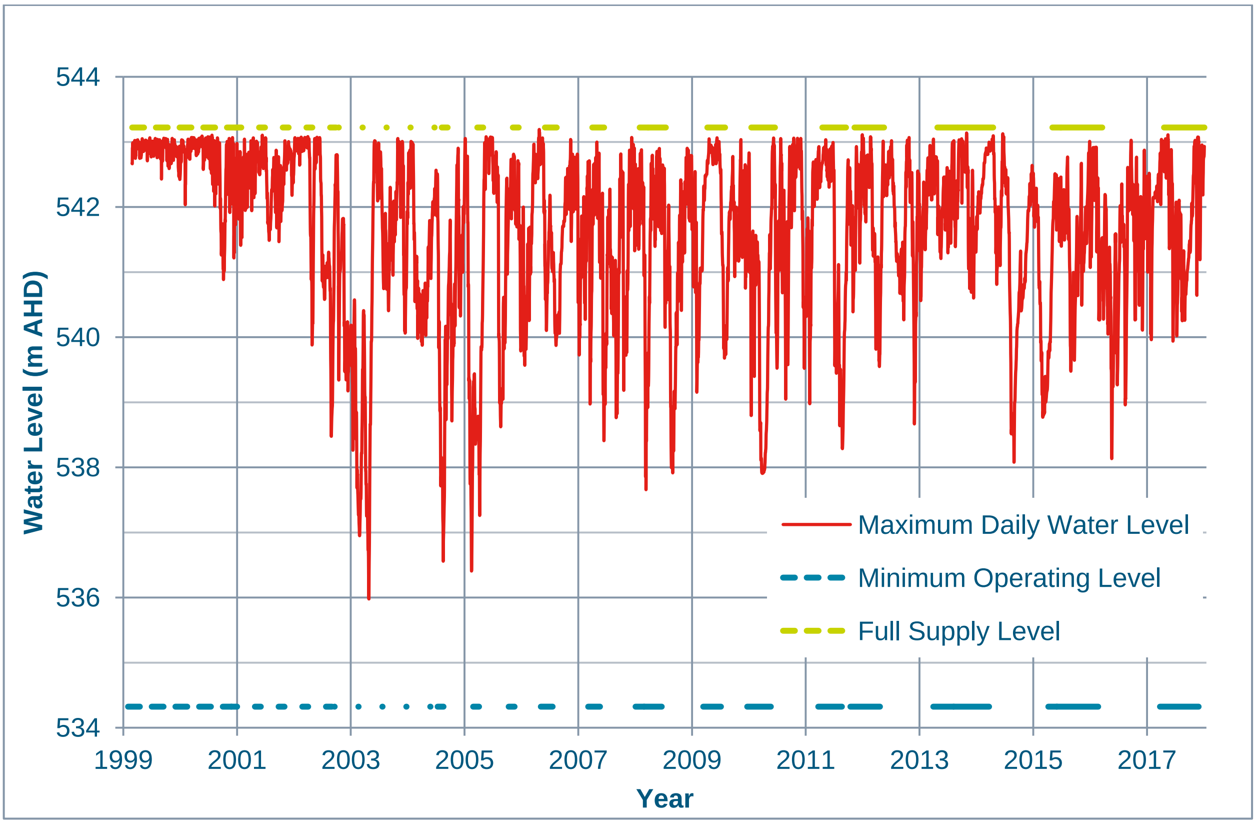

Figure 13: Historic water level in Talbingo Reservoir from 1999-2018.

[1] *AHD (Australian Height Datum) is s a geodetic datum for altitude measurement in Australia. Mean Sea Level measured on the open coast around Australia between 1966-1968 was assigned the value of 0.00 on the Australian Height Datum.*

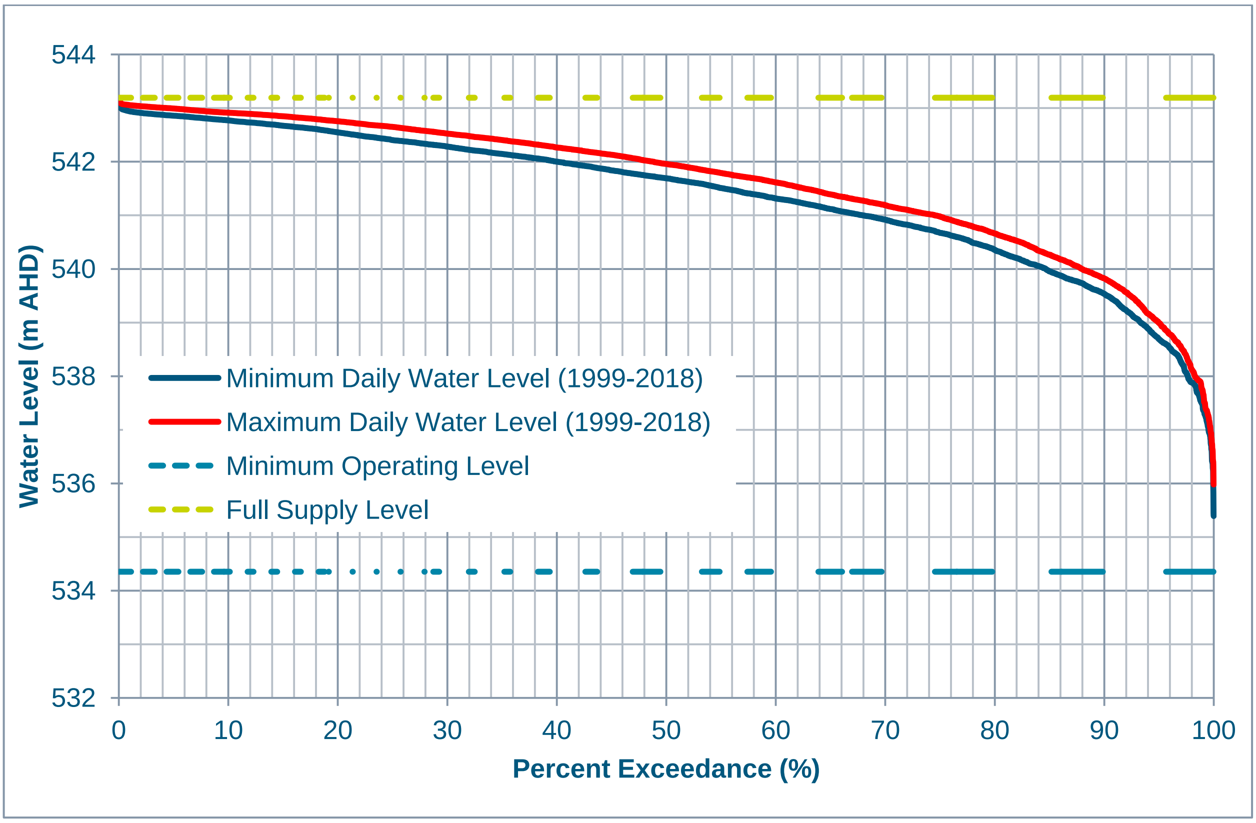

Figure 14: Probability exceedance curve of the water level in Talbingo Reservoir from 1999-2018.

3.2 Bathymetry

Talbingo Reservoir was formed from reaches of the Yarrangobilly River, the Tumut River, and their tributaries. These rivers flowed through deeply incised valleys commonly referred to as ravine country.

3.2.1 Middle Bay

The topography of the region prior to the construction of the dam and the effects of sedimentation has directly influenced the local bathymetry of the reservoir around Middle Bay. In the vicinity of Middle Bay, the Yarrangobilly River flowed in a north to north westerly direction with a gradient of approximately 1:125 (vertical:horizontal). The thalweg[2] of the reservoir in Middle Bay is near the outside bend of the Yarrangobilly River channel. The gradient of the reservoir below FSL, and perpendicular to the thalweg, at sections A-A and B-B in **Figure 15** is approximately 1:1 to 1:8 (vertical:horizontal) respectively. The flatter slope of 1:8 (vertical:horizontal) would have been influenced by sedimentation.

[2] *Thalweg is the line of lowest elevation within a valley, watercourse or reservoir.*

Figure 15: Bathymetry of Middle Bay.

3.2.2 Talbingo spillway

The bathymetry in the vicinity of the Talbingo spillway is influenced by the natural topography prior to the formation of the reservoir and the placement of excavated rock from construction of the spillway. The Talbingo spillway was formed by creating a notch in a ridge on the western side of the reservoir as shown in **Figure 16**. The excavated rock produced from formation of the notch was placed below FSL and has since been flooded. The batter slope of the excavated rock placement through section A-A in **Figure 17** is approximately 1:2 (vertical:horizontal). The crest of the spillway placement is relatively flat at approximately 540 m AHD.

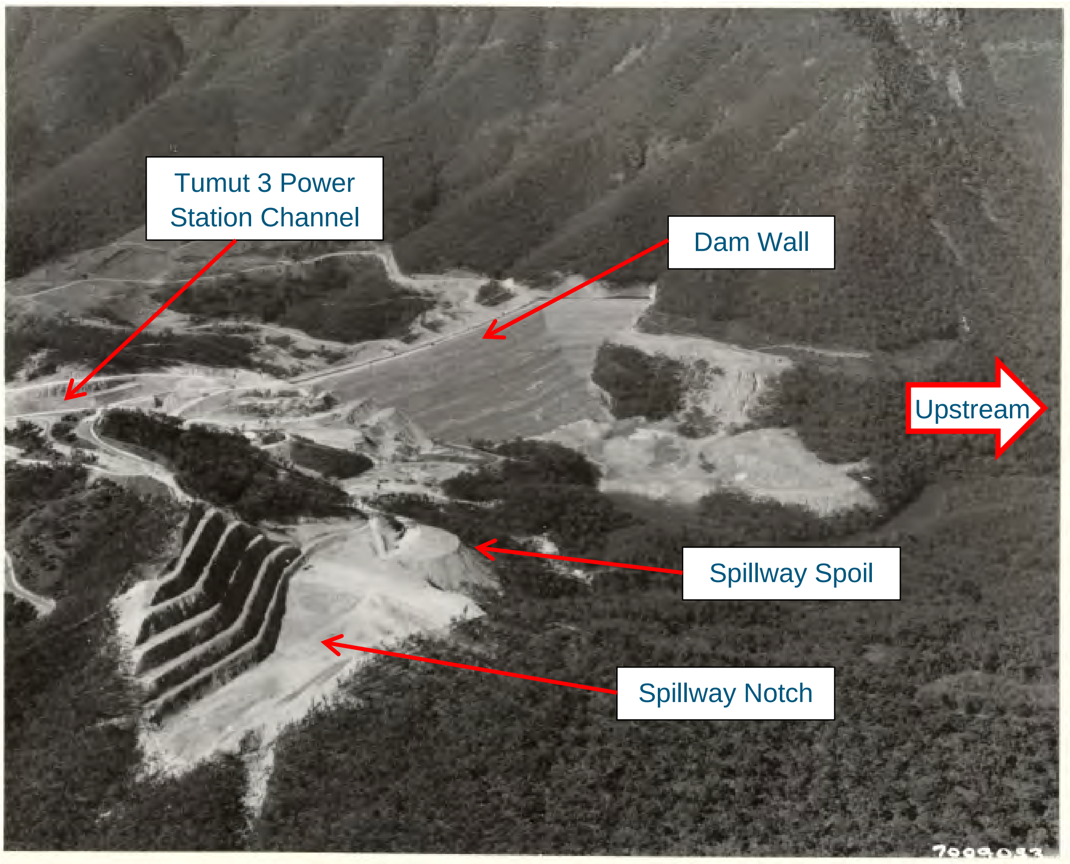

Figure 16: Historic photograph from construction of Talbingo Reservoir (3 September 1970).

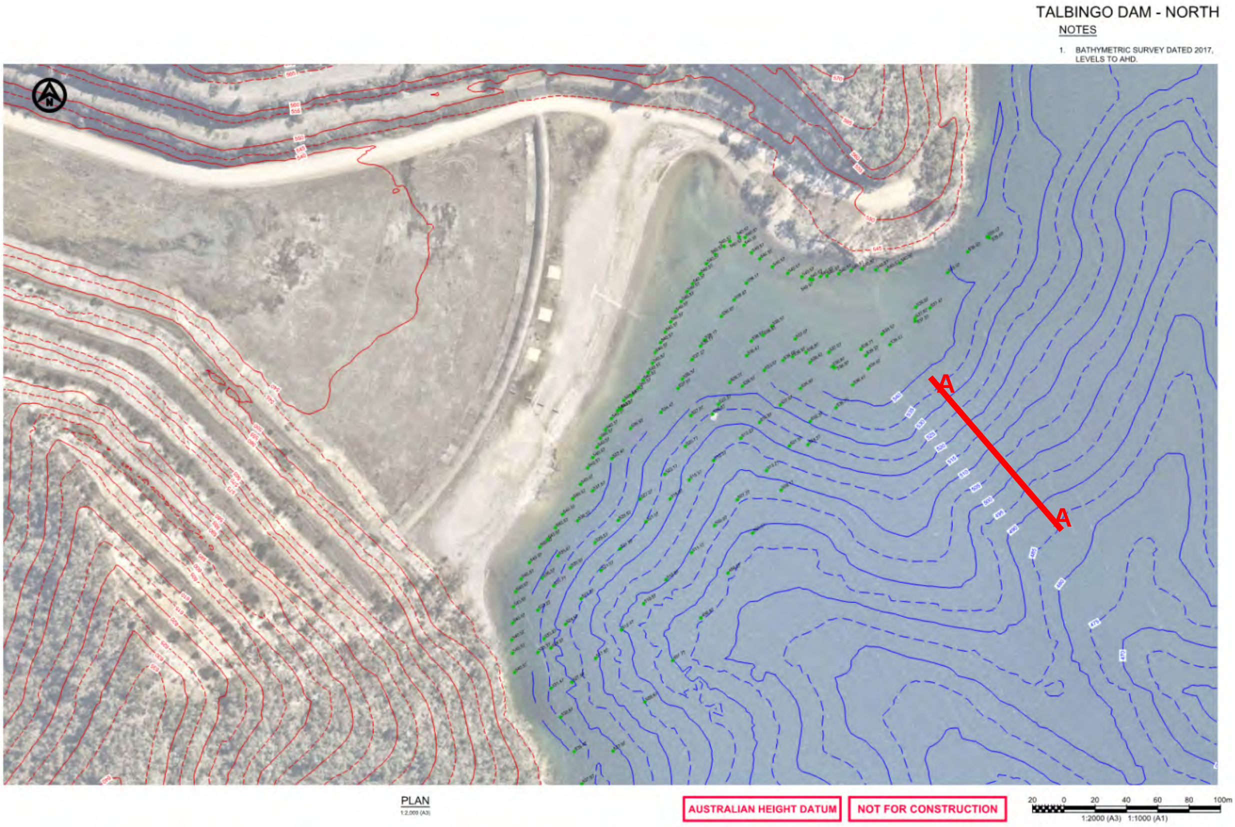

Figure 17: Talbingo spillway bathymetry.

3.3 Geology

The 1:250,000 Wagga Wagga Geological Series Sheet S1 55-15 has been used in the feasibility studies for Snowy 2.0 and is attached in **Figure 18**. Geotechnical investigations comprising borehole drilling are ongoing and to date have targeted locations along the proposed tunnel alignment. Geophysical and geotechnical investigation of the barge access area to inform detailed design are proposed as part of Exploratory Works (refer to Section 2.7).

3.3.1 Middle Bay

The 1:250,000 Wagga Wagga Geological Series Sheet in **Figure 18** indicates Middle Bay is underlain the Ravine Beds geological unit. The geological unit was formed in the Silurian Period and it comprises shale, slate, siltstone, conglomerate and shallow marine shelf deposits.

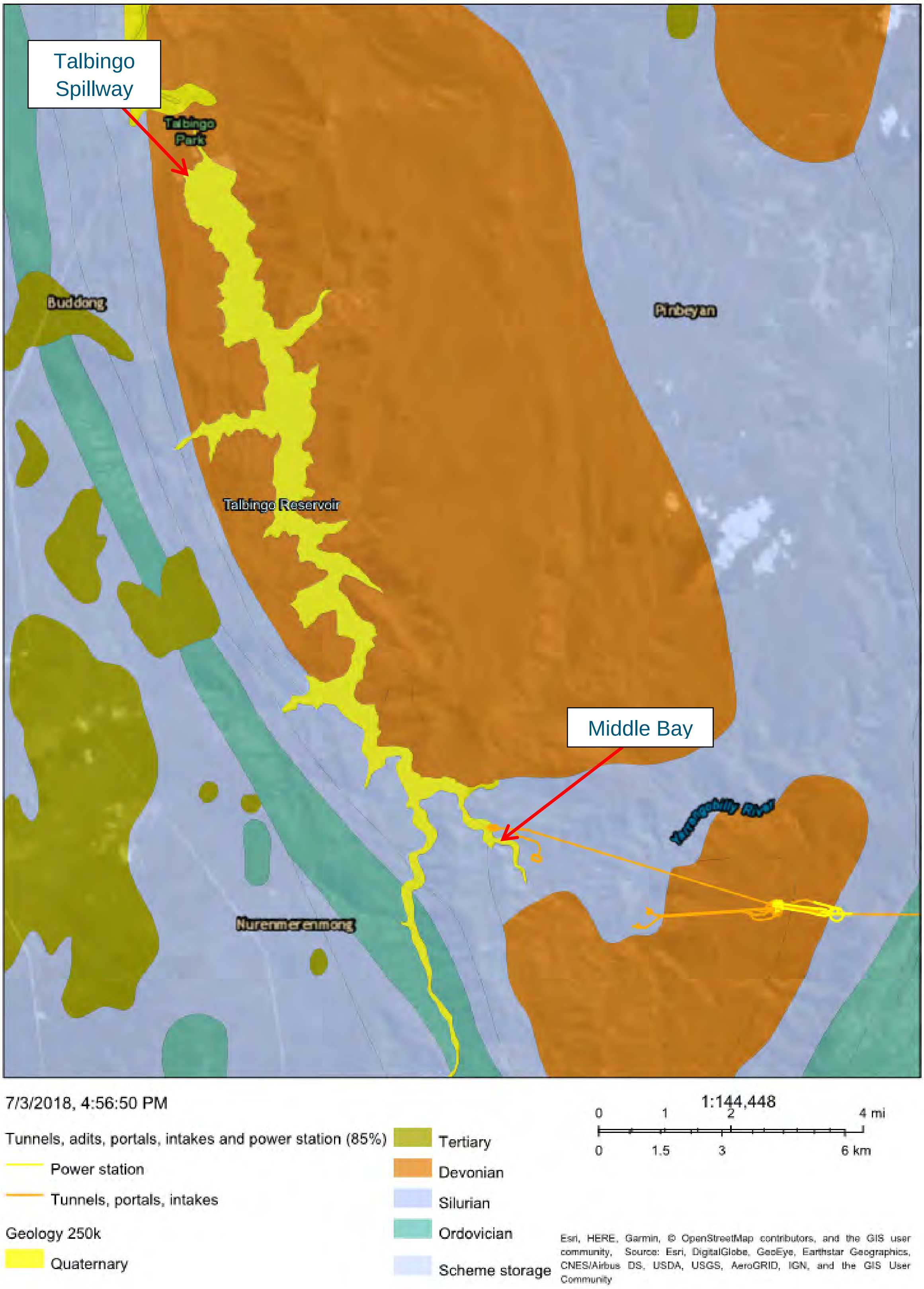

Figure 18: Wagga Wagga 1:250,000 Geological Map adapted for Snowy 2.0.

3.3.2 Talbingo Spillway

The 1:250,000 Wagga Wagga Geological Series Sheet in **Figure 18** indicates Talbingo Spillway is underlain the Boraig Group geological unit. The geological unit was formed in the Devonian Period and it comprises rhyolite, rhyodacite, tuff, lapilli tuff, feldspathic sandstone, granophyre deposited in shield building volcanic complexes and extrusive volcanic deposits.

3.4 Sediments

Reservoir bed sediment sampling using a grab sampler has been undertaken by Cardno throughout Talbingo Reservoir in March, 2018. The location of the sediment samples is displayed in **Figure 19**. Additional sediment sampling was undertaken in the vicinity of Middle Bay along the alignment of the proposed navigation channel in May, 2018. Additional information regarding the sediment sampling and results of the sampling are provided in the Dredging and Dredge Impact Assessment attached in **Appendix C**.

The particle size grading of the sediment samples was similar at all locations. The sediments are soft and muddy in texture with a dominance of particles in the coarse silt fraction.

Sediment sampling and particle size grading was not conducted at Talbingo Spillway. A visual observation of the excavated rock stockpile at Talbingo Spillway indicates widely graded material varying from silt to boulders larger than 250 mm.

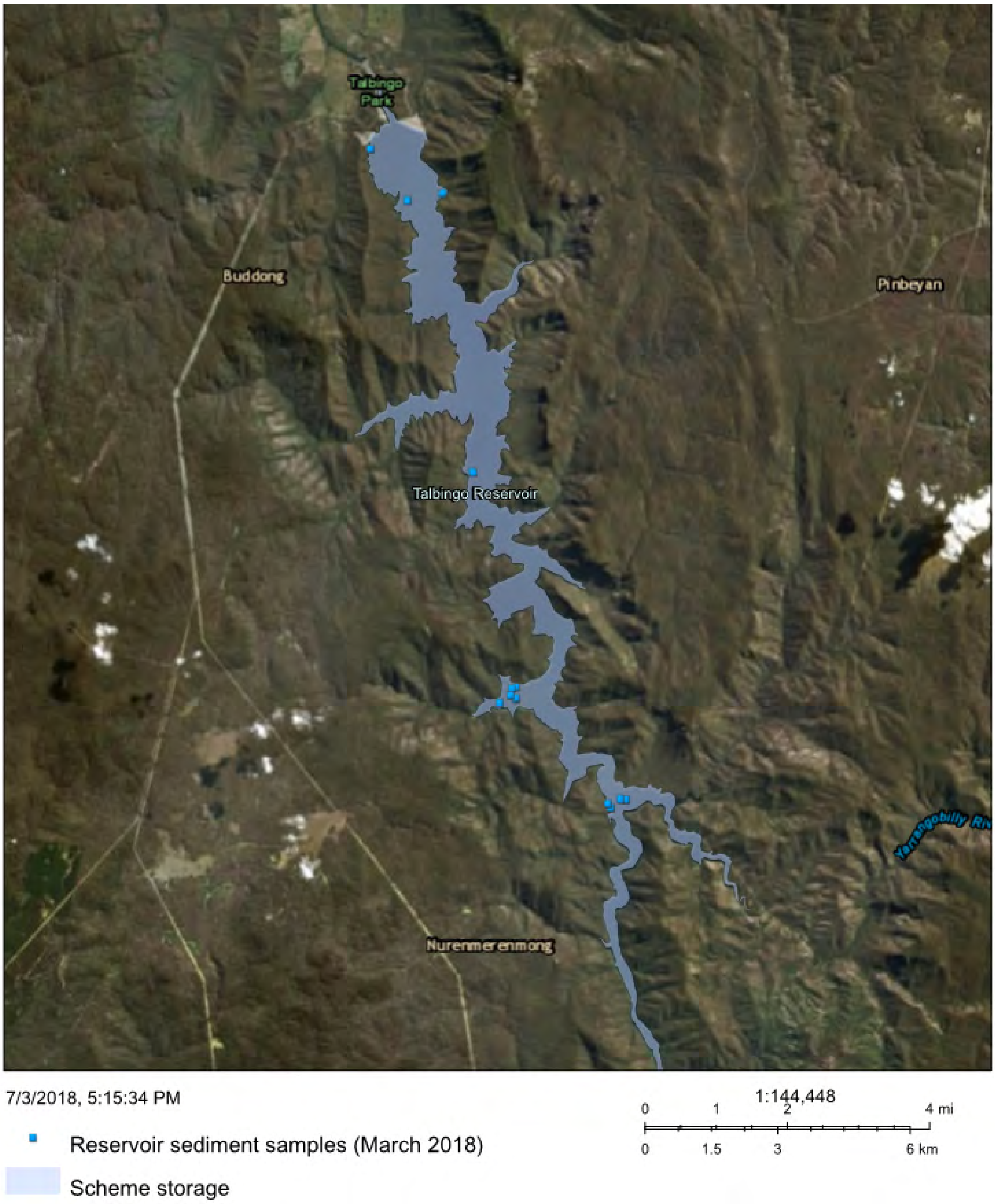

Figure 19: Sediment sample locations (Cardno, 2018).

3.5 Water quality

Water sampling has been undertaken by Cardno throughout Talbingo Reservoir and the samples have been analysed for a range of chemical and physical parameters. Additional information regarding the water quality sampling and results of the sampling are provided in the Dredging and Dredge Impact Assessment attached in **Appendix C**.

3.6 Wind

Wind has an influence on wave formation and the manoeuvrability of a vessel.

The regional topography around Talbingo Reservoir is highly variable. The reservoir is located in ravine country comprising steep sided valleys. Approximately 10 km to the east, the landscape changes to an area referred to as the High Plains comprising relatively flat hills and plains that are approximately 600m higher than the reservoir. Approximately 10 km west of Talbingo Reservoir, the landscape changes to undulating hills. The varied regional landscape results in localised wind patterns.

The nearest anemometers to the site are located at Cabramurra, approximately 18 km south of Middle Bay and Tumbarumba approximately 33 km west of Middle Bay (BOM, 2018). The wind roses at these locations are provided in **Figure 20** and **Figure 21**. The wind roses indicate significantly different predominant directions and speed. Interpreting the graphs and applying the information to Talbingo Reservoir would be problematic.

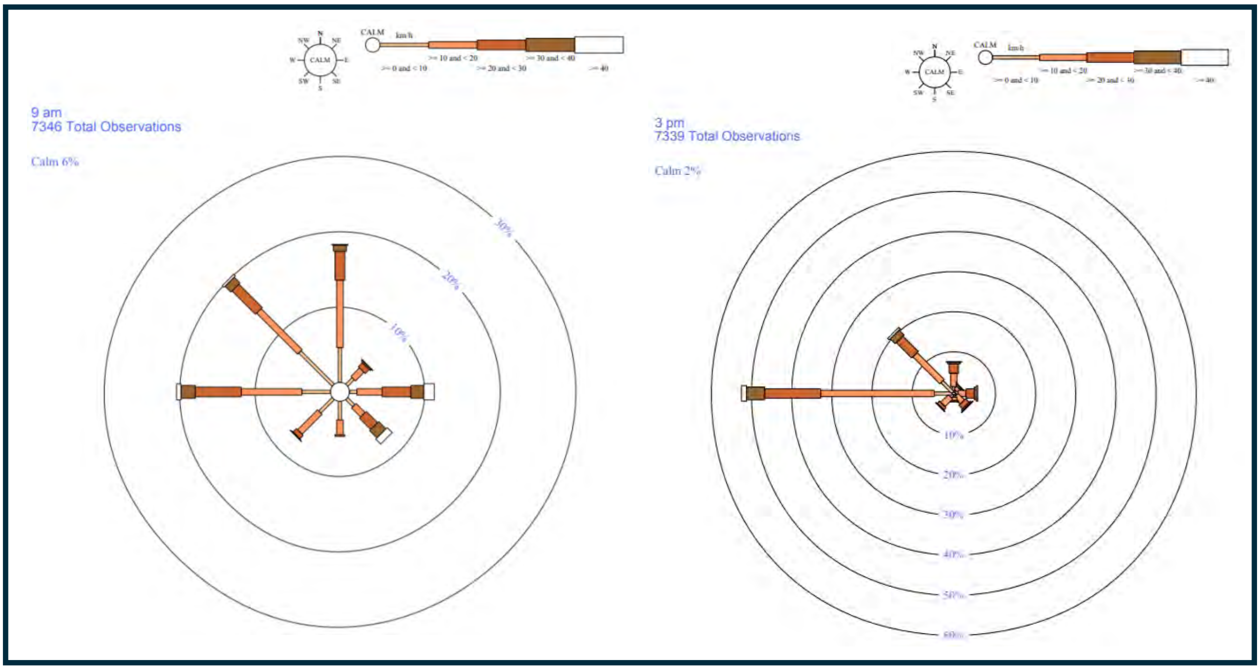

Figure 20: Annual wind roses for Cabramurra at 9 am (left) and 3 pm (right).

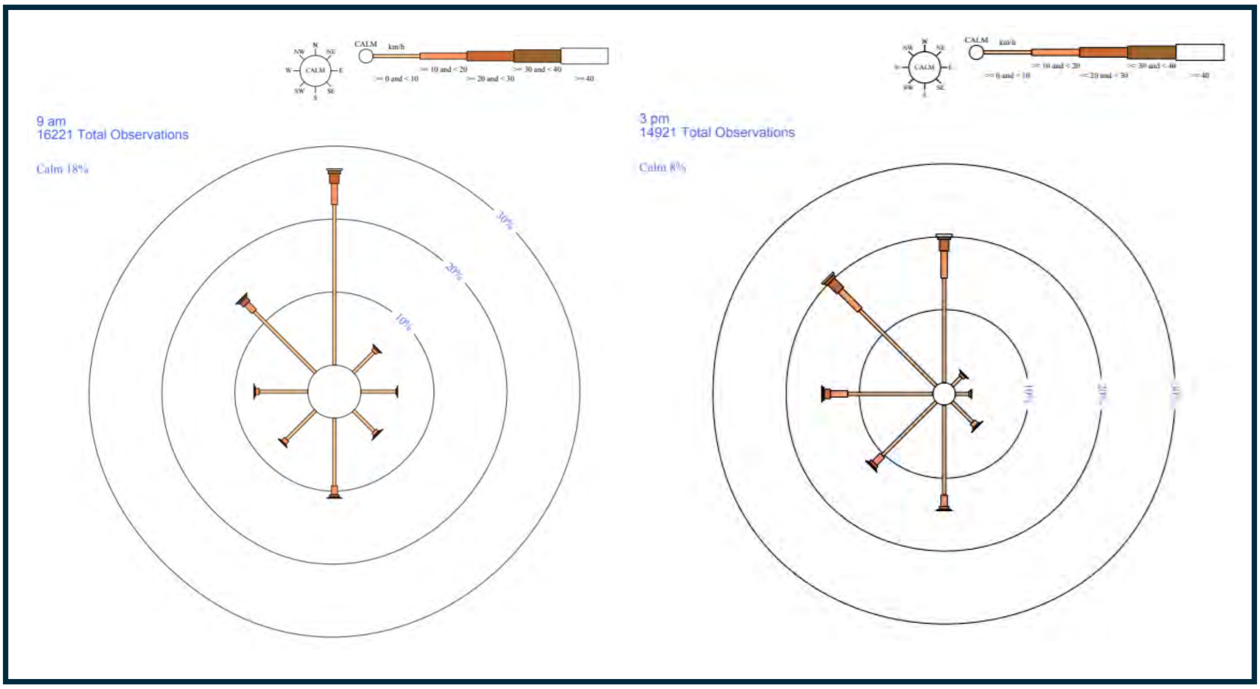

Figure 21: Annual wind roses for Tumbarumba at 9 am (left) and 3 pm (right).

Design wind velocities for the site obtained from *Australian Standard Structural Design Action Part 2: Wind Actions (AS/NZS1170.2:2011)* are presented in **Table 8**. The design wind velocities cover NSW between 50 and 200km of the coast. These wind velocities should be adopted for the design of structures however, provide minimal information on day to day wind velocity.

Table 8: Site Wind Speed (m/s) for 3 second gust at 10m above surface.

Average Recurrence Interval (ARI)	Direction							
	N	NE	E	SE	SE	SW	W	NW
1	25.5	24	24	24	24	25.5	27	30
20	31.45	29.6	29.6	29.6	29.6	31.45	33.3	37
50	33.15	31.2	31.2	31.2	31.2	33.15	35.1	39
100	34.85	32.8	32.8	32.8	32.8	34.85	36.9	41

3.7 Waves

3.7.1 Boat waves

Boat generated waves are governed by the submerged shape of the boat hull, the boat speed and the water depth. Typically boat waves exhibit a divergent component that emanates from the bow, and a transverse component that follows behind the stern.

There are no vessels permanently stored on Talbingo Reservoir. As such, all vessels are trailerable craft. The NSW Boat Ramp Facility Guidelines (RMS, 2015) are based on a maximum vessel length of 7.5 m with a maximum beam of 2.5 m. These dimensions are partially governed by NSW road regulations. The size and type of vessel influences the height and period of the resultant boat wash.

The boat speed relative to the boat length can affect the form of the waves. This is conveniently considered in relation to the length based Froude number F_{nl} (applicable to deepwater) where:

$F_{nl} = \frac{V}{\sqrt{gL}}$, where:

V = vessel speed (m/s)

g = acceleration due to gravity (9.81 m/s^2)

L = water line length of vessel (m)

When F_{nl} is less than 0.5, the vessel speed is defined as sub-critical, and when it is greater than 0.5, it is defined as supercritical. The “critical speed”, when F_{nl}=0.5, is associated with maximum resistance of a moving vessel and corresponding maximum wave height generation. For a vessel with a length of say 7 m, the theoretical maximum wave height would be produced at a speed of approximately 8 knots.

The maximum wave height and peak period is associated with vessels participating in wakesurfing activities at the ideal operational speed (approximately 10 knots) (Ruprecht et al, 2015). The wave height and peak period are outlined in **Table 9**. Wakesurfing is a recreational activity that is increasing in popularity and involves creating a large wave that can be surfed without a tow rope. Wake Enhancement Devices are usually fitted to the vessels to maintain the critical speed, which ensures a large displacement wave is generated resulting in increased wave height.

Maximum wave heights and peak periods produced by other waterway users, such as fishermen and water-skiers, are formed at the critical speed (approximately 8 knots). The wave height and peak period are outlined in **Table 9** (Ruprecht et al, 2015). However, these users do not typically operate at the critical speed. The wave height and peak period associated with the operational speed for waterskiing (approximately 30 knots) are outlined in **Table 9** and are significantly less than the wave height produced at the critical speed.

The wave heights in **Table 9** could occur anywhere on Talbingo Reservoir that is free of submerged obstructions (e.g. trees) including near the spillway. Wave heights attenuate with distance from the sailing line. Wave period remains relatively constant.

Table 9: Maximum boat wave height and peak period 22 m from the sailing line.

Vassal Type	Operating Conditions	Maximum Wave Height (m)	Peak Wave Period (sec)
Wakesurfing Vessel	10 knots (typical operational speed)	0.45	2.2
Waterskiing and Fishing Vessel	8 knots (critical speed)	0.35	2.0
Waterskiing Vessel	30 knots (typical operational speed)	0.13	1.6

3.7.2 Wind waves

Wind waves are generated when the wind blows across a body of water. The size and period of these waves depends on the wind speed, the distance over which the wind blows (fetch) and the water depth. Design wind velocities for the site were obtained from *Australian Standard Structural Design Action Part 2: Wind Actions (AS/NZS1170.2:2011)*. Wind wave hindcast procedures set out in the Coastal Engineering Manual (USACE, 2008) were used to predict the incident wind wave climate at Middle Bay and Talbingo spillway.

Wind waves are typically defined at primary directions separated by 45 degrees. The fetch is defined as the average length of eight radials separated by 3 degrees, centred on the primary direction (SPM, 1984). The primary direction and fetch resulting in the highest significant wave height are outlined in **Table 10** and **Table 11** for Middle Bay and Talbingo spillway respectively. The tables summarise the significant wave height for varying Average Recurrence Intervals (ARIs).

Table 10: Incident wind wave height at Middle Bay.

Fetch and Direction	0.85km, northwest	
Average Recurrence Interval	H_s (m)	T (s)
1 year	0.3	1.5
50 year	0.5	1.6
100 year	0.5	1.7

Notes: significant wave height H_s is the average of the highest 1/3 of waves in a wave train. H_{max} ~ $1.86H_s$

Table 11: Incident wind wave height at Talbingo spillway.

Fetch and Direction	2.1km, southeast	
Average Recurrence Interval	Hs (m)	T (s)
1 year	0.4	1.8
50 year	0.5	2.0
100 year	0.6	2.1

4 Barge access infrastructure

4.1 Need for barge access infrastructure

Barges are required for construction of:

1. Exploratory Works; and
2. Main Works.

The barge access infrastructure is required to provide areas to safely load and unload the barges.

Barging and barge access infrastructure may also be required for maintenance activities during operation of the Main Works (should it be approved). However, the requirement for barges to transfer plant, equipment, and materials to undertake maintenance activities is not considered further as any replacement items or equipment such as turbines and transformers would be similar to or smaller than the items or equipment required for construction. Designing the barges and barge access infrastructure for construction activities would suffice the requirements for future maintenance or replacement activities.

4.1.1 Exploratory Works

The Exploratory Works requires barging and barge access infrastructure during the construction phase to undertake the following activities:

1. transport and deliver plant, equipment, and materials for construction works;
2. dredge a navigation channel (refer **Appendix C**); and
3. undertake subaqueous excavated rock placement (refer **Appendix D**).

The preferred locations for barge access infrastructure are dictated by the project requirements in particular activity 1 and activity 3 above. The proposed locations are:

1. Talbingo spillway at the northern end of Talbingo Reservoir. Road access to the spillway can readily be upgraded to provide access for heavy haulage all year round. The barge access infrastructure at this location is referred to as Talbingo barge ramp herein; and
2. Middle Bay at the southern end of Talbingo Reservoir, on the Yarrangobilly River arm of the reservoir. Upstream of Middle Bay, the water depth becomes too shallow for safe navigation of vessels. Middle Bay is as close as practical to the Exploratory Works for barge access infrastructure. The existing access roads would need to be upgraded between the barge access infrastructure and the location of the Exploratory Works. The barge access infrastructure at this location is referred to as Middle Bay barge ramp herein.

The location of Talbingo barge ramp and Middle Bay barge ramp are shown in **Figure 22**. The distance between these two locations is approximately 18 km. However, the navigation route overwater is approximately 22 km.

A safe navigation channel to approach the Middle Bay barge ramp will be required. Barges would be required as part of dredging this channel. Dredging is discussed separately in **Appendix C**, which provides an outline of the proposed dredging, dredge methodology, approximate volumes, dredged material placement location, environmental impacts, and mitigation measures.

As described in **Section 2.4.2**, it is also proposed to undertake a subaqueous excavated rock placement program within Talbingo Reservoir during the Exploratory Works. Barges would be required to transport and place the excavated rock. Excavated rock would be loaded onto the barges at the Middle Bay barge ramp. This activity is discussed separately in **Appendix D**.

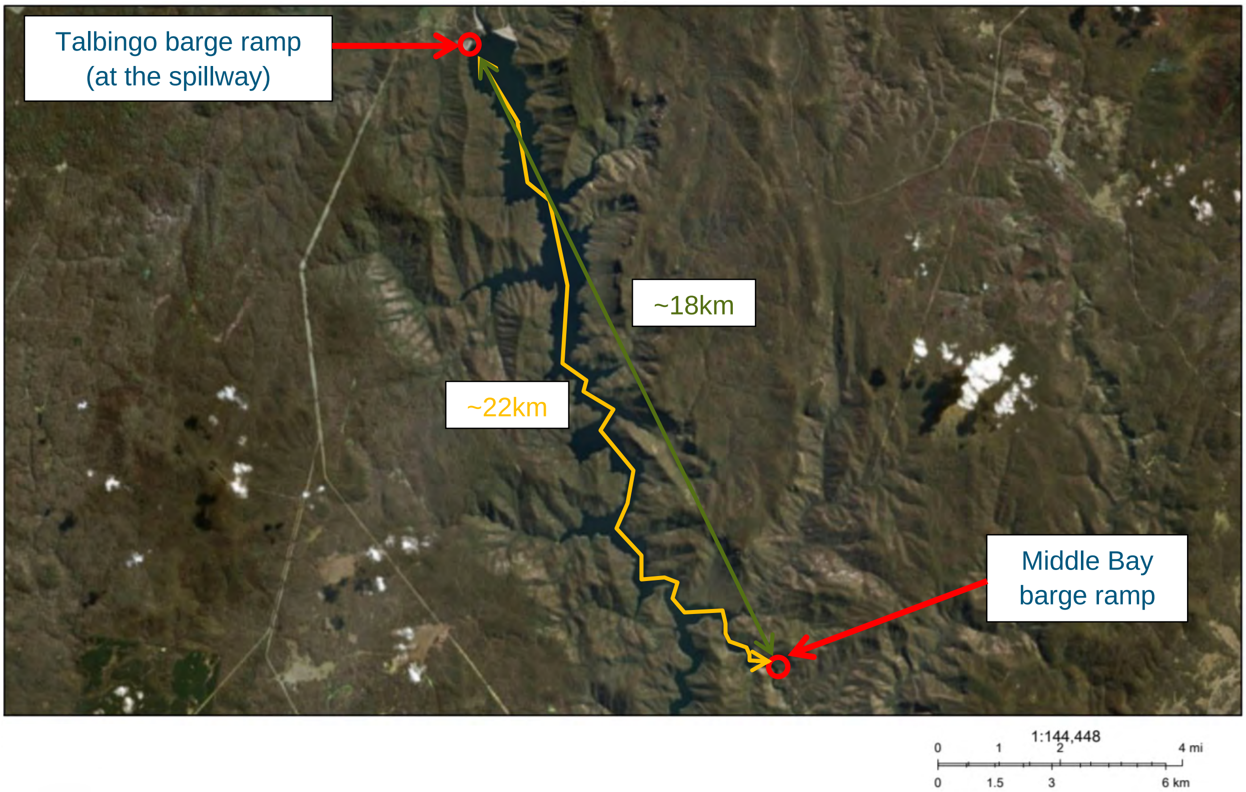

Figure 22: Location of Talbingo barge ramp and Middle Bay barge ramp.

Barges would be required for construction of the Middle Bay barge ramp and Talbingo barge ramp. Primary activities requiring barges includes:

1. removal of submerged woody debris (dead trees) that have been inundated by the reservoir;
2. excavation to establish a suitable grade for construction of the barge ramp; and
3. placement of fill, bedding material and precast concrete planks to form the subaqueous ramp surface.

Plant, equipment, and materials that require barging from Talbingo barge ramp to Middle Bay barge ramp during the Exploratory Works may include:

1. Plant:
    a. Long reach excavator for dredging and construction of the barge ramp;
    b. Dozers, graders, excavators, and rollers for construction of access roads;
    c. Drill rigs for drill and blast operations;
    d. Haul trucks/dump trucks for handling excavated rock;
    e. Crane for unloading material from barges; and,
    f. Water carts, concrete trucks etc. to assist with construction activities.

2. Materials:
    a. Concrete and steel reinforcing for construction of cast *in situ* section of the barge ramp, drainage structures, retaining walls, building foundations etc.,
    b. Precast concrete elements for construction of a section of the barge ramp and the bridges along Lobs Hole Ravine Road;
    c. Pipes for the construction of culverts and water intake/outlet structures; and,
    d. Material for tunnelling including concrete materials and reinforcing to line the tunnels.
3. Construction site amenities:
    a. Accommodation;
    b. Site office;
    c. Amenities block; and
    d. Generators etc.

4.1.2 Main Works

While separate to Exploratory Works, the Snowy 2.0 Main Works (if approved) would require barging and barge access infrastructure during the construction phase for the transport and delivery of plant, equipment, and materials between Talbingo barge ramp and Middle Bay barge ramp, and for the subaqueous placement of excavated rock (refer **Appendix D**). These activities have been considered in relation to the design life and design loading of the infrastructure.

The critical pieces of plant and equipment for loading and unloading onto barges during the Main Works (if approved) are the six (6) transformers (note: the dimension and mass of the TBM has not been confirmed). The key criteria for transport of the transformers are outlined below:

1. Transformer: 250 t
2. Transport platform: 16 axle platform, 28.8 m long and 4.2 m wide. Tare weight 57 t
3. Prime mover: Maximum 7 required depending on terrain. Tare weight 22.5 t each.
4. Turning radius to the centreline: 30 m
5. Minimum vertical curve radius: 400 m
6. Maximum grade: 1:10 (vertical:horizontal)

4.2 Basis of Design

4.2.1 Design water level

The minimum design water level for Talbingo Reservoir is MOL (534.4 m AHD). This water level dictates the elevation of the toe of the barge access infrastructure.

The maximum design water level is the 100 year Average Recurrence Interval (ARI) flood level (~546.1 m AHD). This level dictates the crest of the barge access infrastructure.

4.2.2 Design life

The barge access infrastructure would be designed as permanent structures with a design working life of 50 years. The barge access infrastructure presents a low degree of hazard to life or property. As such, the barge access infrastructure would be designed for wave loads corresponding to a 200 year ARI event in accordance with *Australian Standard Guidelines for the design of maritime structures (AS4997)*.

4.3 Barge design

The following types of barges would be required for the Exploratory Works:

1. Transport barge for transport of plant, equipment, and material, including potentially dredge material to create the navigation channel; and,
2. Construction barge fitted with an excavator for the purpose of constructing the barge ramps and dredging.

All barges would be dumb (un-propelled) barges. Tugs would be required to move the barges to the required location/s. The size of the tugs would depend on required distance and operational speed.

The laden draft of the barges would be approximately 2.0 m.

4.3.1 Transport barge for plant, equipment and material transfers

The transport barges would be modular flat top barges approximately 50 m long and 20 m wide. The modular barges comprise numerous modules (units) that are transported to the site by truck and assembled locally to form a single working platform. Due to the modularity of the system, the barges can be made wider to meet particular stability requirements for heavy lifting. The modular transport barges would be fitted with bow ramps and possibly stern ramps to facilitate loading and unloading plant, equipment, and materials. The barges could be modified and used for other activities including handling and transport of dredged material and excavated rock for subaqueous placement.

An example of a commercially available modular barge system is that fabricated by Damen. The Damen product is proposed to be used for the project. However, other alternatives are available. The Damen individual modular pontoon units are made of steel which are coupled together by a specially designed system to form the desired barge or vessel configuration. The modular units include a raked bow nose/extension. The barges have been used to transport all types of heavy plant and equipment including crawler cranes, excavators, trucks, hydraulic hammers, and transformers. The barges are also used as roll on roll off (RoRo) ferries for transport of passengers and vehicles.

An example of a Damen modular unit being loaded onto a flatbed trailer and a complete Damen modular barge are provided in **Figure 23**. The modules are supplied in standard sizes typically 6.1 m or 12.2 m long, 2.4 m wide and between 1.1 and 2.9 m high. The raked bow extensions are also available in all height variations except 1.1 m.

Figure 23: Damen modular barge loaded on flatbed trailer (left) and assembled (right).

4.3.2 Construction barge

The construction barge would be a modular flat top barge approximately 20 m long and 20 m wide. The construction barge would be capable of supporting a 40 to 70 t excavator. An example of a construction barge supporting an excavator is provided in **Figure 24**. The construction barge would be fixed in position with spuds. The spuds would be lowered into the reservoir bed during construction activities. The barge would be moved over the construction area by a tug.

Figure 24: Example construction barge and excavator operating within a 'moon pool' (floating silt curtain).

4.3.3 Tugs

The barges would be transferred and positioned using shallow-draft pusher tugs. The minimum engine capacity would be approximately 600 horsepower. The tug would be a twin propeller vessel, which has enhanced manoeuvrability for navigating the narrow channels.

4.4 Submerged trees

The majority of Talbingo Reservoir was not cleared of vegetation prior to flooding in the 1970s. A number of mature eucalypts and other vegetation species were inundated. However, the trunks and primary branches remain, which are clearly visible upon inspection of the reservoir. It is estimated that the tree trunks are up to 1 m diameter. Submerged trees are particularly prevalent around the Middle Bay barge ramp area and on the approach to Middle Bay.

Dead trees would need to be removed to provide safe navigation and enable construction of the barge access infrastructure. Dead trees may also need to be removed from the proposed locations for subaqueous excavated rock placement to provide safe navigation and ensure the placed material is stable. Mapping the subaqueous vegetation would be required to identify the number and location of trees that require removal.

Submerged tree trunks and branches would be cut and removed to 3 m below MOL throughout the reservoir where navigation is required, unless sediment or rock is encountered above this level. If sediment or rock is encountered, dredging would be required and the stump and root system of the dead trees would be removed.

In addition, within the footprint of the Middle Bay barge ramp, the stump and root system of the dead trees would be removed to facilitate construction of the barge ramp.

Following removal, the woody debris would be placed along the shoreline elsewhere in the reservoir in approximately 0 to 10 m water depth. The placement locations are proposed to form snags and enhance existing habitat for fish and other aquatic biota. The woody debris would be placed in the reservoir as soon as practical after removal to minimise the amount of time the debris is exposed to air. This would ensure the timber does not completely dry and would ensure any fish / fish eggs etc. (if present in/on the debris) would not desiccate.

4.4.1 Construction equipment and methodology

The submerged timber would be removed by a combination of methods. Tree trunks or branches would be cut using an underwater hydraulic chainsaw operated from the deck of the construction barge. The trunks and branches would be removed using the excavator with a grab attachment supported on the construction barge. A crane may also be used. Stumps and root systems that require removal, would be pulled out using an excavator with a grab attachment supported on the construction barge. It may be necessary to excavate around the root system to sever the root ball and pull out the stump.

Depending on the size of the logs, branches, and stumps recovered, the material would be placed directly on a transport barge. The barges would be towed to the selected location near the shore. The placement location would be selected such that it does not interfere with operation of Talbingo Reservoir and is clear of existing and proposed navigations channels. An excavator positioned on the transport barge would place the material at the desired locations in approximately 0 to 10 m of water. The placed woody debris would be intertwined and secured such that it is not free to float or move within the reservoir.

Smaller branches, roots etc., that are not suitable for placement in the reservoir would be placed in a skip bin and transported to a suitable land disposal location. The land disposal location is to be confirmed. However, it would be in the vicinity of the on land rock emplacement area at Lobs Hole.

4.5 Barge access infrastructure

The barge access infrastructure for loading and unloading barges at Middle Bay and Talbingo spillway will take the form of concrete ramps (barge ramps) at a grade of 1:10 (vertical:horizontal). The ramps would be approximately 15 m wide at Middle Bay and 10 m wide at Talbingo spillway. The surface would comprise deep grooves moulded into the concrete to promote self-cleansing of the ramp surface by allowing drainage of excess water and debris. The reservoir bed 20 m either side of the centreline of the barge ramp would be no higher than the barge ramp surface. This would require excavation of material and is necessary to ensure unimpeded access is provided to the barge ramp.

The barge ramps would be constructed from cast insitu concrete above FSL (or the prevailing water level at the time of construction) and precast concrete planks or slabs below this level. To ensure a sufficient number of precast planks are formed and accounting for the fact that the Contractor would not have control of the water level in the reservoir during construction, it is assumed that the Contractor would plan to place precast concrete planks below FSL. This would ensure construction can proceed irrespective of the prevailing water level at the time of construction.

The precast planks would be laid on a pre-prepared flexible foundation comprising bedding material screeded and compacted at the desired grade. The planks would be connected with stainless steel straps and pins. The bedding material would typically comprise 50 to 100 mm igneous cobbles or a suitable alternative.

The barges bow ramp would be lowered onto the concrete barge ramp to enable vehicles, plant, and equipment to roll on and roll off the barges. The barges would be positioned using tugs and would be held against the concrete barge ramp by mooring lines attached to bollards near the crest of the ramp. The mooring lines would be tensioned using a winch to ensure the barges are held securely in place.

An example of a vehicular barge (car ferry) with bow ramps is portrayed in **Figure 25**. This car ferry is located at Berowra Waters in Sydney and it is approximately 26 m long (not including the bow ramps), 12 m wide and has a capacity of 90 tonnes. This barge is approximately half the length and half the width of the proposed barges at Talbingo. The other main difference to the proposed barges at Talbingo is that the car ferry at Berowra Waters is a cable ferry meaning that it is guided across the river by cables connected to both shores. The barges at Talbingo would be tug assisted to move from one location to another. However, cables or mooring lines attached to the shore would be employed to hold the barge against the barge ramp while loading and unloading, as noted above.

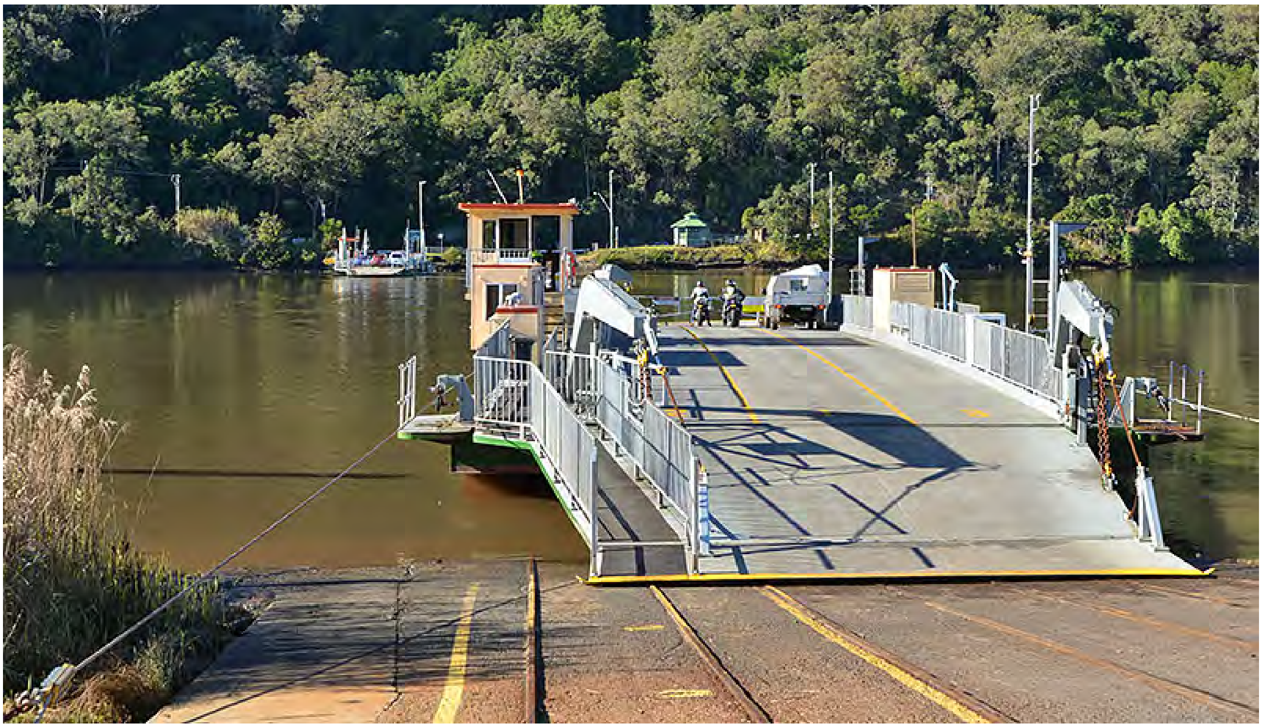

Figure 25: Vehicular barge, bow ramp and barge ramp at Berowra Waters, New South Wales.

A crane may be located near the head of both ramps. The crane may be used to load and unload equipment and materials.

4.5.1 Middle Bay barge ramp

The concept layout of the Middle Bay barge ramp, long section through the centre of the ramp and cross sections at 20 m intervals are attached in **Appendix A**. An excerpt from the barge ramp layout is provided in **Figure 26**. Dredging is required to establish a navigation channel on the approach to the Middle Bay barge ramp. Dredging is discussed in **Appendix C**.

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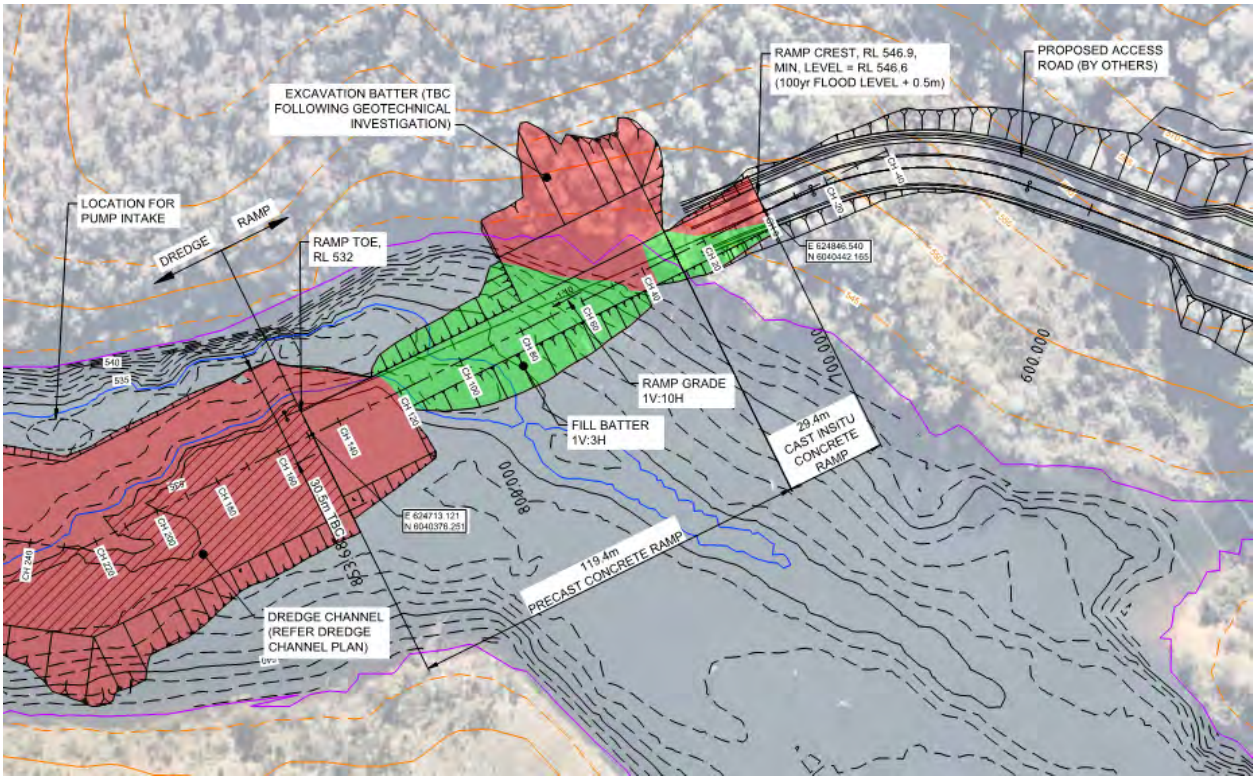

Figure 26: Middle Bay barge ramp concept design.

The toe of the ramp would be at 532.0 m AHD. This elevation allows for operation at MOL and includes an allowance of 2.3 m for laden draft of the barge plus under keel clearance.

The crest of the ramp at Middle Bay would be 546.6 m AHD, 0.5 m above the maximum design water level, to accommodate freeboard during a flood event. The crest of the ramp is located a horizontal distance of 50 m from the transmissions lines to provide sufficient space for a crane to be erected near the crest of the ramp, if required.

The horizontal length of the ramp to achieve the desired grade, crest elevation, and toe elevation is 146 m. The upper 34 m above FSL (543.2 m AHD) would be constructed from cast in situ concrete. The lower 112 m would be constructed from precast concrete planks.

The topography and bathymetry at Middle Bay is relatively steep at approximately 1:1 to 1:8 (vertical:horizontal) (refer **Section 3.2.1**). To reduce the amount of cut and fill required for construction of the barge ramp, the ramp is aligned oblique to the natural slope. The ramp crosses the thalweg of the channel at approximately longitudinal Chainage 105 (refer **Figure 26**).

Excavation would be required near the crest of the ramp to establish a suitable laydown area, working compound, and barge ramp approach. Ideally, the road alignment of the barge ramp approach would be gently sloping towards the barge ramp (approximately 2%) and parallel to the barge ramp for a distance of approximately 40 m. This provides a level area to manoeuvre vehicles while ensuring water does not pond on the surface. The grade towards the ramp reduces the distance required to achieve a suitable vertical curve. Drainage features (e.g. catch drains and retention basins) would be required to collect, attenuate, convey and treat runoff before discharge into Talbingo Reservoir. The drainage features should also be designed to capture oils and fuels in case vehicle fluids are spilt.

The approximate volume of material required to be excavated for the barge ramp approach between longitudinal Chainage 0 and -40 (see **Figure 26**) is outlined in **Table 12** and would be confirmed during completion of the detailed design.

Excavation is required along the northern side of the ramp, between Chainage 0 and 60 (see **Figure 26**). The excavation is required to provide adequate clearance between the embankment and barges when they are held against the concrete ramp for loading and unloading. The approximate volume of excavation is outlined in **Table 12**. Alternatively, fender bollards may be installed at regular intervals along this side of the ramp. The bollards would need to extend approximately 3 m above FSL. The extent of excavation would be reduced as the bollards would ensure the barges are clear of excavation batters.

Dredging is required below Chainage 120 to establish a suitable water depth for construction of the toe of the ramp. The approximate volume of material that would need to be removed is outlined in **Table 12**.

Excavated material from construction of the barge ramp would be handled in a similar manner to dredged material (refer **Appendix C**).

Fill is required between approximately longitudinal Chainage 0 and 120 (refer **Figure 26**). Fill would be granular material, similar to the ramp bedding material. Subaqueous fill batters would be constructed at a slope of approximately 1:3 (vertical:horizontal) and protected with two layers of larger rock armour. The fill material and rock armour would be sourced from nearby excavations that form part of the Exploratory Works. The material would be placed with an excavator either positioned on land or mounted on a barge. The approximate volume of fill and rock armour required to construct the ramp is outlined in **Table 12**.

Bedding material would be placed under the precast planks below FSL. Loose and soft sediments would need to be dredged prior to placing fill or bedding material.

Table 12: *Approximate cut and fill volumes to construct the barge ramp.*

Location	Assumption	Cut/Fill	Approximate Volume (m^3)
Road alignment of the barge ramp approach	15m wide road and 1:2 (vertical:horizontal) batters.	Cut	3,000
Excavation/dredging along northern side of ramp between Chainage 0 and Chainage 70	Level area 20m either side of centreline of the barge ramp and 1:2 (vertical:horizontal) excavation batters.	Cut	2,200
Dredging toe of ramp below Chainage 120	Ramp toe at 532m AHD and 1:2 (vertical:horizontal) dredge batters.	Cut	1,500
Fill between Chainage 0 and 120	Ramp 15 m wide and 1:3 (vertical:horizontal) fill batters.	Fill	4,500
Fill batter rock armour protection	1:3 (vertical:horizontal) fill batters with 2 layers of rock armour.	Fill/ Armour	300

Additional rock armouring may be required where the barge ramp crosses the thalweg of the existing channel between approximately longitudinal Chainage 100 and 120. If the water level in the reservoir drops below approximately 537 m AHD, significant flow rates through this area may occur due to runoff from the Yarrangobilly River catchment.

4.5.2 Talbingo barge ramp

The concept layout of the Talbingo barge ramp, longsection through the centre of the ramp and cross sections at 20 m intervals are attached in **Appendix B**. An excerpt from the barge ramp layout is provided in **Figure 27**.

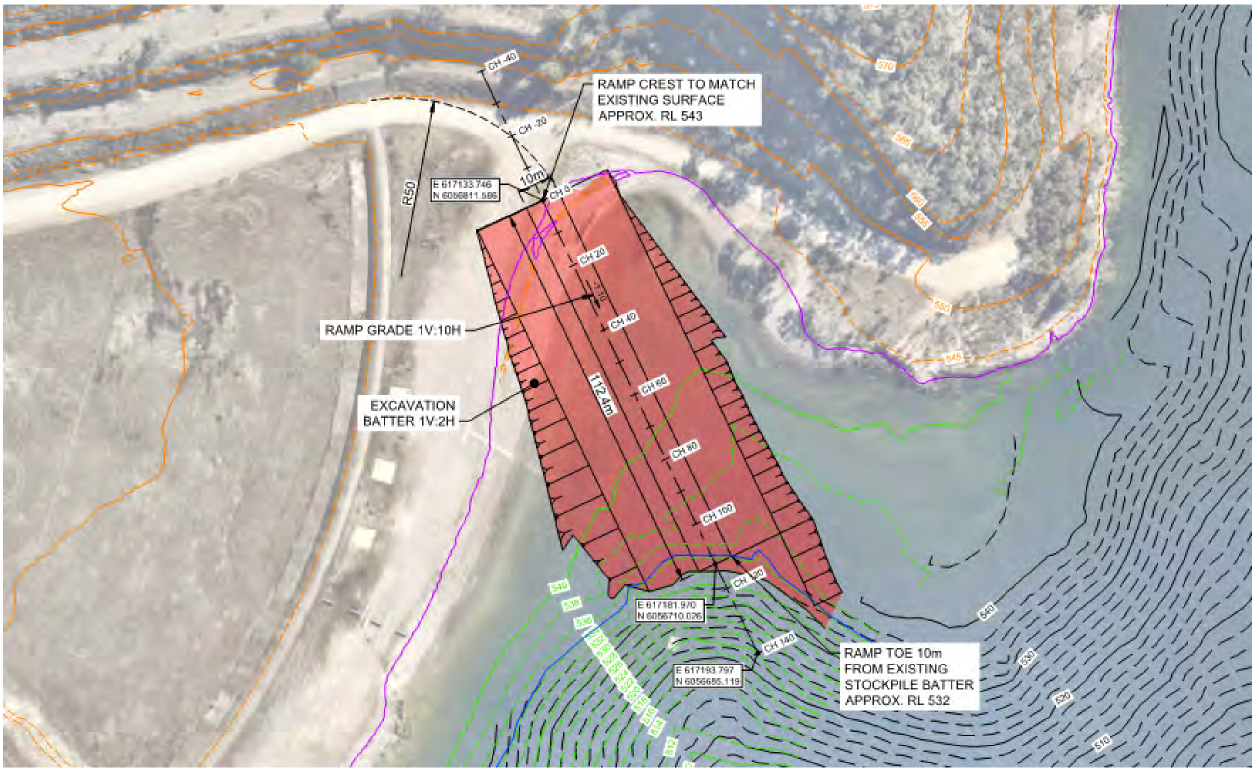

Figure 27: Talbingo barge ramp concept design.

The toe of the ramp would be at 532 m AHD. This elevation is the same as for Middle Bay.

The crest of the ramp at the spillway would be approximately equal to the existing ground level. The ground level on the reservoir side of the spillway is approximately 543.3 m AHD (determined from historic spillway design plans) and the water level corresponding to the date of the aerial in **Figure 27** (26 March 2017) was 542.2 m AHD. The latter has been adopted as chainage 0 and FSL (543.2 m AHD) has been adopted as the level for the crest of the ramp. The crest of the spillway is 544.7 m AHD (determined from historical spillway design plans) and it has not been overtopped since construction of Talbingo Reservoir. The design crest level of the barge ramp at the spillway is substantially lower than the adopted crest level at Middle Bay (546.6 m AHD). However, it is not desirable to place fill to raise the crest level of the barge ramp to this level as it may impact the hydraulic performance of the spillway.

The horizontal length of the ramp to achieve the desired grade, crest elevation, and toe elevation is approximately 112 m. The full length of the ramp would be constructed from precast concrete planks. The barge ramp approach could be constructed from cast in situ concrete or asphalt.

The proposed barge ramp including surface treatments, excavation and stockpiling of spoil would not impact the hydraulic performance or operation of the spillway in a flood event. Stockpiles would be placed clear of the spillway such that the conveyance of flow in a flood event is not impeded.

The ground level around the spillway is relatively level and slopes gently away from the spillway crest. Bedrock would be expected to be shallow. Minimal earthworks are proposed in this area as the rock may be difficult to excavate. An excavated rock stockpile is located on the reservoir side of the spillway, below FSL, which was placed during construction of the spillway in the late 1960's and early 1970's. It is currently assumed that the stockpile would comprise uncompacted drill and blast material that would readily be able to be excavated to form the ramp profile. Further assessment of the historic stockpile will be undertaken prior to its use to determine its suitability.

The bathymetry at the spillway, over the historic excavated rock stockpile, is relatively flat and then drops off steeply (refer **Section 3.2.2**). The toe of the ramp would be located approximately 10 m landward of the crest of the excavated rock stockpile slope, which may be unstable if a load is placed close to the crest.

A laydown area and working compound would be located largely 'upstream' (east) of the spillway crest. Minimal earthworks are required for construction of the laydown area and working compound. However, there is a risk of inundation and high flow velocities in a flood event that overtops the spillway. The spillway has not been overtopped since construction of the reservoir was completed in the early 1970's. Management of flooding would continue in accordance with reservoir operating procedures.

An existing access road is located over the spillway crest on the northern side of the spillway. The crest of the barge ramp would be located in close proximity to the access road over the spillway crest. The barge ramp approach would be parallel to the barge ramp for a distance of approximately 40 m. The access road over the spillway and barge ramp approach would be aligned to accommodate a turning radius of 15 m minimum, which is the recommended radius for a prime mover and long semi-trailer (25 m length) operating at 5 to 15 km/h in accordance with the Ausroads Guidelines. This turning radius would also cater for larger vehicles at a lower speed.

Excavation is required over the entire length of the barge ramp below FSL. The excavation would form a notch through the historic excavated rock stockpile with a base 40 m wide and batter slopes of approximately 1:2 (vertical:horizontal). The batter slopes would be confirmed following review of the geotechnical investigation. The ramp surface would be approximately 10 m wide. The material to be excavated (approximately 25,000 m^3) is coarse excavated rock from construction of the spillway.

Fender bollards may be required on each side of the barge ramp to assist in manoeuvring the barges. Depending on the arrangement of the fender bollards, it may be possible to optimise and reduce the width of the notch to suit the floating plant and equipment. However, installing fender bollards in the excavated rock may be difficult given the substrate.

The ramp would be founded on a mix of native rock and excavated rock stockpile fill. Depending on the material grading and composition of the excavated rock stockpile, suitable bedding material may need to be placed under the precast planks. This would require over excavation and placement of screedable material.

It is expected that there will be a lower potential for silt to be mobilised into the water column during excavation and construction of the Talbingo barge ramp when compared to excavation and construction of the Middle Bay barge ramp. This is due to the reservoir bed sediments, which are significantly coarser at the Spillway (refer **Section 3.4**). Notwithstanding the potential for mobilising sediment, the use of the environmental management measures described in **Section 4.6** will be implemented.

4.5.3 Construction equipment and methodology

The required excavation above FSL at Middle Bay could be completed with a range of equipment including excavators and dozers. Some of this material may be suitable for use as fill, bedding material, or rock armour for construction of the barge ramp. The remainder of the material would be loaded into a truck and hauled to the on land rock emplacement area.

Excavation below FSL would be undertaken using a 40 to 70 t long reach excavator either positioned on land or mounted on the construction barge, depending on the water level at the time of construction. As an alternative to an excavator, or supplementary to an excavator, a drag line may be used at Talbingo barge ramp for excavation of the barge ramp. Excavation would take place within a silt curtain.

Should excavated material be placed on land, the excavator would load heavy duty skips of 15 – 25 m^3 capacity, mounted on a separate transport barge or positioned along the foreshore. The barges would be towed to shore and the skips would be picked up off the barge using a 'skip-truck' for road transport to the on-land rock emplacement area. Note that at the time of removal of the excavated material, the formal barge ramp at Middle Bay and at the spillway would not have been constructed. Excavated material would be unloaded from the barges at the existing informal boat ramp at Middle Bay, a temporary area adjacent to the Talbingo barge ramp or the public boat ramp near the reservoir wall.

Excavated material from the Talbingo barge ramp may be placed either side of the barge ramp provided it does not impede on conveyance of flow over the spillway in a flood event. The material would be used to establish additional working platforms or placed in temporary bunds. It is yet to be determined whether the barge ramp sites will be reinstated to the preconstruction condition following construction of the Main Works (should they be approved) or whether they will be retained. Notwithstanding, the Talbingo spillway area would be rehabilitated to retain is recreational value at completion of the works.

Excavated material from the Talbingo barge ramp may be suitable for subaqueous placement. The method for handling and placing the material is discussed in **Appendix C**.

Placement, compaction, and screeding of fill and/or foundation material would be undertaken with an excavator either positioned on land or mounted on a barge. Rock armour to protect subaqueous fill batters would also be placed with an excavator

The precast ramp segments required below the water level could be constructed at any location and transported to the Middle Bay barge ramp on a flatbed truck (possibly loaded onto a barge). Due to the number of precast segments that would be required for construction of the Middle Bay barge ramp, reusable formwork moulds would be constructed to pour and shape the segments. Ferrules and stainless steel straps would be cast into the precast concrete ramp segments to assist in lifting, positioning, and connecting the various segments. An excavator or crane with lifting chains/slings positioned either on the land or mounted on a barge would be required to lift and position the precast segments. Divers would be required to assemble and fit the connection pins between the ramp segments where these will be underwater.

The cast in situ ramp above FSL would require preparation of a suitable foundation, placement of reinforcement, erection of formwork, and pouring of concrete. Construction of the ramp would require a concrete batching plant in close proximity to enable concrete to be batched, delivered to site, poured and compacted within approximately 90 minutes in accordance with AS1379 Specification and supply of concrete. The cast in situ ramp could be poured prior to, or following, placement of the precast segments. However, the design of the ramp would need to consider how the precast segments and cast in situ ramp would be connected.

To assist with construction of the Middle Bay and Talbingo barge ramps, it may be necessary to initially launch construction plant and equipment from the public boat ramp near the reservoir wall, the public boat ramp off Elliot Way on the upper reaches of the Tumut arm of Talbingo Reservoir and/or from the unformed boat ramp at Middle Bay.

4.6 Environmental management during construction of barge access infrastructure

Construction of the barge access infrastructure has the potential to cause adverse environmental impacts during construction. Key activities, impacts, and mitigation measures are outlined in **Table 13**. This would be developed further as part of a Construction Environmental Management Plan (CEMP) for Exploratory Works.

Table 13: Key environmental impacts and mitigation measures.

Impact	Ref #	Environmental management measures
Biodiversity		
Removal of submerged trees		Wood debris from tree removal within the dredge footprint and subaqueous placement location would be spread back into the reservoir in relatively shallow water (0-10 m) where fish are more likely to occur.
Land		
Stockpiling excavated material on land		Refer to Snowy 2.0 Exploratory Works, Excavated Rock Emplacement Areas Assessment, SGM environmental Pty Limited, June 2018.
Water		
Water quality during construction of the barge access infrastructure.		A CEMP will be implemented incorporating mitigation measures including (but not limited to): • silt curtain usage around the works site; • selecting uncontaminated granular fill with less than 2% fines and selecting granular bedding material; • ensuring skip bins for land disposal of excavated material are watertight; • establishing a bunded area around the disposal area.
Transport		
Marine Traffic Congestion		A Marine Traffic Management Plan will be implemented incorporating mitigation measures including (but not limited to): • establishing exclusion zones around barge access infrastructure and at other locations where navigation channel widths are constrained; • undertake community consultation prior to 'marine' works and barging. Posting information material at the boat ramps including the location of exclusion zones and informing on legally enforceable speed restrictions around construction plant and equipment in accordance with the Marine Safety Act 2013; and • ensuring construction plant and equipment are fitted with Automatic Identification Systems.
Noise and Light		
Disturbance to the community		The CEMP will incorporate mitigation measures including, but not limited to noise control and mufflers must be fitted and maintained on all plant and equipment to reduce noise and exhaust fumes.
Impact on the ecology, particularly bird species during the night		The CEMP will incorporate mitigation measures including, but not limited to light shielding when undertaking night works.

5 Consideration of alternatives to barge access infrastructure

Alternatives considered during the concept design phase include:

1. alternate transport methodology and excavated rock placement locations to remove the need for barges and barge access infrastructure (refer **Appendix D**);
2. alternate barge access infrastructure locations; and
3. alternate structures for the barge access infrastructure.

5.1 Alternative transport and methodologies

An alternate to barging and 'marine' transport is land transport. The only land based access route to the site of the Exploratory Works is along Snowy Mountains Highway, Link Road, and Lobs Hole Ravine Road. Road access is likely to be restricted during winter months due to safety concerns as a result of the cold climate conditions. Further, Lobs Hole Ravine Road is currently an unsealed road that requires significant upgrade to accommodate trafficking by large plant and equipment. Large equipment will need to be transported to Lobs Hole prior to road upgrades being completed. Barging of plant and equipment is proposed to fast track the construction program for the Exploratory Works and reduce the scope of road upgrade works, which could have an impact on sensitive ecosystems. The barge infrastructure also provides an alternate route out of Lobs Hole that could be used in the event of an emergency.

5.2 Alternative locations

Alternate locations for barge access infrastructure were considered at the northern and southern ends of Talbingo Reservoir.

Key criteria in selecting the barge access infrastructure location at the southern end of the reservoir, near Middle Bay included:

1. location of the transmission lines and transmission tower. It is desirable to cater for the option to install a crane near the crest of the ramp for loading and unloading barges, hence it is necessary to be clear of transmission lines and towers;
2. synergistic use of the ramp for the Exploratory Works (and Main Works, if approved). The ramp should ideally be in close proximity to Lobs Hole to reduce the distance between the excavated rock stockpiles and the barge access infrastructure;
3. location of other proposed water based infrastructure, including a proposed water supply intake pipe, which would be avoided;
4. water depth near the ramp to minimise dredging; and
5. topography and bathymetry near the ramp, which should be close to 1:10 (vertical:horizontal), to minimise the required volume of cut and fill to construct the ramp.

Alternate locations in the area of Middle Bay were explored southeast of the initially proposed location including the existing informal ramp approximately 150 m to the south. This location was not preferred primarily due to the proximity of the transmission lines and transmission tower. It would not have been possible to install a crane near the crest of the ramp without reclaiming part of the reservoir or relocating the transmission lines and tower. Upstream of this point, the water depths decrease and the volume of dredging would need to increase substantially.

Alternate locations were also explored northwest of the proposed location, including an area approximately 200 m downstream of the proposed ramp location. The slope of the terrain increases towards the northwest and the quantity of fill required to construct the ramp would increase. Additional terrestrial vegetation clearing and excavation to form road access would also have been required.

Key criteria in selecting the barge ramp location at the northern end of Talbingo Reservoir included:

1. existing road access; and,
2. impact on public recreation amenity.

An alternate location with road access was identified near the reservoir wall at the location of the existing public boat ramp. This location was not desired for a number of reasons including:

1. restricted loads permitted along the access road traversing the reservoir wall;
2. impact on public amenity and occupation of the only boat ramp at the northern end of Talbingo Reservoir; and,
3. limited area available for construction compound and laydown area.

No other suitable locations were identified.

5.3 Alternative structure

The preferred barge access infrastructure for loading and unloading of barges is a barge ramp. Key criteria in selecting this design included:

1. preference for roll on-roll off (RORO) capabilities for loading and unloading plant and equipment;
2. program and cost to complete the works; and
3. operational requirements including relatively high water level fluctuations (approximately 9 m between FSL and MOL).

Alternate structures considered during the concept design phase included:

1. floating pontoon connected to the foreshore via a heavy duty gangway (suitable for transferring very heavy plant and equipment items); and
2. a piled wharf structure.

Both options would have required piled ramps or gangways to achieve the desired RORO functionality (at 1:10 [vertical:horizontal] grade). The length of the gangways or ramps to achieve operation over the design water level fluctuation limits the practicality of these options. Further, the cost and time involved in constructing these alternate structures would significantly exceed the cost and program for constructing the barge ramp.

6 Marine traffic and transport

Talbingo Reservoir is only accessible to trailerable craft. This limits recreational vessels to typically less than 7.5 m in length (refer **Section 3.7.1**). The majority of the foreshore of Talbingo Reservoir is steep and densely vegetated, which restricts boating opportunities. Further, the reservoir is located in a remote area with limited road access. The main boat ramps are:

1. a public boat ramp adjacent to the reservoir wall at the northern end of the reservoir;
2. a public boat ramp near the confluence of Tumut River and Talbingo Reservoir on Elliot Way; and,
3. an unformed boat ramp at Middle Bay (near the proposed barge ramp) marked on the Roads and Maritime Services Boating Map as a hand launching ramp. The ramp is only accessible via a four wheel drive track.

The main recreational activities on Talbingo Reservoir include fishing all year round and tow sports (water skiing, wakeboarding etc.) during the warmer months (October to May). Fishing vessels would typically be 4 to 5 m in length and tow sport vessels would typically be 5 to 6.5 m in length.

Recreational demand from waterway users has been assessed via a study of traffic counts to the Main Boat Ramp as discussed below. It is understood other nearby reservoirs that form part of the Snowy Scheme including Lake Jindabyne, Lake Eucumbene, and Blowering Dam provide easier road access to the general population and would have higher usage.

Traffic counts were undertaken on Miles Franklin Drive between March and April, 2018 (including Easter and ANZAC Day public holidays). The traffic counts provide an indication of boat launching at the public boat ramp adjacent to the reservoir wall assuming all cars with trailers are towing a boat. The traffic count indicated:

- 144 cars and trailers accessed the boat ramp over Easter with 52 of these occurring on Easter Sunday.
- the average number of cars and trailers accessing the boat ramp on a weekday (excluding public holidays) was 8 with a maximum of 19; and
- the average number of cars and trailers accessing the boat ramp on a weekend (excluding public holidays) was 11 with a maximum of 18.

This data does not include boat launching at the other boat ramps on Talbingo Reservoir. However, demand at the other two boat ramps is assumed to be less due to the isolated locations. Peak boating demand on Talbingo Reservoir is assumed to be 75 vessels per day. However, on a typical day, demand would be less than 10 vessels per day.

Recreational demand and marine construction movements are relatively minor and wide-spaced given the size of the reservoir. The main restrictions on recreational use of the reservoir during construction of the Exploratory Works would be:

1. Short-term restricted public access to the public boat ramp near the reservoir wall during construction of the Talbingo barge ramp during the Exploratory Works;
2. Temporary closure of the whole of the spillway area during the construction of the Talbingo barge ramp;
3. Restricted public access to the northern part of the spillway area for the duration of the Exploratory Works;

4. Restricted public access to the existing access road on the northern side of the spillway for part or all of the Exploratory Works - if required to maintain public access to the southern part of the spillway foreshore, a road along the southern side of the spillway may be required for public use;
5. Relocation of the swimming enclosure at the spillway to the southern end of the spillway;
6. Implementation of appropriate pedestrian, land vehicle and watercraft control measures when a barge is loading or unloading at the Talbingo barge ramp. This would include the application of normal inland waters boating and navigation requirements as per Roads and Maritime Requirements and the Marine Safety Regulation 2016;
7. Closure of the informal boat launching ramp near Middle Bay;
8. Restricted public boat access to the Yarrangobilly Arm upstream of the low water barge turning basin to prevent interactions with barge operations and to prevent members of the public making landfall in Middle Bay construction areas; and,
9. Restricted public boat traffic close to subaqueous excavated rock placement areas, including in the vicinity of any silt curtains.

These measures will maintain access to the southern part of the spillway foreshore for public recreational use during the majority of the Exploratory Works. Impacts to recreational users are assessed in the Recreational user impact assessment (TRC 2018).

There are other nearby waterways, namely Blowering Dam, which provide recreational amenity including boating and swimming opportunities for the community.

Positive outcomes would be expected at completion of the project, including:

- removal of submerged obstructions and hazards from some navigation areas;
- installation of a barge ramp at Middle Bay, which is expected to be retained for public usage following construction; and
- restoration of the swimming area at Talbingo spillway.

7 References

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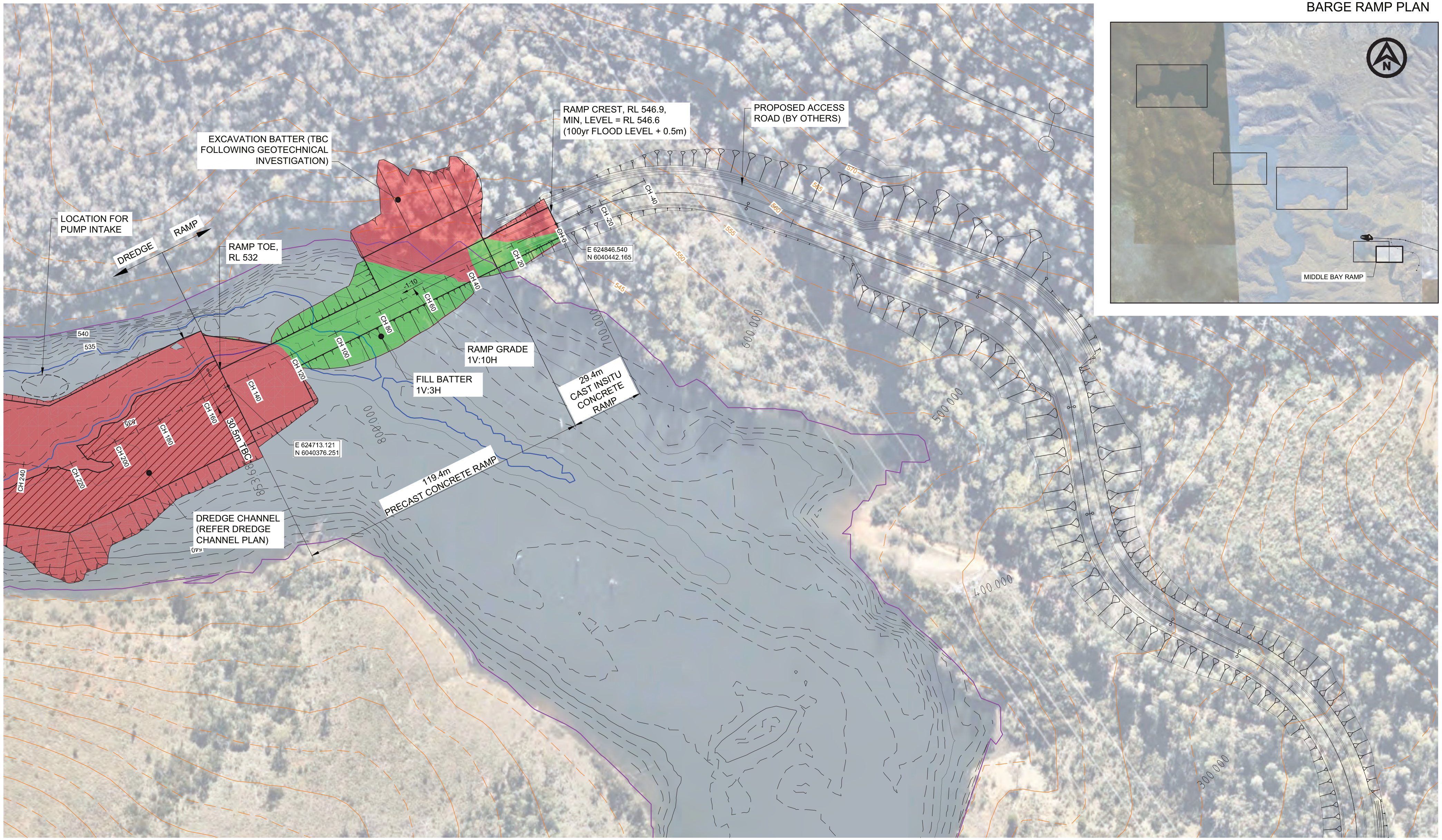
- Ruprecht J.E., Glamore W.C., Coghlan I.R., Flocard F. (2015), *Wakesurfing: Some Wakes are More Equal than Others*, paper presented at the Australasian Coasts & Ports Conference 2015, Auckland, New Zealand, September 2015.
- US Army Corps of Engineers (USACE, 2008), *Coastal Engineering Manual*, publication EM 1110-2-1100.

Appendix A – Middle Bay barge ramp

TALBINGO RESERVOIR - BARGE ACCESS INFRASTRUCTURE
MIDDLE BAY
BARGE RAMP PLAN



LEGEND

- LIDAR CONTOUR
- HYDROSURVEY CONTOUR (26/02/2018)
- FULL SUPPLY LEVEL (FSL) = RL 543.19mAHD
- MIN. OPERATING LEVEL (MOL) = RL 534.35mAHD

RAMP
CUT / FILL TABLE

No.	MIN. (m)	MAX. (m)	AREA (m2)	VOL (m3)	COLOUR
1	-3.8	0.1	3418	4307	(red)
2	0.1	3.7	2590	3633	(green)

15 0 15 30 45 60 75m
1:1500 (A3) 1:750 (A1)

NOT FOR CONSTRUCTION **AUSTRALIAN HEIGHT DATUM**

SNOWY HYDRO 2.0
I:\PA1804\Technical_Data\~PA1804 - Snowy Hydro Dams\E02 Working Drawings\PA1804-RHD-TAL-MA-C3D - Middle Bay Ramp.dwg

SAVED: 28-Jun-18

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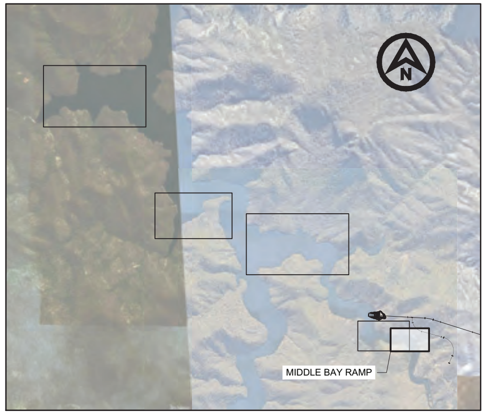
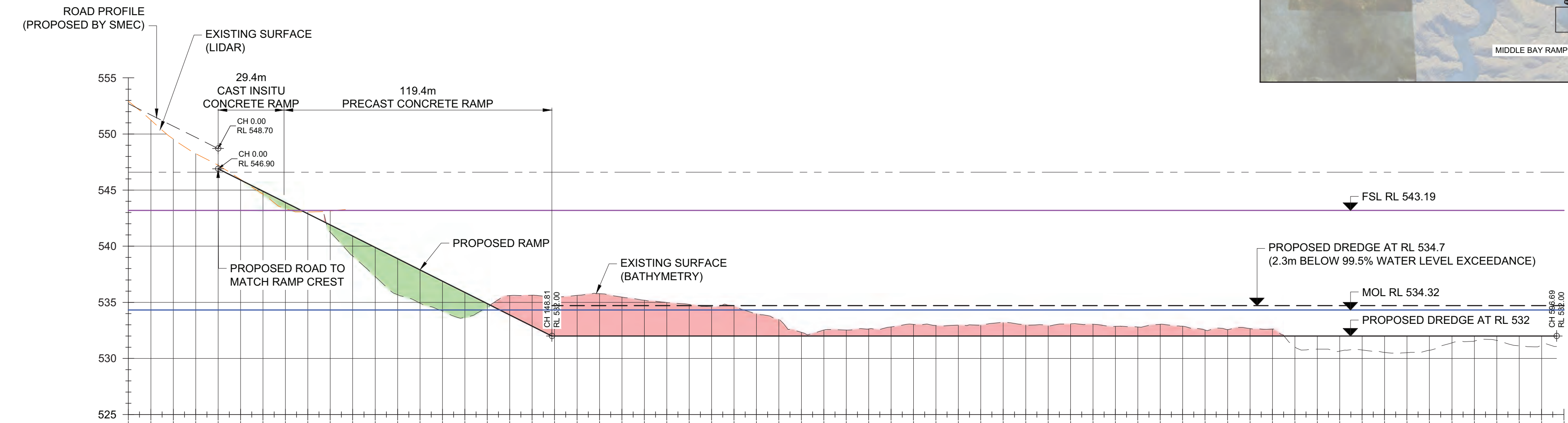
TALBINGO RESERVOIR - BARGE ACCESS INFRASTRUCTURE
MIDDLE BAY
BARGE RAMP AND DREDGE CHANNEL LONG-SECTION



LEGEND

- LIDAR
- HYDROGRAPHIC SURVEY (26/02/2018)
- FILL
- CUT



CHAINAGE	PROPOSED RAMP	EG LIDAR_10m	EG BATHY
-40		552.93	
-30		551.24	
-20		549.55	
-10		548.25	
0	546.90	547.22	
10	545.90	545.95	
20	544.90	544.62	
30	543.90	543.36	
40	542.89	543.06	
50	541.89	543.13	541.25
60	540.89		539.12
70	539.89		537.31
80	538.89		535.69
90	537.89		534.93
100	536.89		534.24
110	535.89		533.66
120	534.88		534.54
130	533.88		535.61
140	532.88		535.64
150			535.46
160			535.61
170			535.77
180			535.46
190			535.18
200			534.98
210			534.81
220			534.61
230			534.69
240			533.98
250			533.48
260			532.32
270			532.53
280			532.52
290			532.62
300			532.81
310			533.03
320			532.93
330			532.96
340			532.97
350			533.20
360			532.98
370			532.91
380			533.08
390			533.04
400			532.86
410			532.80
420			533.04
430			532.86
440			532.53
450			532.57
460			532.66
470			532.62
480			531.03
490			530.83
500			530.65
510			530.75
520			530.53
530			530.51
540			530.73
550			531.38
560			531.55
570			531.61
580			531.13
590			531.18
600			

MIDDLE BAY
RAMP LONG-SECTION
1:1,000H, 1:200V (A3)

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

10 0 10 20 30 40 50m
1:1000 (A3) 1:500 (A1)

NOT FOR CONSTRUCTION

AUSTRALIAN HEIGHT DATUM

Appendix B – Talbingo barge ramp

TALBINGO RESERVOIR - BARGE ACCESS INFRASTRUCTURE
TALBINGO SPILLWAY
BARGE RAMP PLAN

LEGEND

- LIDAR
- FISH FINDER SURVEY (2018)
- HYDROGRAPHIC SURVEY (26/02/2018)
- FULL SUPPLY LEVEL (FSL) = RL 543.19mAHD
- OPERATING LEVEL (MOL) = RL 534.35mAHD

CUT TABLE

No.	MIN. (m)	MAX. (m)	AREA (m2)	VOL (m3)	COLOUR
1	-7.14	0.00	6541	18147	

AUSTRALIAN HEIGHT DATUM

NOT FOR CONSTRUCTION

15 0 15 30 45 60 75m

1:1500 (A3) 1:750 (A1)

SNOWY HYDRO 2.0

I:\PA1804\Technical_Data\~PA1804 - Snowy Hydro Dams\E02 Working Drawings\PA1804-RHD-TAL-MA-C3D - Spillway Ramp.dwg

SAVED: 12-Jul-18

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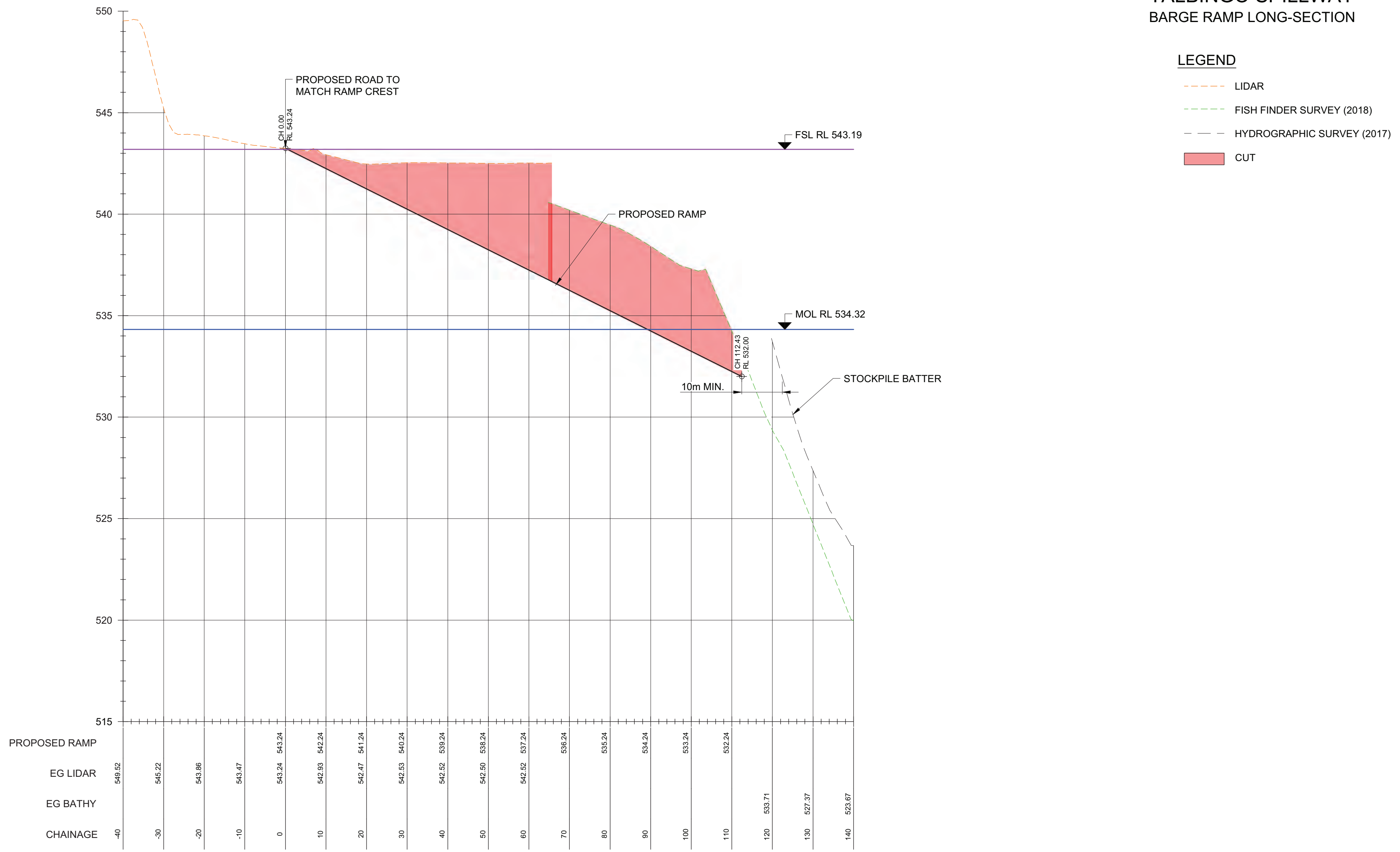
TALBINGO RESERVOIR - BARGE ACCESS INFRASTRUCTURE
TALBINGO SPILLWAY
BARGE RAMP LONG-SECTION



	-40	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
PROPOSED RAMP					543.24	542.24	541.24	540.24	539.24	538.24	537.24	536.24	535.24	534.24	533.24	532.24			
EG LIDAR	549.52	545.22	543.86	543.47	543.24	542.93	542.47	542.53	542.52	542.50	542.52								
EG BATHY																	533.71	527.37	523.67
CHAINAGE	-40	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140

SPILLWAY
RAMP LONG-SECTION
1:1,000H, 1:200V (A3)

AUSTRALIAN HEIGHT DATUM

NOT FOR CONSTRUCTION

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

10 0 10 20 30 40 50m
1:1000 (A3) 1:500 (A1)

Appendix C – Middle Bay Dredging and Dredge Impact Assessment

REPORT

Snowy 2.0 Exploratory Works

Technical Study
Dredging and Dredging Impact Assessment

Client: Snowy Hydro Limited

Reference: M&APA1804R003D0.3

Revision: 0.3/Final

Date: 12 July 2018

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Document title:	Snowy 2.0 Exploratory Works
Document short title:	Exploratory Works Dredging and Dredging Impact Assessment
Reference:	M&APA1804R003D0.3
Revision:	0.3/Final
Date:	12 July 2018
Project name:	Snowy 2.0
Project number:	PA1804
Author(s):	Ali Watters
Drafted by:	Ali Watters/Rick Plain
Checked by:	Ali Watters
Date / initials:	AW 12/07/18
Approved by:	Greg Britton
Date / initials:	GWB 12/07/18

Classification

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
OHSAS 18001

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Appendices

1 Project description

1.1 Overview

The Exploratory Works comprise:

- establishment of an exploratory tunnel to the site of the underground power station for Snowy 2.0;
- establishment of a portal construction pad;
- excavated rock management, including subaqueous rock placement;
- establishment of an accommodation camp;
- road establishment and upgrades providing access and haulage routes during Exploratory Works;
- establishment of barge access infrastructure, including dredging, to enable access and transport by barge on Talbingo reservoir; and
- establishment of services infrastructure such as diesel-generated power, water and communications.

1.2 Barge access infrastructure

The Exploratory Works requires barging and barge access infrastructure during the construction phase to undertake the following activities:

1. transport and deliver plant equipment and materials for construction works;
2. dredge a navigation channel; and
3. undertake a subaqueous excavated rock placement program.

The preferred locations for barge access infrastructure are dictated by the project requirements in particular activity 1 and activity 3 above. The preferred locations are:

1. Talbingo spillway at the northern end of Talbingo Reservoir. Road access to the spillway can readily be upgraded to provide access for heavy haulage all year round. The barge access infrastructure at this location is referred to as Talbingo barge ramp herein; and
2. Middle Bay at the southern end of Talbingo Reservoir, on the Yarrangobilly River arm of the reservoir. Upstream of Middle Bay, the water depth becomes too shallow for safe navigation of vessels. Middle Bay is as close as practical to the Exploratory Works and portions of the Main Works for barge access infrastructure. Suitable road access will need to be established between the barge access infrastructure and the location of the Exploratory Works. The barge access infrastructure at this location is referred to as Middle Bay barge ramp herein.

The location of Talbingo barge ramp and Middle Bay barge ramp are shown in **Figure 1**. The distance between these two locations is approximately 22 km.

A safe navigation channel to approach the Middle Bay barge ramp will be required. Barges would be required as part of dredging this channel.

A control program for the placement of excavated rock within Talbingo reservoir also forms part of Exploratory Works. The program will be implemented in accordance with a detailed management plan based on an engineering method informed through the materials' geochemistry and reservoirs' characteristics. The purpose of the program is to confirm the suitability of the emplacement method for future excavated rock material produced during the construction of Snowy 2.0, should it proceed. Barges would be required to transport and place the excavated rock. Excavated rock from the tunnel would be loaded onto the barges at the Middle Bay barge ramp.

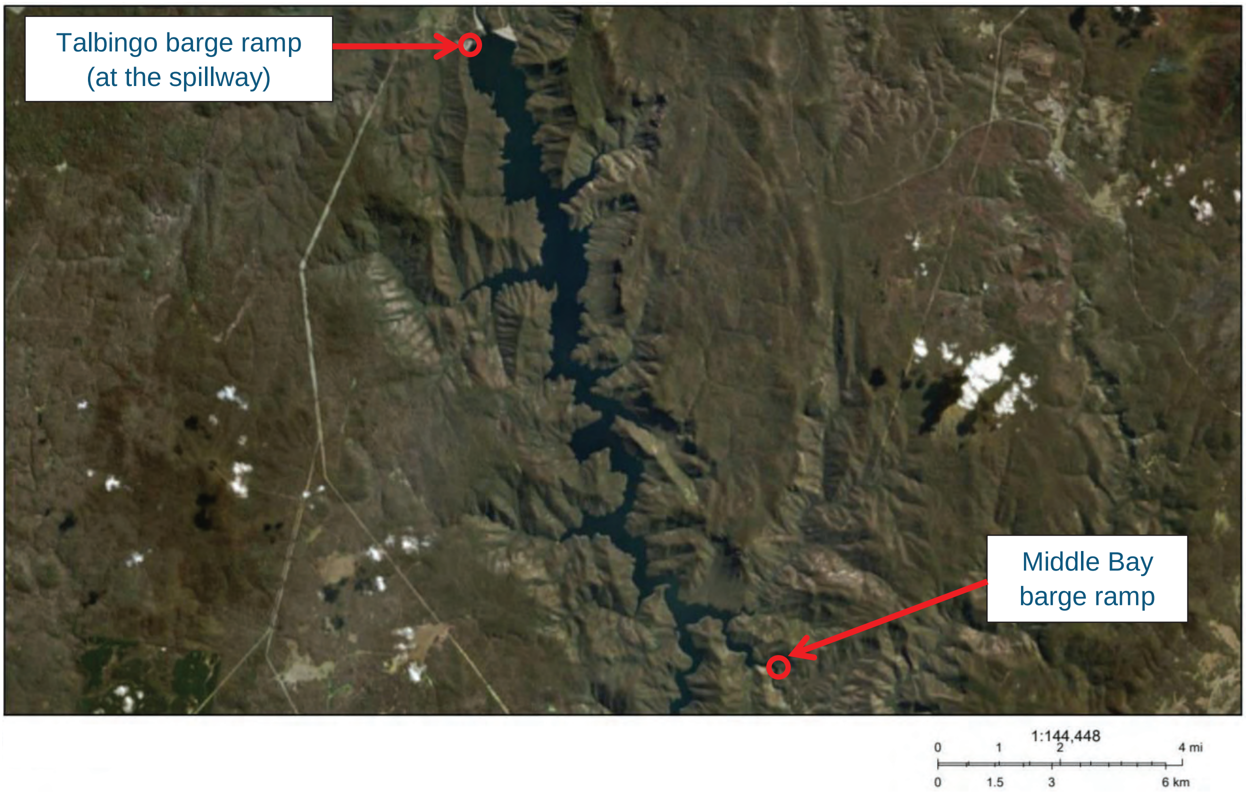

Figure 1: Location of Talbingo barge ramp and Middle Bay barge ramp

Barges would be required for construction of the Middle Bay barge ramp and Talbingo barge ramp. Primary activities requiring barges include:

1. removal of submerged trees that have been inundated by the reservoir;
2. excavation to establish a suitable grade for construction of the barge ramp;
3. dredging to ensure sufficient navigable water depths in the navigation channel on the approach to the Middle Bay barge ramp; and
4. placement of fill, bedding material, and precast concrete planks to form the subaqueous ramp surface.

A more detailed description of the proposed Middle Bay dredging, land placement of dredged material, and potential subaqueous placement of dredged material is provided in the following section.

1.3 Dredging

1.3.1 Middle Bay barge ramp

The Middle Bay barge ramp layout is provided in **Figure 2.**

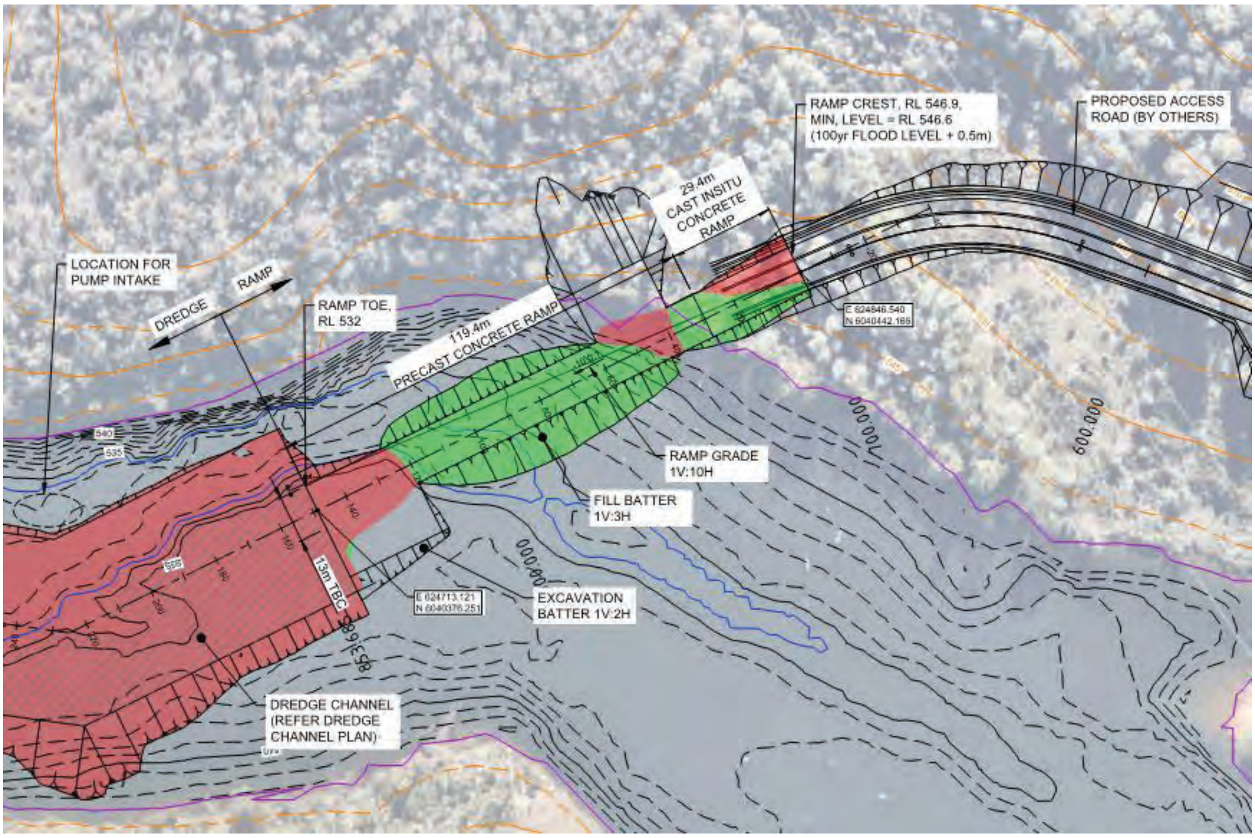

Figure 2: Middle Bay barge ramp concept design

The toe of the ramp would be at 532 m AHD. This elevation allows for operations at the Minimum Operating Level (MOL) of the reservoir (see **Section 2.1**) and includes an allowance of 2.3 m for the laden draft of the barges using the ramp plus under keel clearance .

Dredging is required to establish a suitable water depth for construction of the toe of the ramp. The volume of material that would need to be removed is estimated to be 1500 m^3.

1.3.2 Dredged navigation channel

Dredging is required to establish a navigation channel on the approach to the Middle Bay barge ramp. The navigation channel layout is provided in **Figure 3**.

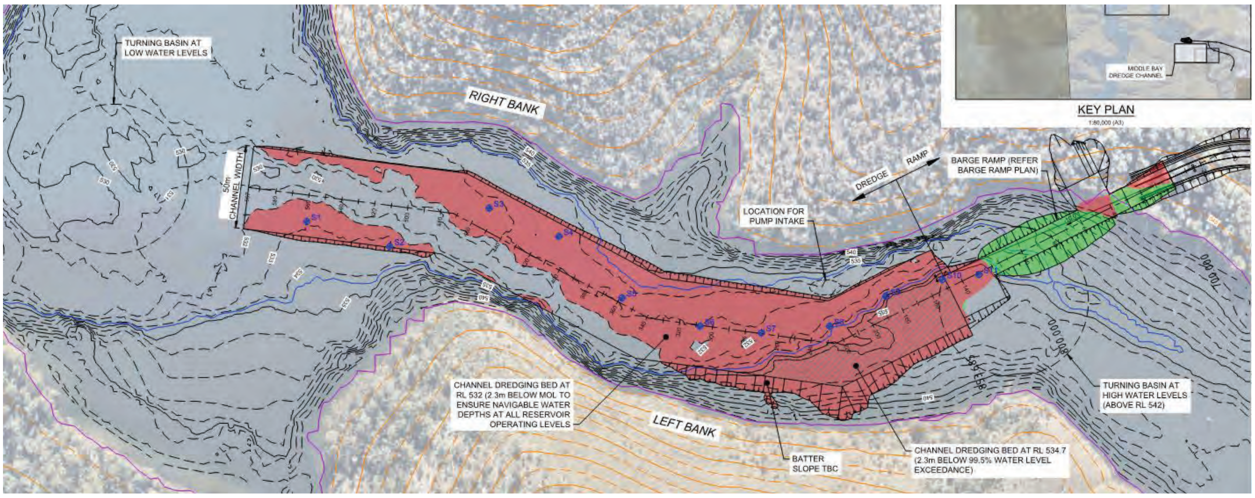

Figure 3: Middle Bay navigation channel

The channel depth would accommodate the laden draft of the barges plus under keel clearance at the MOL. This total allowance would be approximately 2.3 m.

The minimum channel depth would be:

- 534.7 m AHD for the Exploratory Works; and
- 532 m AHD for the Main Works.

Channel batters formed by dredging would be confirmed following review of a geotechnical investigation.

The minimum width of the navigation channel would be 50 m. Turning basins would be required with a diameter of 100 m (2 times the barge length). The navigation channel may be wider in the vicinity of bends in the channel to allow safe navigation.

The alignment of the dredge channel approximately follows the channel thalweg[1]. This alignment minimises the requirement for dredging the steep subaqueous profile on the outside bend of the drowned river channel. Dredging would primarily be required on the inside bend where the profile is flatter, which is likely to indicate increased depth of sediment. The depth to bedrock is to be confirmed following review of a geotechnical investigation. However, dredging will be confined to unconsolidated material and further assessment will be conducted if consolidated rock needs to be removed to form the channel.

Approximately 35,000 m^3 of material needs to be dredged to achieve the required water depth for the Exploratory Works and the Main Works, including an overdredging allowance of 300 mm.

1.3.3 Dredge method

The dredge barge would be a modular flat-top barge approximately 20 m long and 20 m wide. The dredge barge would be capable of supporting a 40 to 70 t excavator. The excavator and barge in combination are referred to as the Backhoe Dredger (BHD) (refer **Figure 4**). The dredge barge would be fixed in position with spuds when dredging (the spuds would be lowered into the bed of the reservoir). The barge would be moved over the dredge area by a tug.

[1] *Thalweg is the line of lowest elevation within a valley, watercourse or reservoir.*

Based on surface sediment samples collected from the area to be dredged (see **Section 2.3**), the surface dredged material is expected to be fine textured, predominantly coarse silts. The dredged material would not be drained at the dredging site as it is difficult to drain fine grained material and there is limited area available adjacent to the dredge area. This material could be dredged using the BHD with a bucket or environmental clamshell attachment.

Bed rock and/or floating boulders are expected to be encountered at depth. However, geotechnical investigations are incomplete. Rock strength is expected to increase with depth while the degree of rock weathering is expected to decrease with depth. Very low strength rock and extremely low strength rock may be dredged using the BHD with a bucket attachment. Higher strength rock would require an alternate dredge methodology. The BHD could be fitted with a rock hammer/breaker, which would be used to breakdown the rock that would be subsequently removed with a bucket attachment.

Typically, the BHD would load the dredged material at around 30% water content by weight. Dredging would take place within a silt curtain or, so called 'moon pool'.

A combination of on-land placement and subaqueous placement of the dredge material is proposed.

Figure 4: Example construction barge and excavator operating within a 'moon pool' (floating silt curtain)

1.3.4 On-land placement of dredged material

Should dredged material be placed on land, the BHD would load dredged material to heavy duty skips of 15 – 25 m^3 capacity, mounted on a separate transport barge. The transport barges would be towed to shore and the skips would be picked up off the barge using a 'skip-truck' for road transport to the land based placement area.

The proposed land-based placement area at Lobs Hole is in the same area where excavated rock from the tunnel during the Exploratory Works will be placed (see Snowy 2.0 Exploratory Works Excavated Rock Emplacement Areas Assessment prepared by SGM environmental Pty Limited).

1.3.5 Subaqueous placement of dredged material

Should dredged material be placed in the reservoir, the BHD would load the material directly onto a transport barge. Skip bins would not be required as the bulwarks (the sides of the barge that extend above the deck, also known as 'hungry boards'), would be water tight to mitigate loss of water and fines into the water column. However, depending on the project sequencing, skip bins may still be used at times.

The transport barges would be dumb (un-propelled) barges. They would be transferred and positioned using shallow draft pusher tugs. Each transport barge would be towed to the placement area and the material would be transferred to a discharge barge.

The discharge barge would be a modular barge approximately 20 m long and 20 m wide. It would be fitted with a receiving well/hopper above a fall pipe to discharge dredged material below the water surface. The use of a discharge barge would minimise surface turbidity during subaqueous placement. The discharge barge may be fixed in position with anchors. Cables and winches may be required to move the barge over the placement location. If dredged material is loaded into skip bins, an excavator located on the transport barge would transfer material from the skip bins into the well/hopper.

The proposed locations for subaqueous placement of dredged material are described in the Subaqueous Excavated Rock Placement (SERP) report (refer to the *Barge Access Infrastructure Report including Subaqueous Excavated Rock Placement Assessment* (Royal HaskoningDHV 2018). An initial subaqueous placement program is proposed in Plain Creek Bay (see **Figure 5**); a semi-enclosed bay located approximately 5km from the dredging area in Middle Bay. Material would be placed more than 3 m below MOL. The site was selected based on a constraints/opportunities assessment. Criteria for determining the placement location of dredged material included:

- aquatic ecology;
- other environmental and social considerations e.g. fishing, navigation etc.;
- available water depth;
- potential for re-suspension;
- distance from the dredging location, i.e. preferable to be within approximately 4-5 km of Middle Bay;
- Snowy Scheme operational considerations; and
- ability to incorporate environmental controls during placement.

The potential approximate volume of material that could be placed in Plain Creek Bay is 500,000 m^3. This assumes a batter slope of 1:4 (vertical:horizontal) and a surface level of 531 m AHD, approximately 3.3 m below MOL.

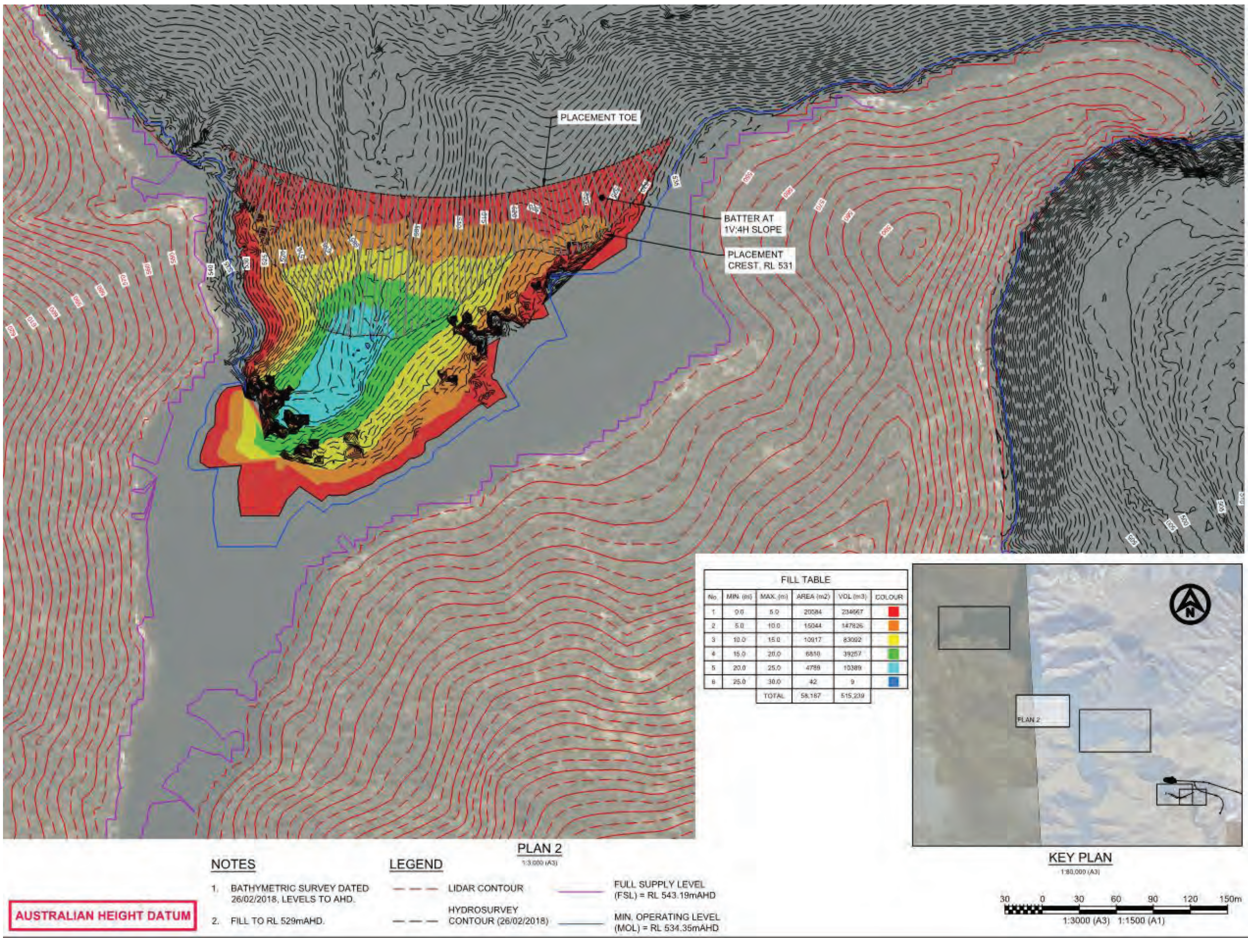

Figure 5: Subaqueous emplacement area at Plain Creek Bay.

2 Site conditions

2.1 Water level variation

The MOL and Full Supply Level (FSL) in Talbingo Reservoir are 534.4 m AHD[2] and 543.2 m AHD respectively. Historically, the water level in the reservoir has frequently been within 3 m of the FSL. The water level fluctuates throughout the year, largely as a result of the operation of the Snowy Hydro scheme and there is no marked seasonality. Operation of the Snowy Hydro scheme is not expected to change during construction of Snowy 2.0.

2.2 Bathymetry

Talbingo Reservoir was formed from reaches of the Yarrangobilly River, the Tumut River and their tributaries. Prior to the formation of the reservoir, the Yarrangobilly River in the vicinity of Middle Bay flowed in a north to north westerly direction with a gradient of approximately 1:125 (vertical:horizontal) through deeply incised valleys commonly referred to as ravine country. The thalweg of the reservoir is near the outside bend of the reservoir. In the vicinity of Middle Bay, the gradient of the reservoir below

[2] *AHD (Australian Height Datum) is s a geodetic datum for altitude measurement in Australia. Mean Sea Level measured on the open coast around Australia between1966-1968 was assigned the value of 0.00 on the Australian Height Datum.*

FSL, and perpendicular to the thalweg, is approximately 1:1 to 1:8 (vertical:horizontal) for sections A-A and B-B in **Figure 6** respectively. The flatter slope of 1:8 (vertical:horizontal) would have been influenced by sedimentation.

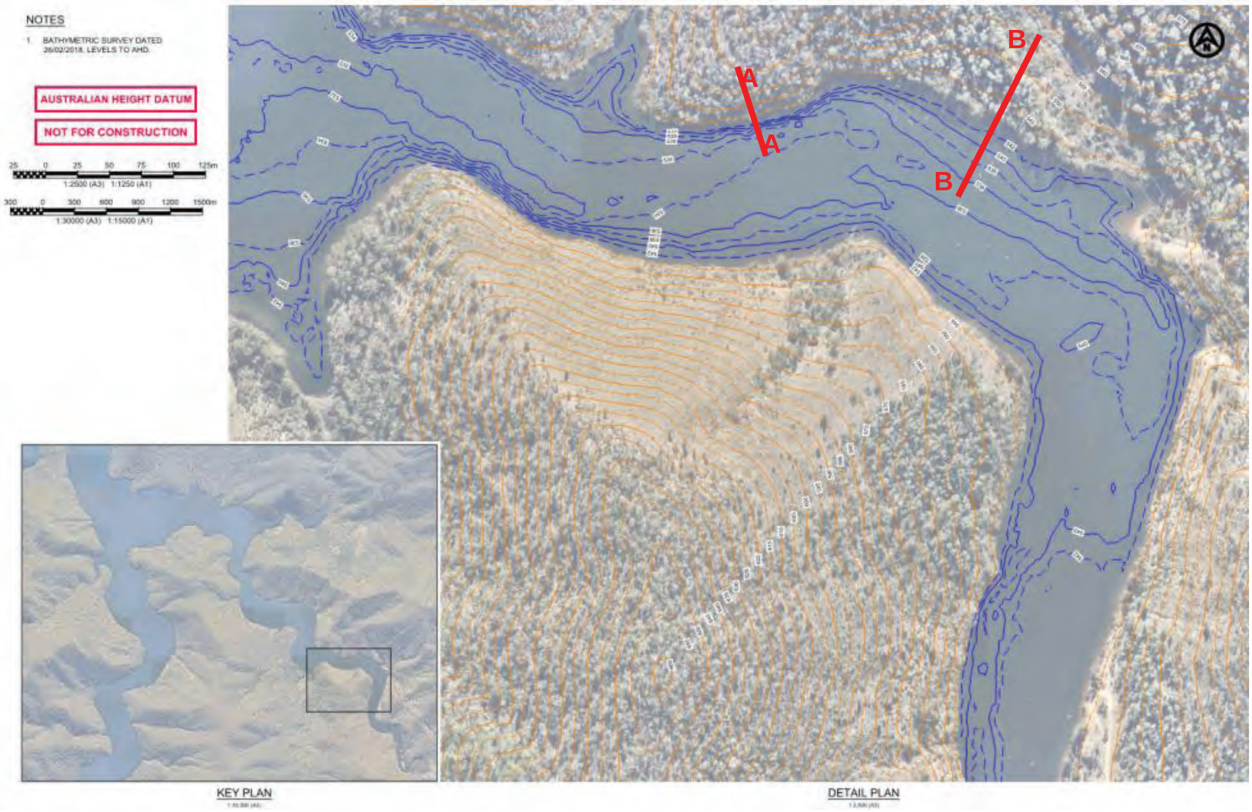

Figure 6: Bathymetry of Middle Bay

2.3 Water quality

A surface water quality program commenced for the broader Snowy 2.0 Project in February 2018. This program includes water quality sampling from Tantangara and Talbingo Reservoirs, all major watercourses that contribute runoff to the reservoirs, and watercourses within proximity to the potential surface infrastructure. At the time of writing this report, results were available for a single round of samples collected from Talbingo Reservoir in March 2018. Samples were collected from the surface, mid-depth, and bottom of the reservoir at five locations.

The following tabulation and description of water quality for Talbingo Reservoir is drawn from Snowy 2.0 Exploratory Works Surface Water Assessment prepared by EMM Consulting Pty Limited (June 2018).

Table 1 provides a summary of water quality results from Talbingo Reservoir. A summary of results from the Yarrangobilly and Tumut Rivers is also provided for context. The results are compared to guideline values that have been established using:

- default trigger values that were sourced from relevant sections of ANZECC (2000) where available; and

- low reliability trigger levels established for analytes that do not have default trigger values in ANZECC (2000) using the methods recommended in Section 8.3.4.5 of ANZECC (2000).

The water quality of Talbingo Reservoir can be characterised as having a neutral pH, low carbonate (hardness and alkalinity), low salinity, low levels of suspended solids, and low nutrient levels.

Dissolved metal concentrations were below guideline levels with the exception of copper and zinc. Dissolved copper concentrations ranged from below detection to 0.088 mg/l (the 90th percentile value was 0.056 mg/l) relative to a guideline value of 0.0014 mg/l (7 of the 15 samples exceeded the guideline value). Dissolved zinc concentrations ranged from below detection to 0.068 mg/l (the 90th percentile value was 0.065 mg/l) relative to a guideline value of 0.008 mg/l (11 of the 15 samples exceeded the guideline value). Elevated copper and zinc concentrations were not identified in either the Yarrangobilly River or Tumut River inflow locations.

Royal HaskoningDHV

Table 1: Water quality results summary: Talbingo Reservoir (March 2018)

			Talbingo Reservoir (March 2018)				Yarrangobilly River (Feb – April 2018)				Tumut River (Tals_SW_001)	
	Unit	Guideline Value	# Samples	10th Percentile[5]	Median	90th Percentile[5]	# Samples	Min	Median	Max	March 18	April 18
Field Parameters												
Temperature	ºC	-	-	-	-	-	11	13	19	22	22	13
Dissolved Oxygen (DO)	%	90 – 110[1]	-	-	-	-	8	**75**	**85**	93	**82**	**74**
Electrical Conductivity (EC)	µS/cm	30 – 350[1]	15	27	29	32	11	32	171	185	86	115
pH		6.5 – 8.5[1]	15	6.8	7.0	7.2	11	7.5	7.9	8.1	7.8	9.5
Oxidising and Reducing Potential (ORP)		-	-	-	-	-	11	112	130	143	137	183
Turbidity	NTU	2 - 25	-	-	-	-	7	<2	<2	5	<2	-
Analytical Results - General												
Suspended Solids (SS)	mg/l	-	15	<5	<5	5	11	<5	<5	<5	<5	<5
Total Alkalinity (as $CaCO_3$)	mg/l	-	15	<20	<20	<20	7	15	86	109	46	-
Total Hardness (as $CaCO_3$)	mg/l	-	15	6	7	10	4	9	89	97	-	30
Analytical Results - Nutrients												
Ammonia	mg/l	0.013	15	<0.01	<0.01	<0.01	7	<0.01	<0.01	<0.01	-	<0.01
Oxidised Nitrogen (NOx)	mg/l	0.015	15	<0.05	<0.05	**0.07**	7	<0.01	**0.03**	**1.9**	-	**0.03**
Total Kjeldahl Nitrogen (TKN)	mg/l	-	15	<0.2	<0.2	<0.2	7	<0.1	<0.1	<0.1	-	<0.1
Total Nitrogen (TN)	mg/l	0.25	15	<0.2	<0.2	<0.2	7	<0.1	<0.1	**1.9**	-	<0.1
Reactive Phosphorus	mg/l	0.015	15	<0.05	<0.05	<0.05	4	<0.01	<0.01	<0.01	-	<0.01
Total Phosphorus (TP)	mg/l	0.020	15	<0.05	<0.05	<0.05	7	0.01	0.01	0.02	-	<0.01
Total Organic Carbon	mg/l	-	15	<5	<5	<5	4	1	11	23	-	<1
Dissolved Organic Carbon	mg/l	-	15	<5	<5	<5	4	<1	<1	<1	-	<1
Analytical Results - Inorganics (Dissolved)												
Fluoride	mg/l	0.115[3]	15	<0.5	<0.5	<0.5	7	0.1	0.1	**0.6**	0.13	-
Analytical Results - Metals (Dissolved)												
Aluminium (Al)	mg/l	0.055	15	<0.05	<0.05	<0.05	4	0.01	0.01	**0.06**	-	<0.01

			Talbingo Reservoir (March 2018)				Yarrangobilly River (Feb – April 2018)				Tumut River (Tals_SW_001)	
	Unit	Guideline Value	# Samples	10th Percentile[5]	Median	90th Percentile[5]	# Samples	Min	Median	Max	March 18	April 18
Arsenic (As)	mg/l	0.013	15	<0.001	0.001	0.001	4	<0.001	<0.001	<0.001	-	<0.001
Barium (Ba)	mg/l	0.008[3]	15	<0.02	<0.02	<0.02	4	**0.011**	**0.0285**	**0.042**	-	**0.01**
Boron (Bo)	mg/l	0.370	15	<0.05	<0.05	<0.05	4	<0.05	<0.05	<0.05	-	<0.05
Cobalt (Co)	mg/l	0.0014[3]	15	<0.001	<0.001	<0.001	4	<0.001	<0.001	<0.001	-	<0.001
Total Chromium (Cr)	mg/l	0.001	15	<0.001	<0.001	<0.001	7	<0.001	<0.001	<0.001	<0.002	-
Copper (Cu)	mg/l	0.0014	15	<0.001	<0.001	**0.056**	4	<0.001	<0.001	<0.001	-	0.001
Manganese (Mn)	mg/l	1.9	15	<0.005	<0.005	0.007	4	0.001	0.001	0.002	-	0.008
Nickel (Ni)	mg/l	0.011	15	0.001	0.003	0.005	7	0.001	0.001	0.002	-	0.001
Lead (pb)	mg/l	0.0034	15	0.001	0.002	0.003	4	<0.001	<0.001	<0.001	-	<0.001
Selenium (Se)	mg/l	0.005	15	<0.001	<0.001	<0.001	4	<0.01	<0.01	<0.01	-	<0.01
Silver (Ag)	mg/l	0.0005	15	<0.005	<0.005	<0.005	4	<0.001	<0.001	<0.001	-	<0.001
Vanadium (Va)	mg/l	0.006[3]	15	<0.005	<0.005	<0.005	4	<0.01	<0.01	<0.01	-	<0.01
Zinc (Zn)	mg/l	0.008	15	<0.005	**0.024**	**0.065**	4	<0.005	<0.005	<0.005	-	<0.005
Mercury (Hg)	mg/l	0.00006	15	<0.0001	<0.0001	<0.0001	4	<0.0001	<0.0001	<0.0001	-	<0.0001
Iron (Fe)	mg/l	0.3[7]	15	<0.05	<0.05	<0.05	4	0.05	0.05	0.06	-	0.09

Notes:

1. The Guideline Values for field parameters and nutrients refer to the trigger values for physical and chemical stressors in south-east Australia (upland rivers) that are reported in Tables 3.3.2 and 3.3.3 of ANZECC (2000).

2. Unless otherwise stated, the Guideline Values for dissolved metals refer to the trigger values for slightly-moderately disturbed ecosystems that are reported in Table 3.4.1 of ANZECC (2000). It is noted that no hardness adjustments have been made.

3. The Guideline Value refers to a low reliability trigger value that has been established using the methods recommended in Section 8.3.4.5 of ANZECC (2000).

4. Value is below guideline values once adjustments for hardness are made using the hardness adjustment algorithms provided in Table 3.4.3 of ANZECC (2000).

5. If less than 10 samples are available, the minim value is reported instead of the 10th percentile value and the maximum value is reported instead of the 90th percentile value

***Bold** denotes Guideline Value or Range is exceeded.*

2.4 Sediments

Sampling of the sediment with the proposed dredge footprint was undertaken at 11 locations (refer **Figure 7**) in May 2018. Surface grab samples of the sediment were recovered at each location. Laboratory testing of all samples included:

- Nutrients: Nitrate/Nitrogen dioxide (NO_3/NO_2), Total Phosphorus P (Total P), Total Kjeldahl Nitrogen (TKN), Total Nitrogen (Total N), Total Inorganic Carbon (TIC), Total Organic Carbon (TOC)
- Particle size distribution (PSD)
- Total metals: Aluminium, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Vanadium and Zinc

Two samples were also tested for the following additional parameters:

- Benzene, toluene, ethylbenzene and xylene (BTEX);
- Organochlorine Pesticides;
- Organophosphorus Pesticides;
- Polycyclic Aromatic Hydrocarbons;
- Total Recoverable Hydrocarbons - 1999 NEPM Fractions;
- Total Recoverable Hydrocarbons - 2013 NEPM Fractions; and
- Volatile Organics.

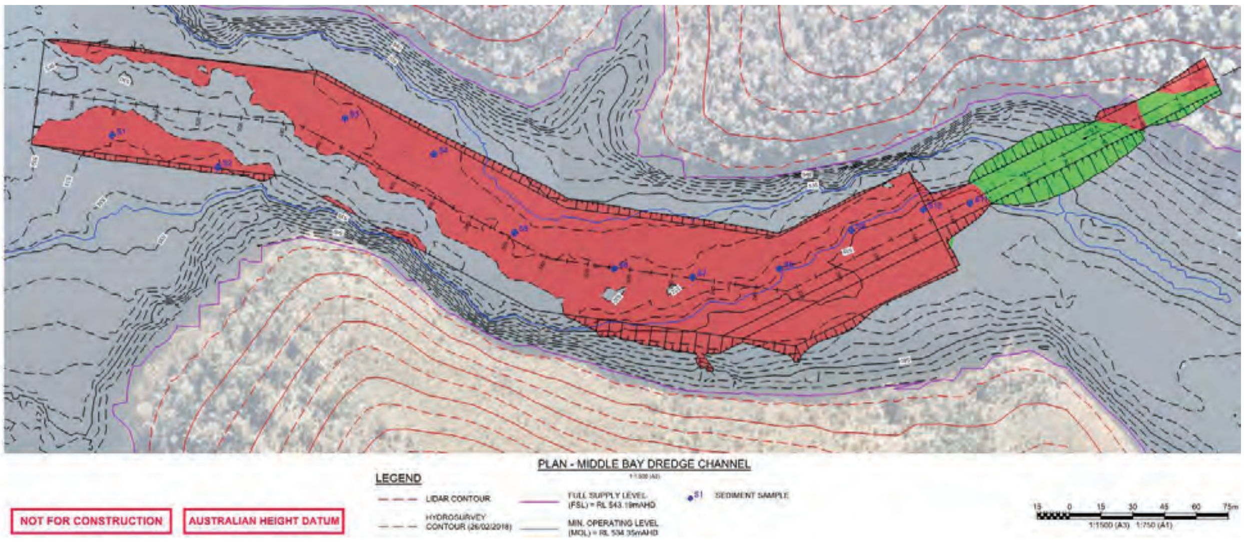

Figure 7: Middle Bay sediment sampling locations

Laboratory results of the physical testing of the sediments (PSD) are included in **Appendix A**. The results show that the sediments are fine textured, predominantly coarse silts.

Broader sampling throughout Talbingo Reservoir was undertaken on 29th March 2018. The PSD results from this broader sampling and testing are also included in **Appendix A**. Sediments from across the reservoir bed are soft and muddy in texture with a dominance of particles in the coarse silt fraction.

Laboratory results of the chemical testing of the sediments from the 11 locations throughout Middle Bay in May 2018 are included in **Appendix B**. The results have been summarised and compared to the screening levels provided in the National Assessment Guidelines for Dredging (NAGD) 2009 (refer **Table 2**). The NAGD screening levels are generally the same values as the Interim Sediment Quality Guideline (ISQG) low values provided in ANZECC/ ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality: Sediment Quality Guidelines. Updated sediment quality guidelines have also been published in by CSIRO in the Sediment Quality Assessment, A Practical Guide, (2016).

The NAGD screening levels and ISQG low trigger values form the basis for the assessment of risk that any sediment contaminants might pose to the environment. Concentrations less than the NAGD screening levels or ISQG low trigger values pose a low risk. Concentrations greater than the SL or ISQG low trigger values require further investigations in accordance with the ANZECC/ARMCANZ tiered framework for the assessment of contaminated sediments (refer **Figure 8**).

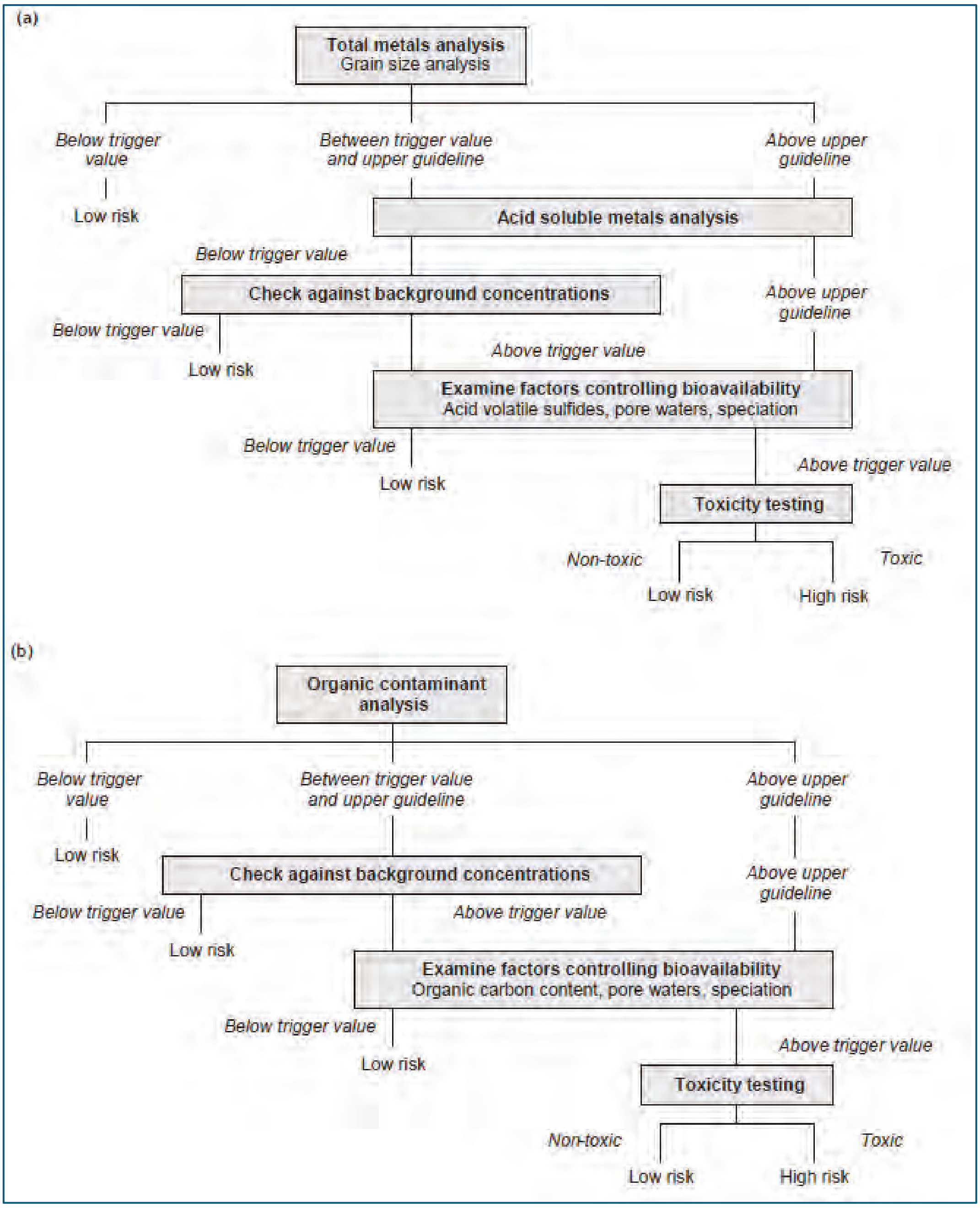

Figure 8: ANZECC/ARMCANZ tiered framework for the assessment of contaminated sediments for (a) metals and (b) organics

The concentrations in the two samples tested for the full suite of parameters were all below laboratory detection levels for the following parameters:

- BTEX;
- Organochlorine Pesticides;
- Organophosphorus Pesticides;
- Polycyclic Aromatic Hydrocarbons;
- Total Recoverable Hydrocarbons - 1999 NEPM Fractions;
- Total Recoverable Hydrocarbons - 2013 NEPM Fractions; and

- Volatile Organics.

The results of the total metal[3] analysis are summarised in **Table 2**. Concentrations of beryllium, boron, cadmium, mercury, molybdenum, selenium, and silver were all below laboratory detection in all samples. Concentrations of arsenic, chromium, lead, mercury, and zinc were all below the NAGD screening levels. Concentrations of nickel were greater than the NAGD screening levels at all locations. Concentrations of copper were greater than the NAGD screening levels at three locations.

The sediment quality results from broader sampling in Talbingo Reservoir on 29th March 2018 are included in **Appendix B** and shows similar, and in places, higher nickel concentrations throughout the reservoir. Although elevated, copper concentrations did not exceed the NAGD screening levels or ISQG low trigger values elsewhere in Talbingo Reservoir.

As per the ANZECC/ARMCANZ tiered framework for the assessment of potentially contaminated sediments, acid soluble metal analysis (dilute acid extraction, DAE) was undertaken for three samples (MBSQ05, MBSQ08 and MBSQ11). The results for the DAE are shown in **Table 3** together with the results of some preliminary elutriate testing. DAE and elutriate testing was undertaken on three samples as per the minimum requirements of the NAGD (2009) for the proposed dredge volume.

Sediment metals and organic contaminants may be present in a variety of forms, but only the bioavailable fraction will affect organisms. While not equivalent to the bioavailable fraction, concentrations measured in a DAE are a closer approximation to the bioavailable fraction than 'total' metals measured following a rigorous extraction using strong acids. As shown in **Table 3**, while the total concentrations of copper and nickel exceeded the NAGD screening level, DAE concentrations of copper and nickel were below the NAGD screening level indicating these that these metals are unlikely to be bioavailable.

Elutriate tests were used to investigate desorption of metals from sediment particulates to waters. They simulate the maximum concentrations released occurring during placement of dredged material. This release can occur by physical processes (e.g. directly from sediment porewater) or a variety of chemical changes, such as oxidation of metal sulphides and release of metals adsorbed to particles or organic matter. As described in NAGD (2009), an elutriate test is carried out by shaking the sediment samples with four times the volume of water from the disposal site at room temperature for 30 minutes, then allowing the sediment to settle for one hour. The supernatant is then centrifuged within sixty minutes, and analysed using analytical methods appropriate for determining ultratrace concentrations for comparison to ANZECC/ARMCANZ (2000) water quality trigger values. The relevant trigger values should not be exceeded after allowing for initial dilution, defined as 'that mixing which occurs within four hours of dumping'. Initial dilution will depend on a number of factors, such as water depth, layering in the water column, and current velocities and directions.

The elutriate test uses a dilution of 1:4, wet sediment: added water, and will greatly overestimate water quality impacts given that, within the four-hour period, significant dilution would be expected to occur. The test data are therefore corrected for the calculated dilution factor after the four-hour mixing period (after taking account of the test dilution of 1:4) to assess whether or not the water quality guidelines will be exceeded after disposal.

The results of the elutriate testing are presented in **Table 3.** Without allowance for dilution beyond the 1:4 test dilution, the results have been compared to the trigger values for dissolved metals for slightly-moderately disturbed ecosystems that are reported in Table 3.4.1 of ANZECC (2000). The results show

[3] *Including metalloids such as arsenic.*

exceedances of the water quality guidelines for chromium, copper, lead, and zinc. A total initial dilution of 1:25 is required for these contaminants to be below the water quality guideline in the water column at the placement location within four hours of placement. Based on the proposed subaqueous placement area (Plain Creek Bay), specifically the available water depth and allowance for a four hour mixing period, an initial dilution of 1:25 is considered to be readily achievable. As noted in the NAGD (2009), the elutriate test will greatly overestimate water quality impacts given that within the four-hour period, dilutions of the order of a hundred times can be expected. As part of the elutriate test, the bulk water sample from Middle Bay used in the elutriate testing was also tested. All contaminant concentrations for all parameters tested were below detection for the Middle Bay bulk water sample.

Results of water quality testing undertaken throughout the reservoir are discussed in **Section 2.3**. The 90th percentile Talbingo Reservoir values for the metals assessed in the elutriate testing are included in **Table 3**.

Table 2: Middle Bay sediment metal concentrations (mg/kg)

Metals	NAGD ML[1]	NAGD SL[2]	MBSQ01	MBSQ02	MBSQ03	MBSQ04	MBSQ05	MBSQ06	MBSQ07	MBSQ08	MBSQ09	MBSQ10	MBSQ11
Aluminium	-	-	21000	22000	22000	23000	21000	24000	22000	21000	22000	22000	21000
Arsenic	**70**	**20**	9.2	10	10	9.9	9.7	9.2	9.4	10	11	11	8.8
Barium	-	-	180	180	180	190	170	190	170	170	180	190	170
Beryllium	-	-	< 2	< 2	< 2	2	< 2	2.3	< 2	< 2	< 2	< 2	< 2
Boron	-	-	11	< 10	< 10	< 10	< 10	< 10	< 10	11	< 10	< 10	< 10
Cadmium	**10**	**1.5**	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	**370**	**80**	42	44	45	47	45	46	43	45	47	51	43
Cobalt	-	-	12	13	14	14	13	14	13	14	14	14	12
Copper	**270**	**65**	57	58	62	63	**66**	54	58	**65**	**71**	**73**	60
Iron	-	-	24000	25000	26000	27000	26000	27000	25000	26000	26000	27000	24000
Lead	**220**	**50**	26	26	26	27	26	26	25	26	27	28	24
Manganese	-	-	400	420	400	400	350	430	410	400	370	370	340
Mercury	**1**	**0.15**	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	-	-	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Nickel	**52**	**21**	**48**	**49**	**51**	**52**	**51**	**51**	**48**	**50**	**52**	**57**	**48**
Selenium	-	-	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Silver	**3.7**	**1.0**	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	-	-	28	29	30	31	29	31	28	29	30	32	28
Zinc	**410**	**200**	86	87	90	92	87	94	85	87	90	94	83

Note:

1. *ML – Maximum Level (NAGD 2009)*
2. *SL – Screening level (NAGD, 2009)*

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Table 3: DAE and elutriate testing

Parameter	Test method	Units	Guidelines		MBSQ05	MBSQ08	MBSQ11	Middle Bay Bulk Water	Talbingo Reservoir (90th percentile value)
Arsenic	Total metals	mg/kg	NAGD SL	65	9.7	10	8.8	-	-
	DAE	mg/kg	NAGD SL	65	1.2	3.3	3.1	-	-
	elutriate	mg/L	95% ANZECC[1]	0.013	0.0052	0.0051	0.0053	<0.0005	0.001
Chromium	Total metals	mg/kg	NAGD SL	50	45	45	43	-	-
	DAE	mg/kg	NAGD SL	50	4.8	5.4	6.8	-	-
	elutriate	mg/L	95% ANZECC	0.001	**0.0057**	**0.0024**	**0.0036**	<0.0005	<0.001
Copper	total metals	mg/kg	NAGD SL	65	**66**	**65**	60	-	-
	DAE	mg/kg	NAGD SL	65	33.7	41.7	38	-	-
	elutriate	mg/L	95% ANZECC	0.0014	**0.013**	**0.008**	**0.008**	<0.001	0.056
Lead	total metals	mg/kg	NAGD SL	50	26	26	24	-	-
	DAE	mg/kg	NAGD SL	50	22.4	27.3	28.3	-	-
	elutriate	mg/L	95% ANZECC	0.0034	**0.0053**	0.0024	0.003	<0.0002	0.003
Nickel	total metals	mg/kg	NAGD SL	21	**51**	**50**	**48**	**-**	-
	DAE	mg/kg	NAGD SL	21	10	12	14.6	-	-
	elutriate	mg/L	95% ANZECC	0.011	0.0054	0.0024	0.0033	<0.0005	0.005
Zinc	total metals	mg/kg	NAGD SL	200	87	87	83	-	-
	DAE	mg/kg	NAGD SL	200	29.6	35	42.3	-	-
	elutriate	mg/L	95% ANZECC	0.008	**0.044**	**0.033**	**0.034**	<0.005	0.065

1. 95% species protection for slightly-moderately disturbed ecosystems that are reported in Table 3.4.1 of ANZECC/ARMCANZ (2000)

2.5 Ecology

An aquatic ecology assessment has been completed for the Exploratory Works EIS (Cardno 2018). This includes a description of aquatic ecology applicable to Middle Bay and Talbingo Reservoir.

2.6 Noise

A noise impact assessment has been completed for the Exploratory Works EIS (EMM 2018). This includes noise conditions applicable to Middle Bay.

2.7 Air quality

An air quality impact assessment has been completed for the Exploratory Works EIS (Jacobs 2018). This includes air quality conditions applicable to Middle Bay.

2.8 Reservoir traffic and transport

Talbingo Reservoir is only accessible to trailerable watercraft. This limits recreational vessels to typically less than 7.5m in length. The majority of the foreshore of Talbingo Reservoir is steep and densely vegetated with submerged snags and woody debris near the shoreline. Boat access to the foreshore for recreational activities is limited. The main boat ramps are:

1. Public boat ramp adjacent to the reservoir wall at the northern end of the reservoir;
2. Public boat ramp near the confluence of Tumut River and Talbingo Reservoir on Elliot Way; and,
3. Unformed boat ramp at Middle Bay (near the proposed barge ramp) marked on the Roads and Maritime Services Boating Map as a hand launching ramp. The ramp is only accessible via a four wheel drive track.

Boat access to the foreshore is also provided at the southern end of Talbingo Spillway. The reservoir near the spillway is free of submerged snags and woody debris and the foreshore is suitable for beaching a vessel. The spillway has been levelled and it is accessible by car. This area is frequented by the boating community, particular those partaking in tow sports.

The main recreational activities on Talbingo Reservoir include fishing all year round and tow sports (water skiing, wakeboarding, etc.) during the warmer months (October to May). Fishing vessels would typically be 4 to 5m in length and tow sport vessels would typically be 5 to 6.5m in length.

Traffic counts were undertaken on Miles Franklin Drive between March and April 2018 (including Easter and ANZAC Day public holidays). The traffic counts provide an indication of boat launching at the public boat ramp adjacent to the reservoir wall assuming all cars with trailers are towing a boat. The traffic count indicated:

- 144 cars and trailers accessed the boat ramp over Easter with 52 of these occurring on Easter Sunday;
- the average number of cars and trailers accessing the boat ramp on a weekday (excluding public holidays) was 8 with a maximum of 19; and
- the average number of cars and trailers accessing the boat ramp on a weekend (excluding public holidays) was 11 with a maximum of 18.

This data does not include boat launching at the other boat ramps on Talbingo Reservoir. However, demand at the other two boat ramps is assumed to be less due to the isolated locations. Peak public boating demand on Talbingo Reservoir has been assumed to be 75 vessels per day. However, on a typical day, demand would be less than approximately 10 vessels

3 Impact assessment

This dredge impact assessment considers the dredging required for the navigation channel and toe of the barge ramp at Middle Bay. The assessment covers the dredging, transport of dredge material to the proposed land placement location, the potential subaqueous placement within the reservoir, and the impact of the potential subaqueous placement. The impact of dredged material transported to the on-land placement location is considered in the Snowy 2.0 Exploratory Works Excavated Rock Emplacement Areas Assessment prepared by SGM environmental Pty Limited.

3.1 Hydrodynamics

If placed in the reservoir, the dredged material would settle to the bed of the reservoir within Plain Creek Bay via the well and fall pipe fitted to the discharge barge. The dredged material would be of similar composition (fine textured sediments) to that on the bed of Plain Creek Bay. The proposed quantity of dredged material of 35,000 m^3 is relatively minor compared to the potential placement volume in Plain Creek Bay, which is approximately 500,000 m^3 (refer **Section 1.3.5**). Considered as a proportion of the total 'dead water storage' in Talbingo Reservoir below MOL, the dredged volume is less than 0.005%. Water movement at depth within the side bay and the reservoir generally is low, as evidenced by the fine textured sediments on the bed, i.e. the reservoir is a depositional environment.

It follows that the subaqueous placement of dredged material in Plain Creek Bay would not be expected to have any significant impact on hydrodynamics of the reservoir.

3.2 Geology and sediments

The results of sediment sampling and testing within Middle Bay, and more broadly throughout Talbingo Reservoir, show that the sediments are fine textured, predominantly coarse silts with similar concentrations of contaminants and nutrients across the 22 km range. The sediment to be dredged from Middle Bay would therefore be placed on material with similar physical and chemical properties i.e. like with like material.

As discussed in **Section 2.4**, the sediments at Middle Bay were tested for a broad range of organic and inorganic contaminants. Exceedances of relevant sediment quality guidelines were only observed for nickel and copper. Further investigation of the potential bioavailability of nickel and copper was undertaken by some DAE testing. DAE concentrations of copper and nickel were below the NAGD screening level indicating these metals are unlikely to be bioavailable and pose a low risk to the environment.

3.3 Ecology

An aquatic ecology assessment has been completed for the Exploratory Works EIS (Cardno 2018). This includes an assessment of impacts to aquatic ecology as a result of dredging and subaqueous placement of material, and is summarised in this section.

There would be a direct loss of aquatic habitat within the dredging and barge ramp structure footprints. Soft sediment habitat, aquatic macrophytes (albeit likely non-native) and wood debris within these areas would be displaced. As the depth of the reservoir bed would change following dredging, the aquatic habitat would be permanently altered, although soft-sediment biota similar to that currently present would be expected to rapidly re-colonise the dredge channel, albeit the assemblage may be somewhat different due to the greater depth here following dredging.

Subaqueous placement of dredged material would result in the smothering of any benthic fauna. Associated benthic biota, which would provide food for macroinvertebrates and fish, within this area would also be lost. Sampling of benthic infauna in Talbingo Reservoir (2 replicate grab samples at each of 12 sites) indicated the soft sediment was dominated numerically by oligochaetes (80 % of individuals) followed by nematodes (13 % of individuals) and small numbers of chironomids and copepods. The few corbiculid molluscs, caddisfly and a mayfly were possibly of watercourse origin. These taxa are common and none are of conservation value though all would provide food for fish and other invertebrates. The potential for recovery of soft sediment biota is low given the likely depth of burial (> 1m) and the addition of much coarser material (rocks up to 1 m diameter). Ultimately, there would likely be a permanent change in aquatic habitat. However, this area is a very small proportion (approximately 0.3 %) of the total reservoir area and the change would be negligible at the scale of the entire reservoir. Further, the addition of larger rocks would be expected to create new interstices and refuges for fish and macroinvertebrates. In particular, rocks may provide habitat for any trout cod and Murray cod and a hard surface suitable for attaching adhesive eggs.

Similar to the dredge area, mobile aquatic fauna such as fish would predominantly avoid the placement area during subaqueous placement and would be expected to return to the area following completion of the placement activities.

Placement in a confined placement location as proposed (rather than spreading the material across a wider area of the reservoir) is preferred to minimise any impacts on aquatic ecology.

Impacts to wood debris and in particular aquatic plants along shallow sections of the reservoir banks would be avoided as placement would be undertaken no shallower than -3 m below MOL (i.e. where more valuable aquatic habitat, such as aquatic plants, would be less likely to occur).. The placement locations are expected to contain submerged timber (dead trees). Prior removal of submerged timber within the dredge footprint and subaqueous placement area may be required to a sufficient level to allow safe navigation by barges and push tugs. Due to the importance of the trees in providing habitat for fish and other aquatic biota, wood debris from tree removal is proposed to be spread back into the reservoir in relatively shallow water (0-10 m) where fish are more likely to occur.

3.4 Water quality

The proposed dredging program is expected to generate turbidity as a result of the dredging of the sediments within Middle Bay and, if undertaken, at the location of subaqueous placement of the dredged material.

At the dredge site, removal of sediment would be by a barge mounted excavator. As described in **Section 2.3**, typically, the excavator would load the dredged material at around 30% water content by weight and the dredged material would not be drained at the dredging site. In order to minimise water quality impacts dredging would take place within a silt curtain or moon pool.

Should dredged material be placed within the reservoir, the excavator would load dredge material directly onto the transport barge. The bulwarks (‘hungry boards’) would be water tight to mitigate loss of water and fines into the water column. Depending on the project sequencing, skip bins may still be used to mitigate loss of water and fines into the water column in lieu of bulwarks, which would require the barge to be modified.

The transport barge would be towed to the placement area and the material would be transferred to the discharge barge. An excavator or similar would be located on the transport barge to transfer material to the well on the discharge barge.

The discharge barge would be fitted with a receiving well and fall pipe to discharge dredged material below the water surface. The use of a discharge barge would minimise surface turbidity during subaqueous placement. The discharge barge would also be enclosed within a silt curtain.

As discussed in **Section 2.3**, results of the elutriate testing without allowance for dilution beyond the 1:4 test dilution exceeded the copper and zinc trigger values for slightly-moderately disturbed ecosystems ANZECC (2000). However, it has been conservatively estimated that an initial dilution (mixing which occurs within four hours of placement) of 1:25 would be readily achievable at the placement location. Allowing for initial dilution, metal concentrations in the water column would be less than the relevant ANZECC trigger values and therefore adverse water quality impacts due to the release of metals into the water column are not expected.

In addition, the results of the baseline water quality testing from throughout Talbingo Reservoir undertaken in March 2018 showed some existing zinc and copper exceedances of the relevant ANZECC trigger values similar to those observed in the elutriate testing. This suggests that marginally elevated metal concentrations, in excess of the ANZECC trigger values would not be a concern to the ecosystem.

As with all construction activities there would be risk of fuel and oil spills as a result of the proposed dredging. All activities would be carried out in a manner that minimises the potential for leaks and spills and in compliance with the waste handling and disposal procedures outlined in a dredging environmental management plan (DEMP).

3.5 Noise

Noise that would be generated by the dredging activities would be from the proposed plant and equipment comprising barges, tugs, excavators and trucks. Noise impacts from these activities have been assessed as part of the noise impact assessment for the Exploratory Works EIS and can be found in the Snowy 2.0 Exploratory Works NoiseNoise and Vibration Impact Assessment prepared by EMM Consulting Pty Limited (June 2018).

3.6 Air quality

The dredged material would be transported wet and most likely with a film of water overlying the dredged material in the skips and/or barges to the proposed land and subaqueous placement locations. The generation of dust due to the dredging and transport activities is considered unlikely due to the moisture content of the sediments.

Impacts on air quality from the plant and equipment exhaust during the short period in which the dredging would be undertaken are expected to be negligible compared to road transport of material as described in in Snowy 2.0 Exploratory Works Air Quality and Greenhouse Gas Impact Assessment prepared by Jacobs (June 2018).

3.7 Reservoir traffic

Daily construction barge movements during the dredging are anticipated between Middle Bay and Plain Creek Bay (a round journey of 10 km). Barges and tugs will be marked with the required navigation and warning devices (including lights) when in motion and stationary. The main restrictions on recreational use of the reservoir associated with dredging and subaqueous disposal during the Exploratory Works would be:

1. Closure of the informal boat launching ramp near Middle Bay;
2. Restricted public boat access to the Yarrangobilly Arm upstream of the low water barge turning basin to prevent interactions with barge operations and to prevent members of the public making landfall in Middle Bay construction areas; and,
3. Restricted public boat traffic close to subaqueous placement in Plain Creek Bay, including in the vicinity of any silt curtains.

Recreational vessel demand and construction movements are relatively minor relative to the size of the reservoir. There would be ample space available to avoid collisions between construction vessels and recreational vessels. Impacts to recreational users are assessed in the Recreational user impact assessment (TRC 2018).

4 Management of impacts

A dredge environmental management plan (DEMP) should be developed for the works comprising the following management measures.

Impact	Ref #	Environmental management measures
Biodiversity		
Aquatic impacts	01	Subaqueous placement of any dredged material would be in a confined placement location rather than spreading the material across a wider section of the reservoir bed.
	02	Wood debris from tree removal within the dredge footprint and subaqueous placement location would be spread back into the reservoir in relatively shallow water (0-10 m) where fish are more likely to occur.
	03	The subaqueous placement monitoring program for Talbingo Reservoir (described in the Subaqueous Excavated Rock Placement Report) will be implemented and include monitoring of pre-placement and post-placement bathymetry at the placement location and monitoring of water quality (see water quality measures below).
	04	Mapping of aquatic habitats in the dredge areas and subaqueous placement area will be completed prior to dredging including searches for crayfish burrows along the shoreline, as these could indicate the presence of Murray Crayfish. Deployment of crayfish traps along the shorelines adjacent to the dredging areas could be used to re-locate any large mobile invertebrates (including any Murray Crayfish) from these areas to nearby sections of the reservoir that would not be affected by works.
Water		
Hydrodynamics	01	Subaqueous placement of any dredged material would be localised in a side bay.
Water Quality	02	Subaqueous placement of any dredged material would be below MOL.
	03	Survey monitoring of pre-placement and post-placement bathymetry at the placement location would be undertaken to assess the accuracy of subaqueous placement, batter slopes of placed material and any underwater spreading of the placed material.
	03	A water quality monitoring program would be commenced at the dredge area and subaqueous placement area prior to the dredging and any subaqueous placement commencing. A structured management response to alerts and any exceedances of established triggers would be implemented as described in the Subaqueous Excavated Rock Placement Report.
	04	Physical and chemical characteristics of the sediment at the subaqueous placement area would be confirmed prior to the placement of dredged material.
	05	A total suspended solids (TSS) and turbidity (NTU) relationship would be developed for purposes of water quality monitoring.
	06	A silt curtain would be placed around the BHD at the dredge area.

	07	The dredged material once placed on barges would not be drained at the dredging site. Barges for subaqueous placement and skip bins for land placement would be watertight.
	08	All activities would be carried out in a manner that minimises the potential for leaks and spills and in compliance with waste handling and disposal procedures outlined in a DEMP.
	09	Pollution controls, spill kits would be available on all plant and equipment.
	10	A discharge barge and fall pipe arrangement would be used at the subaqueous placement area to minimise surface turbidity.
	11	A silt curtain would be placed around the discharge barge at the subaqueous placement area to minimise surface turbidity.
	12	The placement location in a side bay would improve ability to incorporate environmental controls

5 Conclusion

With the adoption of the proposed mitigation and monitoring measures, impacts on the environmental values of Talbingo Reservoir are expected to be negligible due to the dredging and subaqueous placement of dredged material.

6 References

ANZECC/ ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality

Cardno (2018) Snowy 2.0 Exploratory Works Aquatic ecology assessment. Prepared on behalf of Snowy Hydro Limited.

CSIRO (2016) Sediment Quality Assessment, A Practical Guide, Edited by: Stuart Simpson, Graeme Batley

EMM Consulting Pty Ltd (EMM) (2018) Snowy 2.0 Exploratory Works Noise and vibration impact assessment. Prepared on behalf of Snowy Hydro Limited.

Jacobs (2018) Snowy 2.0 Exploratory Works Air quality and greenhouse gas impact assessment. Prepared on behalf of Snowy Hydro Limited.

National Assessment Guidelines for Dredging (NAGD) 2009

Newell, R. C., Seiderer, L. J., and Hitchcock, D. R. (1998). The impact of dredging works in coastal waters: A review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. Oceanography and Marine Biology: An Annual Review, Vol 36, pg 127-178.

SGM environmental (2018) Snowy 2.0 Exploratory Works Excavated rock emplacement areas assessment. Prepared on behalf of Snowy Hydro Limited.

TRC (2018) Snowy 2.0 Exploratory Works Recreational user impact assessment. Prepared on behalf of Snowy Hydro Limited.

Appendix A – PSD Testing

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ANALYSIS REPORT SOIL

PROJECT NO:	**EW180905**	**Date of Issue:**	**11/04/2018**
Customer:	EUROFINS VIC	Report No:	1
Address:	2-5 Kingston Town Close OAKLEIGH VIC 3164	Date Received:	4/04/2018
		Matrix:	Soil
Attention:	Nibha Vaidya	Location:	591871
Phone:	03 8564 5000	Sampler ID:	client
Fax:	-	Date of Sampling:	26/03/2018
Email:	EnviroReportsAu@eurofins.com	Sample Condition:	Acceptable

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

Signed: Lisa Nies

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

NATA Accredited Laboratory 12360
Accredited for compliance with ISO/IEC 17025

This analysis relates to the sample submitted and it is the client's responsibility to make certain the sample is representative of the matrix to be tested.

Samples will be discarded one month after the date of this report. Please advise if you wish to have your sample/s returned.

results you can rely on

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35519	18-Ma35520	18-Ma35521	18-Ma35522
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-1**	**180905-2**	**180905-3**	**180905-4**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	3.4	0.6	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.3	0.0	0.0
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.7	1.0	0.1	0.4
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.1	1.5	1.8	0.8
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	1.9	1.3	1.3	1.7
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	1.6	1.4	3.7	2.9
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	73.4	81.3	72.5	71.3
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	5.9	5.0	10.5	12.6
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.1	7.4	10.1	10.3

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35523	18-Ma35524	18-Ma35525	18-Ma35526
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-5**	**180905-6**	**180905-7**	**180905-8**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.2	2.6	0.1
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	1.6	0.2
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.1	0.6	2.9	1.5
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	0.9	2.1	1.9	2.9
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	0.9	1.3	1.2	3.0
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.9	2.1	0.8	3.8
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	70.5	66.7	77.3	70.5
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	13.3	17.0	3.0	8.5
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	11.5	9.9	8.5	9.7

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35527	18-Ma35528	18-Ma35529	18-Ma35530
CLIENT SAMPLE ID								
DEPTH								
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-9**	**180905-10**	**180905-11**	**180905-12**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	2.7	0.0	0.0	0.1
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	1.7	0.2	0.1	0.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	3.5	0.7	0.2	0.5
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.7	2.4	1.1	1.1
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.4	2.1	2.2	5.3
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	1.7	2.6	2.7	7.8
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	69.0	76.8	76.2	63.4
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	5.5	4.8	4.6	9.9
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.7	10.3	12.7	11.9

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35531	18-Ma35532	18-Ma35533	18-Ma35534
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-13**	**180905-14**	**180905-15**	**180905-16**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.7	0.6	0.1	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.6	0.1	0.1	0.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.7	0.9	0.7	1.1
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.3	1.8	2.6	2.9
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.4	1.7	2.5	3.0
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	3.5	3.0	4.1	4.9
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	72.3	72.2	78.2	79.5
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	8.5	11.9	5.6	4.3
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	7.0	7.8	6.0	4.2

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35535	18-Ma35536	18-Ma35537	18-Ma35528
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-17**	**180905-18**	**180905-19**	**180905-20**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.1	0.0	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.1	0.3	0.0
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.3	0.8	2.1	1.5
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	2.3	2.1	3.4	2.4
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.6	2.1	3.0	2.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.0	2.7	2.6	2.3
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	81.8	81.1	77.9	79.3
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	5.2	5.0	4.6	4.9
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	5.7	6.0	6.1	7.0

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35539	18-Ma35540	18-Ma35541	18-Ma35542
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	Method Description	Method Reference	Units	LOR	180905-21	180905-22	180905-23	180905-24
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.2	0.4	0.1	0.2
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.3	1.9	0.7	1.0
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	4.1	3.5	1.8	4.4
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	4.7	3.7	2.1	1.9
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	4.1	3.2	2.3	9.7
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	76.4	79.4	78.1	61.6
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	3.9	3.7	4.7	4.9
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	5.4	4.1	10.2	10.2

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35543	18-Ma35544	18-Ma35545	18-Ma35546
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-25**	**180905-26**	**180905-27**	**180905-28**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.8	0.7
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.3	1.3	1.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.4	0.9	3.2	2.6
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	2.5	3.3	4.1	4.1
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.5	3.1	4.1	4.3
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.6	3.5	5.7	5.5
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	77.7	76.9	61.7	66.6
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	4.2	3.9	8.5	7.8
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.1	8.1	10.5	7.3

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35547	18-Ma35548	18-Ma35549	18-Ma35550
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-29**	**180905-30**	**180905-31**	**180905-32**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	8.2	1.1	0.0	0.4
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	3.0	1.3	0.7	1.2
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	3.1	2.8	2.1	2.1
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	5.9	5.6	3.2	2.3
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	3.8	3.6	2.1	1.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	3.0	4.7	2.9	1.5
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	45.2	60.4	79.8	81.1
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	11.2	9.3	4.2	4.1
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	16.5	11.3	5.1	5.9

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PROJECT NO: EW180905 **Location: 591871**

					18-Ma35551	18-Ma35552	18-Ma35553	18-Ma35554
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-33**	**180905-34**	**180905-35**	**180905-36**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.0	0.7
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.1	0.5	0.6	1.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.0	1.7	2.3	4.2
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	1.7	2.0	2.8	9.8
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.6	0.9	8.6	11.9
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.5	1.4	10.7	6.5
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	79.4	79.2	59.0	50.0
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	4.1	5.2	7.5	7.0
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	8.5	9.1	8.4	8.7

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35555	18-Ma35556	18-Ma35596	18-Ma35597
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-37**	**180905-38**	**180905-39**	**180905-40**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	24.6	26.5	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	7.7	7.8	0.0	0.0
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	5.0	7.7	0.1	0.2
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.4	4.0	0.5	0.5
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	1.8	2.7	0.2	0.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	1.4	1.8	0.1	0.6
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	43.2	36.7	76.4	73.7
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	4.7	4.7	10.5	11.0
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	8.2	8.2	12.2	13.5

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35598	18-Ma35599	18-Ma35600	18-Ma35601
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	Method Description	Method Reference	Units	LOR	180905-41	180905-42	180905-43	180905-44
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.7	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.2	0.3
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.2	0.0	0.4	0.8
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	0.5	0.1	0.6	0.6
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	0.3	0.2	0.5	0.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	0.2	0.6	0.9	0.4
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	76.4	72.0	76.8	76.3
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	10.7	13.2	9.7	9.5
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	11.8	14.0	10.2	11.6

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

Test Parameter	Method Description	Method Reference	Units	LOR	18-Ma35602	18-Ma35603	18-Ma35604	18-Ma35605
				CLIENT SAMPLE ID	18-Ma35602	18-Ma35603	18-Ma35604	18-Ma35605
				DEPTH				
					180905-45	180905-46	180905-47	180905-48
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	1.4	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.1	1.3	0.1	0.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.5	1.5	0.3	0.2
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	0.6	1.7	0.6	0.4
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	0.5	2.1	1.3	0.7
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.3	3.5	2.2	1.9
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	75.3	65.5	75.1	73.0
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	11.0	11.0	7.9	9.5
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.6	12.0	12.4	14.3

NB: LOR is the Lowest Obtainable Reading.

DOCUMENT END

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ANALYSIS REPORT SOIL

PROJECT NO:	**EW180905**	**Date of Issue:**	**11/04/2018**
Customer:	EUROFINS VIC	Report No:	1
Address:	2-5 Kingston Town Close OAKLEIGH VIC 3164	Date Received:	4/04/2018
		Matrix:	Soil
Attention:	Nibha Vaidya	Location:	591871
Phone:	03 8564 5000	Sampler ID:	client
Fax:	-	Date of Sampling:	26/03/2018
Email:	EnviroReportsAu@eurofins.com	Sample Condition:	Acceptable

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

Signed: Lisa Nies

NATA Accredited Laboratory 12360
Accredited for compliance with ISO/IEC 17025

This analysis relates to the sample submitted and it is the client's responsibility to make certain the sample is representative of the matrix to be tested.

Samples will be discarded one month after the date of this report. Please advise if you wish to have your sample/s returned.

results you can rely on

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35519	18-Ma35520	18-Ma35521	18-Ma35522
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-1**	**180905-2**	**180905-3**	**180905-4**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	3.4	0.6	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.3	0.0	0.0
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.7	1.0	0.1	0.4
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.1	1.5	1.8	0.8
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	1.9	1.3	1.3	1.7
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	1.6	1.4	3.7	2.9
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	73.4	81.3	72.5	71.3
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	5.9	5.0	10.5	12.6
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.1	7.4	10.1	10.3

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35523	18-Ma35524	18-Ma35525	18-Ma35526
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-5**	**180905-6**	**180905-7**	**180905-8**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.2	2.6	0.1
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	1.6	0.2
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.1	0.6	2.9	1.5
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	0.9	2.1	1.9	2.9
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	0.9	1.3	1.2	3.0
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.9	2.1	0.8	3.8
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	70.5	66.7	77.3	70.5
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	13.3	17.0	3.0	8.5
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	11.5	9.9	8.5	9.7

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35527	18-Ma35528	18-Ma35529	18-Ma35530
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-9**	**180905-10**	**180905-11**	**180905-12**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	2.7	0.0	0.0	0.1
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	1.7	0.2	0.1	0.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	3.5	0.7	0.2	0.5
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.7	2.4	1.1	1.1
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.4	2.1	2.2	5.3
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	1.7	2.6	2.7	7.8
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	69.0	76.8	76.2	63.4
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	5.5	4.8	4.6	9.9
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.7	10.3	12.7	11.9

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35531	18-Ma35532	18-Ma35533	18-Ma35534
CLIENT SAMPLE ID								
DEPTH								
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-13**	**180905-14**	**180905-15**	**180905-16**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.7	0.6	0.1	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.6	0.1	0.1	0.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.7	0.9	0.7	1.1
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.3	1.8	2.6	2.9
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.4	1.7	2.5	3.0
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	3.5	3.0	4.1	4.9
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	72.3	72.2	78.2	79.5
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	8.5	11.9	5.6	4.3
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	7.0	7.8	6.0	4.2

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35535	18-Ma35536	18-Ma35537	18-Ma35528
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-17**	**180905-18**	**180905-19**	**180905-20**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.1	0.0	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.1	0.3	0.0
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.3	0.8	2.1	1.5
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	2.3	2.1	3.4	2.4
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.6	2.1	3.0	2.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.0	2.7	2.6	2.3
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	81.8	81.1	77.9	79.3
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	5.2	5.0	4.6	4.9
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	5.7	6.0	6.1	7.0

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35539	18-Ma35540	18-Ma35541	18-Ma35542
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-21**	**180905-22**	**180905-23**	**180905-24**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.2	0.4	0.1	0.2
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.3	1.9	0.7	1.0
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	4.1	3.5	1.8	4.4
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	4.7	3.7	2.1	1.9
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	4.1	3.2	2.3	9.7
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	76.4	79.4	78.1	61.6
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	3.9	3.7	4.7	4.9
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	5.4	4.1	10.2	10.2

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35543	18-Ma35544	18-Ma35545	18-Ma35546
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-25**	**180905-26**	**180905-27**	**180905-28**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.8	0.7
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.3	1.3	1.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.4	0.9	3.2	2.6
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	2.5	3.3	4.1	4.1
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.5	3.1	4.1	4.3
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.6	3.5	5.7	5.5
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	77.7	76.9	61.7	66.6
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	4.2	3.9	8.5	7.8
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.1	8.1	10.5	7.3

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35547	18-Ma35548	18-Ma35549	18-Ma35550
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-29**	**180905-30**	**180905-31**	**180905-32**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	8.2	1.1	0.0	0.4
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	3.0	1.3	0.7	1.2
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	3.1	2.8	2.1	2.1
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	5.9	5.6	3.2	2.3
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	3.8	3.6	2.1	1.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	3.0	4.7	2.9	1.5
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	45.2	60.4	79.8	81.1
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	11.2	9.3	4.2	4.1
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	16.5	11.3	5.1	5.9

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35551	18-Ma35552	18-Ma35553	18-Ma35554
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-33**	**180905-34**	**180905-35**	**180905-36**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.0	0.7
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.1	0.5	0.6	1.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	1.0	1.7	2.3	4.2
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	1.7	2.0	2.8	9.8
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	2.6	0.9	8.6	11.9
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.5	1.4	10.7	6.5
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	79.4	79.2	59.0	50.0
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	4.1	5.2	7.5	7.0
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	8.5	9.1	8.4	8.7

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35555	18-Ma35556	18-Ma35596	18-Ma35597
				CLIENT SAMPLE ID				
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-37**	**180905-38**	**180905-39**	**180905-40**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	24.6	26.5	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	7.7	7.8	0.0	0.0
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	5.0	7.7	0.1	0.2
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	3.4	4.0	0.5	0.5
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	1.8	2.7	0.2	0.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	1.4	1.8	0.1	0.6
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	43.2	36.7	76.4	73.7
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	4.7	4.7	10.5	11.0
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	8.2	8.2	12.2	13.5

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ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

					18-Ma35598	18-Ma35599	18-Ma35600	18-Ma35601
CLIENT SAMPLE ID								
DEPTH								
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-41**	**180905-42**	**180905-43**	**180905-44**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.7	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.0	0.0	0.2	0.3
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.2	0.0	0.4	0.8
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	0.5	0.1	0.6	0.6
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	0.3	0.2	0.5	0.5
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	0.2	0.6	0.9	0.4
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	76.4	72.0	76.8	76.3
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	10.7	13.2	9.7	9.5
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	11.8	14.0	10.2	11.6

ANALYSIS REPORT

PROJECT NO: EW180905 **Location: 591871**

				CLIENT SAMPLE ID	18-Ma35602	18-Ma35603	18-Ma35604	18-Ma35605
				DEPTH				
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**180905-45**	**180905-46**	**180905-47**	**180905-48**
Gravel 2.36-4.75mm	Sieve	AS1289.3.6.3	%	na	0.0	1.4	0.0	0.0
Very Coarse Sand 1.18-2.36mm	Sieve	AS1289.3.6.3	%	na	0.1	1.3	0.1	0.1
Coarse Sand 0.6-1.18mm	Sieve	AS1289.3.6.3	%	na	0.5	1.5	0.3	0.2
Medium Sand 0.3-0.6mm	Sieve	AS1289.3.6.3	%	na	0.6	1.7	0.6	0.4
Fine Sand 0.15-0.30mm	Sieve	AS1289.3.6.3	%	na	0.5	2.1	1.3	0.7
Very Fine Sand 0.075-0.15mm	Sieve	AS1289.3.6.3	%	na	2.3	3.5	2.2	1.9
Coarse Silt 0.02-0.075mm	Hydrometer	AS1289.3.6.3	%	na	75.3	65.5	75.1	73.0
Fine Silt 0.002-0.020mm	Hydrometer	AS1289.3.6.3	%	na	11.0	11.0	7.9	9.5
Clay <0.002mm	Hydrometer	AS1289.3.6.3	%	na	9.6	12.0	12.4	14.3

NB: LOR is the Lowest Obtainable Reading.

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Appendix B – Chemical Testing

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Cardno (NSW/ACT) Pty Ltd
Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Attention: **Andrew Bradford**

Report **591871-S**
Project name SNOWY HYDRO 2.0
Project ID 59918111/003
Received Date Mar 29, 2018

Client Sample ID			**TALN_SQ_03D 1**	**TALN_SQ_03D 2**	**TALS_SQ_11A 1**	**TALS_SQ_11A 2**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35519**	**S18-Ma35520**	**S18-Ma35521**	**S18-Ma35522**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 27, 2018**	**Mar 27, 2018**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	93	104	98	91
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TALN_SQ_03D 1	TALN_SQ_03D 2	TALS_SQ_11A 1	TALS_SQ_11A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35519	S18-Ma35520	S18-Ma35521	S18-Ma35522
Date Sampled			Mar 26, 2018	Mar 26, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	93	104	98	91
Toluene-d8 (surr.)	1	%	61	69	70	59
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100

Client Sample ID			TALN_SQ_03D 1	TALN_SQ_03D 2	TALS_SQ_11A 1	TALS_SQ_11A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35519**	**S18-Ma35520**	**S18-Ma35521**	**S18-Ma35522**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 27, 2018**	**Mar 27, 2018**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	97	82	59	94
p-Terphenyl-d14 (surr.)	1	%	120	99	115	119
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	116	100	79	101
Tetrachloro-m-xylene (surr.)	1	%	109	138	144	80

Client Sample ID			TALN_SQ_03D 1	TALN_SQ_03D 2	TALS_SQ_11A 1	TALS_SQ_11A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35519	S18-Ma35520	S18-Ma35521	S18-Ma35522
Date Sampled			Mar 26, 2018	Mar 26, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	106	81	106	114
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.4	0.3	0.3	0.2
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1200	1000	1400	1400
Total Nitrogen (as N)	10	mg/kg	1200	1000	1400	1400
Total Organic Carbon	0.1	%	4.3	3.6	3.3	3.4
Phosphorus	5	mg/kg	410	460	1200	950
% Moisture	1	%	64	63	58	57
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	27000	27000	49000	43000
Arsenic	2	mg/kg	5.1	4.5	11	7.4
Barium	10	mg/kg	170	170	290	260
Beryllium	2	mg/kg	< 2	< 2	2.1	2.0

Client Sample ID			TALN_SQ_03D 1	TALN_SQ_03D 2	TALS_SQ_11A 1	TALS_SQ_11A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35519**	**S18-Ma35520**	**S18-Ma35521**	**S18-Ma35522**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 27, 2018**	**Mar 27, 2018**
Test/Reference	LOR	Unit				
Heavy Metals						
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	17	20	110	95
Cobalt	5	mg/kg	6.6	7.3	29	27
Copper	5	mg/kg	25	28	51	46
Iron	20	mg/kg	26000	22000	64000	49000
Lead	5	mg/kg	21	22	21	19
Manganese	5	mg/kg	470	480	1000	1100
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	12	15	100	87
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	32	32	120	100
Zinc	5	mg/kg	58	66	110	96

Client Sample ID			TALS_SQ_11B 1	TALS_SQ_11B 2	TALS_SQ_11C 1	G01TALS_SQ_1 1C2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35523**	**S18-Ma35524**	**S18-Ma35525**	**S18-Ma35526**
Date Sampled			**Mar 27, 2018**	**Mar 27, 2018**	**Mar 27, 2018**	**Mar 27, 2018**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 40
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.4
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.6
4-Bromofluorobenzene (surr.)	1	%	103	78	92	101
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1

Client Sample ID			TALS_SQ_11B 1	TALS_SQ_11B 2	TALS_SQ_11C 1	G01 TALS_SQ_1 1C2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35523	S18-Ma35524	S18-Ma35525	S18-Ma35526
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.4
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.2
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.6
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	103	78	92	101
Toluene-d8 (surr.)	1	%	69	59	60	65

Client Sample ID			TALS_SQ_11B 1	TALS_SQ_11B 2	TALS_SQ_11C 1	G01TALS_SQ_1 1C2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35523	S18-Ma35524	S18-Ma35525	S18-Ma35526
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
NaphthaleneN02	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 1
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 40
TRH C6-C10 less BTEX (F1)N04	20	mg/kg	< 20	< 20	< 20	< 40
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)N01	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluorantheneN07	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	115	66	104	124
p-Terphenyl-d14 (surr.)	1	%	109	127	87	132
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05

Client Sample ID			TALS_SQ_11B 1	TALS_SQ_11B 2	TALS_SQ_11C 1	G01TALS_SQ_1 1C2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35523	S18-Ma35524	S18-Ma35525	S18-Ma35526
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	117	129	113	75
Tetrachloro-m-xylene (surr.)	1	%	103	127	110	76
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	96	94	88	117

Client Sample ID			TALS_SQ_11B 1	TALS_SQ_11B 2	TALS_SQ_11C 1	G01TALS_SQ_1 1C2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35523	S18-Ma35524	S18-Ma35525	S18-Ma35526
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.2	0.2	0.2	0.2
Total Kjeldahl Nitrogen (as N)	10	mg/kg	790	1100	1300	1200
Total Nitrogen (as N)	10	mg/kg	790	1100	1300	1200
Total Organic Carbon	0.1	%	2.2	2.5	4.4	2.6
Phosphorus	5	mg/kg	1000	1100	820	470
% Moisture	1	%	48	53	64	52
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	37000	42000	37000	22000
Arsenic	2	mg/kg	7.6	8.2	7.0	4.0
Barium	10	mg/kg	240	260	340	200
Beryllium	2	mg/kg	< 2	< 2	2.3	< 2
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	130	130	55	23
Cobalt	5	mg/kg	33	34	20	9.4
Copper	5	mg/kg	46	49	39	19
Iron	20	mg/kg	54000	54000	42000	33000
Lead	5	mg/kg	15	18	37	19
Manganese	5	mg/kg	1100	1100	1100	300
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	120	120	48	18
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	120	110	68	43
Zinc	5	mg/kg	86	92	92	46

Client Sample ID			G01TALS_SQ_1 1D1	TALS_SQ_11D 2	G01TALS_SQ_0 1A1	G01TALS_SQ_0 1A2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35527	S18-Ma35528	S18-Ma35529	S18-Ma35530
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 40	< 20	< 40	< 40
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
Toluene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
Ethylbenzene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
m&p-Xylenes	0.2	mg/kg	< 0.4	< 0.2	< 0.4	< 0.4
o-Xylene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
Xylenes - Total	0.3	mg/kg	< 0.6	< 0.3	< 0.6	< 0.6
4-Bromofluorobenzene (surr.)	1	%	106	93	104	95

Client Sample ID			G01 TALS_SQ_11D1	TALS_SQ_11D2	G01 TALS_SQ_01A1	G01 TALS_SQ_01A2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35527	S18-Ma35528	S18-Ma35529	S18-Ma35530
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.1-Dichloroethene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.1.1-Trichloroethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.1.2-Trichloroethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.2-Dibromoethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.2-Dichlorobenzene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.2-Dichloroethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.2-Dichloropropane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.2.3-Trichloropropane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.2.4-Trimethylbenzene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.3-Dichlorobenzene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.3-Dichloropropane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.3.5-Trimethylbenzene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
1.4-Dichlorobenzene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
2-Butanone (MEK)	0.5	mg/kg	< 1	< 0.5	< 1	< 1
2-Propanone (Acetone)	0.5	mg/kg	< 1	< 0.5	< 1	< 1
4-Chlorotoluene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Allyl chloride	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Benzene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
Bromobenzene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Bromochloromethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Bromodichloromethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Bromoform	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Bromomethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Carbon disulfide	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Carbon Tetrachloride	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Chlorobenzene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Chloroethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Chloroform	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Chloromethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
cis-1.2-Dichloroethene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
cis-1.3-Dichloropropene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Dibromochloromethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Dibromomethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Dichlorodifluoromethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Ethylbenzene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
Iodomethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Isopropyl benzene (Cumene)	0.5	mg/kg	< 1	< 0.5	< 1	< 1
m&p-Xylenes	0.2	mg/kg	< 0.4	< 0.2	< 0.4	< 0.4
Methylene Chloride	0.5	mg/kg	< 1	< 0.5	< 1	< 1
o-Xylene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
Styrene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Tetrachloroethene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Toluene	0.1	mg/kg	< 0.2	< 0.1	< 0.2	< 0.2
trans-1.2-Dichloroethene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
trans-1.3-Dichloropropene	0.5	mg/kg	< 1	< 0.5	< 1	< 1

Client Sample ID			G01 TALS_SQ_1 1D1	TALS_SQ_11D 2	G01 TALS_SQ_0 1A1	G01 TALS_SQ_0 1A2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35527	S18-Ma35528	S18-Ma35529	S18-Ma35530
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Trichloroethene	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Trichlorofluoromethane	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Vinyl chloride	0.5	mg/kg	< 1	< 0.5	< 1	< 1
Xylenes - Total	0.3	mg/kg	< 0.6	< 0.3	< 0.6	< 0.6
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	106	93	104	95
Toluene-d8 (surr.)	1	%	73	64	67	63
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene N02	0.5	mg/kg	< 1	< 0.5	< 1	< 1
TRH C6-C10	20	mg/kg	< 40	< 20	< 40	< 40
TRH C6-C10 less BTEX (F1) N04	20	mg/kg	< 40	< 20	< 40	< 40
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) N01	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene N07	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	95	115	83	52
p-Terphenyl-d14 (surr.)	1	%	92	87	63	91
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05

Client Sample ID			G01TALS_SQ_1 1D1	TALS_SQ_11D 2	G01TALS_SQ_0 1A1	G01TALS_SQ_0 1A2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35527	S18-Ma35528	S18-Ma35529	S18-Ma35530
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	102	60	105	112
Tetrachloro-m-xylene (surr.)	1	%	96	56	100	98
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			G01TALS_SQ_11D1	TALS_SQ_11D2	G01TALS_SQ_01A1	G01TALS_SQ_01A2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35527	S18-Ma35528	S18-Ma35529	S18-Ma35530
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 27, 2018	Mar 27, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	91	87	40	51
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.2	0.2	0.2	0.3
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1600	1200	1400	1200
Total Nitrogen (as N)	10	mg/kg	1600	1200	1400	1200
Total Organic Carbon	0.1	%	3.9	5.1	3.7	3.1
Phosphorus	5	mg/kg	1000	810	900	1100
% Moisture	1	%	60	63	65	64
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	31000	33000	35000	39000
Arsenic	2	mg/kg	9.4	7.8	9.7	8.0
Barium	10	mg/kg	210	190	230	290
Beryllium	2	mg/kg	< 2	2.1	2.5	2.3
Boron	10	mg/kg	< 10	< 10	14	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	46	45	46	80
Cobalt	5	mg/kg	26	21	18	26
Copper	5	mg/kg	49	42	42	45
Iron	20	mg/kg	42000	39000	44000	45000
Lead	5	mg/kg	19	25	33	25
Manganese	5	mg/kg	1200	1200	1000	1300
Mercury	0.1	mg/kg	< 0.1	< 0.1	0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	41	37	40	73
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	60	62	60	85
Zinc	5	mg/kg	67	86	87	92

Client Sample ID			TALN_SQ_AS1	TALN_SQ_AS2	TANN_SQ_09A1	TANN_SQ_09A2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35531	S18-Ma35532	S18-Ma35533	S18-Ma35534
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	40	< 20	27
TRH C15-C28	50	mg/kg	< 50	91	51	51
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	131	51	78

Client Sample ID			TALN_SQ_AS1	TALN_SQ_AS2	TANN_SQ_09A 1	TANN_SQ_09A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35531**	**S18-Ma35532**	**S18-Ma35533**	**S18-Ma35534**
Date Sampled			**Mar 27, 2018**	**Mar 27, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	80	77	78	72
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TALN_SQ_AS1	TALN_SQ_AS2	TANN_SQ_09A 1	TANN_SQ_09A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35531	S18-Ma35532	S18-Ma35533	S18-Ma35534
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	80	77	78	72
Toluene-d8 (surr.)	1	%	50	67	73	66
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	66	107	65	91
p-Terphenyl-d14 (surr.)	1	%	59	108	70	90

Client Sample ID			TALN_SQ_AS1	TALN_SQ_AS2	TANN_SQ_09A 1	TANN_SQ_09A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35531	S18-Ma35532	S18-Ma35533	S18-Ma35534
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	108	122	66	78
Tetrachloro-m-xylene (surr.)	1	%	98	81	69	73
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			TALN_SQ_AS1	TALN_SQ_AS2	TANN_SQ_09A 1	TANN_SQ_09A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35531	S18-Ma35532	S18-Ma35533	S18-Ma35534
Date Sampled			Mar 27, 2018	Mar 27, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	108	20	78	51
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.3	< 0.1	< 0.1	< 0.1
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1100	1000	2500	2400
Total Nitrogen (as N)	10	mg/kg	1100	1000	2500	2400
Total Organic Carbon	0.1	%	5.0	5.8	8.2	8.6
Phosphorus	5	mg/kg	320	410	970	980
% Moisture	1	%	57	56	67	64
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	27000	35000	28000	25000
Arsenic	2	mg/kg	2.7	2.2	4.5	4.7
Barium	10	mg/kg	110	110	180	170
Beryllium	2	mg/kg	< 2	< 2	< 2	< 2
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	12	12	31	30
Cobalt	5	mg/kg	< 5	< 5	12	11
Copper	5	mg/kg	12	10	27	28
Iron	20	mg/kg	14000	14000	23000	21000
Lead	5	mg/kg	13	12	21	20
Manganese	5	mg/kg	530	410	510	440
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	9.6	8.2	19	18
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	23	26	47	45
Zinc	5	mg/kg	43	46	98	98

Client Sample ID			TANN_SQ_09B 1	TANN_SQ_09B 2	TANN_SQ_09C 1	TANN_SQ_09C 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35535	S18-Ma35536	S18-Ma35537	S18-Ma35538
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	40	< 20
TRH C15-C28	50	mg/kg	59	57	70	83
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	59	57	110	83
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	62	79	78	73
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_09B 1	TANN_SQ_09B 2	TANN_SQ_09C 1	TANN_SQ_09C 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35535	S18-Ma35536	S18-Ma35537	S18-Ma35538
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	62	79	78	73
Toluene-d8 (surr.)	1	%	53	71	71	67
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_09B 1	TANN_SQ_09B 2	TANN_SQ_09C 1	TANN_SQ_09C 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35535	S18-Ma35536	S18-Ma35537	S18-Ma35538
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	51	64	77	59
p-Terphenyl-d14 (surr.)	1	%	53	72	80	57
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	54	51	69	71
Tetrachloro-m-xylene (surr.)	1	%	65	52	97	59
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			TANN_SQ_09B 1	TANN_SQ_09B 2	TANN_SQ_09C 1	TANN_SQ_09C 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35535**	**S18-Ma35536**	**S18-Ma35537**	**S18-Ma35538**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	60	77	40	60
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 10	< 5	< 5
Total Inorganic Carbon	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1800	1600	2100	2000
Total Nitrogen (as N)	10	mg/kg	1800	1600	2100	2000
Total Organic Carbon	0.1	%	7.4	7.5	7.3	7.3
Phosphorus	5	mg/kg	910	970	710	930
% Moisture	1	%	69	72	66	67
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	25000	28000	19000	29000
Arsenic	2	mg/kg	3.5	3.8	< 2	3.2
Barium	10	mg/kg	150	160	110	190
Beryllium	2	mg/kg	< 2	< 2	< 2	< 2
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	26	29	17	27
Cobalt	5	mg/kg	8.7	9.3	5.8	9.3
Copper	5	mg/kg	24	26	14	22
Iron	20	mg/kg	20000	22000	13000	21000
Lead	5	mg/kg	20	22	14	21
Manganese	5	mg/kg	290	280	240	370
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	15	17	9.5	15
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	44	48	26	42
Zinc	5	mg/kg	89	93	49	80

Client Sample ID			TANN_SQ_09D 1	TANN_SQ_09D 2	TANN_SQ_07A 1	TANN_SQ_07A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35539	S18-Ma35540	S18-Ma35541	S18-Ma35542
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	81	120	58	< 50
TRH C29-C36	50	mg/kg	< 50	57	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	81	177	58	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	79	78	77	83
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_09D 1	TANN_SQ_09D 2	TANN_SQ_07A 1	TANN_SQ_07A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35539	S18-Ma35540	S18-Ma35541	S18-Ma35542
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	79	78	77	83
Toluene-d8 (surr.)	1	%	69	73	68	74
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	130	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_09D 1	TANN_SQ_09D 2	TANN_SQ_07A 1	TANN_SQ_07A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35539	S18-Ma35540	S18-Ma35541	S18-Ma35542
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	72	76	69	58
p-Terphenyl-d14 (surr.)	1	%	72	87	88	65
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	87	73	72	90
Tetrachloro-m-xylene (surr.)	1	%	67	85	60	65
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			TANN_SQ_09D 1	TANN_SQ_09D 2	TANN_SQ_07A 1	TANN_SQ_07A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35539**	**S18-Ma35540**	**S18-Ma35541**	**S18-Ma35542**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	73	97	99	62
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	< 0.1	< 0.1	0.4	0.3
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1900	2200	2000	1600
Total Nitrogen (as N)	10	mg/kg	1900	2200	2000	1600
Total Organic Carbon	0.1	%	7.5	8.0	4.8	1.9
Phosphorus	5	mg/kg	760	980	1400	670
% Moisture	1	%	69	69	68	49
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	21000	31000	35000	23000
Arsenic	2	mg/kg	2.2	3.4	8.2	5.0
Barium	10	mg/kg	140	190	280	160
Beryllium	2	mg/kg	< 2	< 2	2.1	< 2
Boron	10	mg/kg	< 10	13	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	20	30	34	27
Cobalt	5	mg/kg	6.1	9.7	29	16
Copper	5	mg/kg	17	24	29	20
Iron	20	mg/kg	13000	20000	48000	27000
Lead	5	mg/kg	16	21	31	20
Manganese	5	mg/kg	280	370	1100	610
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	11	17	20	15
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	31	46	65	45
Zinc	5	mg/kg	59	89	110	80

Client Sample ID			TANN_SQ_07B 1	TANN_SQ_07B 2	TANN_SQ_07C 1	TANN_SQ_07C 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35543**	**S18-Ma35544**	**S18-Ma35545**	**S18-Ma35546**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	22	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	77	73	86	75
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_07B 1	TANN_SQ_07B 2	TANN_SQ_07C 1	TANN_SQ_07C 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35543	S18-Ma35544	S18-Ma35545	S18-Ma35546
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	77	73	86	75
Toluene-d8 (surr.)	1	%	70	63	78	70
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_07B 1	TANN_SQ_07B 2	TANN_SQ_07C 1	TANN_SQ_07C 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35543	S18-Ma35544	S18-Ma35545	S18-Ma35546
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	77	92	66	71
p-Terphenyl-d14 (surr.)	1	%	98	53	77	70
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	81	61	94	84
Tetrachloro-m-xylene (surr.)	1	%	80	56	88	81
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			TANN_SQ_07B 1	TANN_SQ_07B 2	TANN_SQ_07C 1	TANN_SQ_07C 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35543**	**S18-Ma35544**	**S18-Ma35545**	**S18-Ma35546**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	38	20	71	81
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.4	0.6	0.3	0.5
Total Kjeldahl Nitrogen (as N)	10	mg/kg	2500	1800	800	2100
Total Nitrogen (as N)	10	mg/kg	2500	1800	800	2100
Total Organic Carbon	0.1	%	3.2	4.6	1.8	3.1
Phosphorus	5	mg/kg	1200	1100	620	740
% Moisture	1	%	67	70	45	53
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	36000	35000	21000	22000
Arsenic	2	mg/kg	6.9	7.3	7.6	9.1
Barium	10	mg/kg	240	250	130	190
Beryllium	2	mg/kg	< 2	< 2	< 2	< 2
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	37	37	23	23
Cobalt	5	mg/kg	21	21	7.0	9.5
Copper	5	mg/kg	27	28	15	15
Iron	20	mg/kg	40000	41000	21000	27000
Lead	5	mg/kg	29	30	17	17
Manganese	5	mg/kg	720	830	340	800
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	20	19	12	12
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	64	67	39	40
Zinc	5	mg/kg	110	110	52	58

Client Sample ID			TANN_SQ_07D 1	TANN_SQ_07D 2	TANS_SQ_05A 1	TANS_SQ_05A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35547	S18-Ma35548	S18-Ma35549	S18-Ma35550
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	-	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	-	< 50	130	89
TRH C29-C36	50	mg/kg	-	< 50	56	< 50
TRH C10-36 (Total)	50	mg/kg	-	< 50	186	89
BTEX						
Benzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	-	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	-	72	76	75
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_07D 1	TANN_SQ_07D 2	TANS_SQ_05A 1	TANS_SQ_05A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35547	S18-Ma35548	S18-Ma35549	S18-Ma35550
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	-	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	-	72	76	75
Toluene-d8 (surr.)	1	%	-	65	71	68
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	-	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	-	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	-	< 100	140	< 100
TRH >C34-C40	100	mg/kg	-	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5

Client Sample ID			TANN_SQ_07D 1	TANN_SQ_07D 2	TANS_SQ_05A 1	TANS_SQ_05A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35547**	**S18-Ma35548**	**S18-Ma35549**	**S18-Ma35550**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	-	61	53	54
p-Terphenyl-d14 (surr.)	1	%	-	60	50	59
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	-	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	-	144	114	95
Tetrachloro-m-xylene (surr.)	1	%	-	139	110	54
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	-	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2

Client Sample ID			TANN_SQ_07D 1	TANN_SQ_07D 2	TANS_SQ_05A 1	TANS_SQ_05A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35547	S18-Ma35548	S18-Ma35549	S18-Ma35550
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	-	< 2	< 2	< 2
Naled	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	-	< 2	< 2	< 2
Phorate	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	-	69	26	46
Nitrate & Nitrite (as N)	5	mg/kg	-	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	-	0.4	0.5	0.5
Total Kjeldahl Nitrogen (as N)	10	mg/kg	-	1400	1900	1700
Total Nitrogen (as N)	10	mg/kg	-	1400	1900	1700
Total Organic Carbon	0.1	%	-	2.4	5.6	5.2
Phosphorus	5	mg/kg	-	610	1100	1200
% Moisture	1	%	-	51	73	75
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	-	24000	31000	36000
Arsenic	2	mg/kg	-	7.2	5.5	6.1
Barium	10	mg/kg	-	100	230	260
Beryllium	2	mg/kg	-	< 2	< 2	2.2
Boron	10	mg/kg	-	< 10	< 10	16
Cadmium	0.4	mg/kg	-	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	-	26	29	33
Cobalt	5	mg/kg	-	8.5	16	21
Copper	5	mg/kg	-	19	23	25
Iron	20	mg/kg	-	26000	29000	33000
Lead	5	mg/kg	-	16	25	28
Manganese	5	mg/kg	-	490	650	780
Mercury	0.1	mg/kg	-	< 0.1	< 0.1	0.1
Molybdenum	5	mg/kg	-	< 5	< 5	< 5
Nickel	5	mg/kg	-	12	17	20
Selenium	2	mg/kg	-	< 2	< 2	< 2
Silver	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	-	48	53	58
Zinc	5	mg/kg	-	45	87	99

Client Sample ID			TANS_SQ_05B 1	TANS_SQ_05B 2	TANS_SQ_05C 1	TANS_SQ_05C 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35551	S18-Ma35552	S18-Ma35553	S18-Ma35554
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	54	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	54	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	68	75	80	80
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANS_SQ_05B 1	TANS_SQ_05B 2	TANS_SQ_05C 1	TANS_SQ_05C 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35551**	**S18-Ma35552**	**S18-Ma35553**	**S18-Ma35554**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	68	75	80	80
Toluene-d8 (surr.)	1	%	60	69	70	72
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TANS_SQ_05B 1	TANS_SQ_05B 2	TANS_SQ_05C 1	TANS_SQ_05C 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35551**	**S18-Ma35552**	**S18-Ma35553**	**S18-Ma35554**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**	**Mar 28, 2018**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	86	77	96	69
p-Terphenyl-d14 (surr.)	1	%	81	110	80	77
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	75	83	72	81
Tetrachloro-m-xylene (surr.)	1	%	63	78	64	61
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			TANS_SQ_05B 1	TANS_SQ_05B 2	TANS_SQ_05C 1	TANS_SQ_05C 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35551	S18-Ma35552	S18-Ma35553	S18-Ma35554
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 28, 2018	Mar 28, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	95	85	85	116
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.3	0.4	0.2	0.2
Total Kjeldahl Nitrogen (as N)	10	mg/kg	2000	1700	1100	1200
Total Nitrogen (as N)	10	mg/kg	2000	1700	1100	1200
Total Organic Carbon	0.1	%	4.5	4.6	2.1	1.7
Phosphorus	5	mg/kg	1200	1300	680	550
% Moisture	1	%	69	67	49	43
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	32000	32000	24000	19000
Arsenic	2	mg/kg	7.3	7.2	6.2	4.9
Barium	10	mg/kg	250	250	190	180
Beryllium	2	mg/kg	< 2	< 2	< 2	< 2
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	33	32	24	19
Cobalt	5	mg/kg	25	24	14	11
Copper	5	mg/kg	28	27	16	13
Iron	20	mg/kg	41000	43000	29000	24000
Lead	5	mg/kg	28	27	19	17
Manganese	5	mg/kg	970	1000	730	850
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	19	19	14	12
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	61	59	39	31
Zinc	5	mg/kg	100	100	66	57

Client Sample ID			TANS_SQ_05D 1	TANS_SQ_05D 2	TALS_SQ_07A 1	TALS_SQ_07A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35555**	**S18-Ma35556**	**S18-Ma35596**	**S18-Ma35597**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	-	25	< 20	< 20
TRH C15-C28	50	mg/kg	-	< 50	63	94
TRH C29-C36	50	mg/kg	-	< 50	< 50	54
TRH C10-36 (Total)	50	mg/kg	-	< 50	63	148
BTEX						
Benzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	-	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	-	82	127	63
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5

Client Sample ID			TANS_SQ_05D 1	TANS_SQ_05D 2	TALS_SQ_07A 1	TALS_SQ_07A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35555	S18-Ma35556	S18-Ma35596	S18-Ma35597
Date Sampled			Mar 28, 2018	Mar 28, 2018	Mar 26, 2018	Mar 26, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	-	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	-	82	127	63
Toluene-d8 (surr.)	1	%	-	72	111	56
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	-	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	-	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	-	< 100	< 100	100
TRH >C34-C40	100	mg/kg	-	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5

Client Sample ID			TANS_SQ_05D 1	TANS_SQ_05D 2	TALS_SQ_07A 1	TALS_SQ_07A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35555**	**S18-Ma35556**	**S18-Ma35596**	**S18-Ma35597**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	-	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	-	47	58	103
p-Terphenyl-d14 (surr.)	1	%	-	55	70	65
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	-	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	-	110	98	101
Tetrachloro-m-xylene (surr.)	1	%	-	102	97	94
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	-	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2

Client Sample ID			TANS_SQ_05D 1	TANS_SQ_05D 2	TALS_SQ_07A 1	TALS_SQ_07A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35555**	**S18-Ma35556**	**S18-Ma35596**	**S18-Ma35597**
Date Sampled			**Mar 28, 2018**	**Mar 28, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	-	< 2	< 2	< 2
Naled	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	-	< 2	< 2	< 2
Phorate	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	-	53	83	91
Nitrate & Nitrite (as N)	5	mg/kg	-	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	-	0.3	0.3	0.2
Total Kjeldahl Nitrogen (as N)	10	mg/kg	-	890	1000	1300
Total Nitrogen (as N)	10	mg/kg	-	890	1000	1300
Total Organic Carbon	0.1	%	-	1.7	4.1	3.1
Phosphorus	5	mg/kg	-	540	1100	870
% Moisture	1	%	-	46	63	59
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	-	23000	31000	33000
Arsenic	2	mg/kg	-	5.5	34	14
Barium	10	mg/kg	-	170	270	280
Beryllium	2	mg/kg	-	< 2	2.1	2.4
Boron	10	mg/kg	-	< 10	< 10	< 10
Cadmium	0.4	mg/kg	-	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	-	24	50	57
Cobalt	5	mg/kg	-	14	20	27
Copper	5	mg/kg	-	16	47	55
Iron	20	mg/kg	-	27000	64000	43000
Lead	5	mg/kg	-	19	26	32
Manganese	5	mg/kg	-	1000	2000	2800
Mercury	0.1	mg/kg	-	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	-	< 5	< 5	< 5
Nickel	5	mg/kg	-	15	51	60
Selenium	2	mg/kg	-	< 2	< 2	< 2
Silver	0.2	mg/kg	-	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	-	40	53	56
Zinc	5	mg/kg	-	61	94	110

Client Sample ID			TALS_SQ_07B 1	TALS_SQ_07B 2	TALS_SQ_07D 1	TALS_SQ_07D 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35598**	**S18-Ma35599**	**S18-Ma35600**	**S18-Ma35601**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	-	< 20	< 20
TRH C10-C14	20	mg/kg	-	-	< 20	< 20
TRH C15-C28	50	mg/kg	-	-	62	54
TRH C29-C36	50	mg/kg	-	-	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	-	-	62	54
BTEX						
Benzene	0.1	mg/kg	-	-	< 0.1	< 0.1
Toluene	0.1	mg/kg	-	-	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	-	-	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	-	-	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	-	-	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	-	-	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	-	-	78	79
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	-	-	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	-	-	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	-	-	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	-	-	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	-	-	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	-	-	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	-	-	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	-	-	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	-	-	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	-	-	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	-	-	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	-	-	< 0.5	< 0.5
Benzene	0.1	mg/kg	-	-	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	-	-	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Bromoform	0.5	mg/kg	-	-	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	-	-	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	-	-	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	-	-	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Chloroform	0.5	mg/kg	-	-	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	-	-	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	-	-	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	-	-	< 0.5	< 0.5

Client Sample ID			TALS_SQ_07B 1	TALS_SQ_07B 2	TALS_SQ_07D 1	TALS_SQ_07D 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35598**	**S18-Ma35599**	**S18-Ma35600**	**S18-Ma35601**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	-	-	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	-	-	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	-	-	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	-	-	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	-	-	< 0.1	< 0.1
Styrene	0.5	mg/kg	-	-	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	-	-	< 0.5	< 0.5
Toluene	0.1	mg/kg	-	-	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	-	-	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	-	-	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	-	-	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	-	-	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	-	-	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	-	-	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	-	-	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	-	-	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	-	-	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	-	-	78	79
Toluene-d8 (surr.)	1	%	-	-	77	78
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	-	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	-	-	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	-	< 20	< 20
TRH >C10-C16	50	mg/kg	-	-	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	-	< 50	< 50
TRH >C16-C34	100	mg/kg	-	-	< 100	< 100
TRH >C34-C40	100	mg/kg	-	-	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	-	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	-	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	-	1.2	1.2
Acenaphthene	0.5	mg/kg	-	-	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	-	-	< 0.5	< 0.5
Anthracene	0.5	mg/kg	-	-	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	-	-	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	-	-	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	-	-	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	-	-	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	-	-	< 0.5	< 0.5
Chrysene	0.5	mg/kg	-	-	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	-	-	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	-	-	< 0.5	< 0.5
Fluorene	0.5	mg/kg	-	-	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	-	-	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	-	-	< 0.5	< 0.5

Client Sample ID			TALS_SQ_07B 1	TALS_SQ_07B 2	TALS_SQ_07D 1	TALS_SQ_07D 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35598**	**S18-Ma35599**	**S18-Ma35600**	**S18-Ma35601**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	-	-	< 0.5	< 0.5
Pyrene	0.5	mg/kg	-	-	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	-	-	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	-	-	100	67
p-Terphenyl-d14 (surr.)	1	%	-	-	78	82
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	-	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	-	-	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	-	-	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	-	-	< 0.05	< 0.05
a-BHC	0.05	mg/kg	-	-	< 0.05	< 0.05
Aldrin	0.05	mg/kg	-	-	< 0.05	< 0.05
b-BHC	0.05	mg/kg	-	-	< 0.05	< 0.05
d-BHC	0.05	mg/kg	-	-	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	-	-	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	-	-	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	-	-	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	-	-	< 0.05	< 0.05
Endrin	0.05	mg/kg	-	-	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	-	-	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	-	-	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	-	-	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	-	-	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	-	-	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	-	-	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	-	-	< 0.05	< 0.05
Toxaphene	1	mg/kg	-	-	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	-	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	-	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	-	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	-	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	-	-	91	105
Tetrachloro-m-xylene (surr.)	1	%	-	-	69	82
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	-	-	< 0.2	< 0.2
Bolstar	0.2	mg/kg	-	-	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	-	-	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	-	-	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	-	-	< 0.2	< 0.2
Coumaphos	2	mg/kg	-	-	< 2	< 2
Demeton-S	0.2	mg/kg	-	-	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	-	-	< 0.2	< 0.2
Diazinon	0.2	mg/kg	-	-	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	-	-	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	-	-	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	-	-	< 0.2	< 0.2
EPN	0.2	mg/kg	-	-	< 0.2	< 0.2
Ethion	0.2	mg/kg	-	-	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	-	-	< 0.2	< 0.2

Client Sample ID			TALS_SQ_07B 1	TALS_SQ_07B 2	TALS_SQ_07D 1	TALS_SQ_07D 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35598	S18-Ma35599	S18-Ma35600	S18-Ma35601
Date Sampled			Mar 26, 2018	Mar 26, 2018	Mar 26, 2018	Mar 26, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	-	-	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	-	-	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	-	-	< 0.2	< 0.2
Fenthion	0.2	mg/kg	-	-	< 0.2	< 0.2
Malathion	0.2	mg/kg	-	-	< 0.2	< 0.2
Merphos	0.2	mg/kg	-	-	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	-	-	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	-	-	< 0.2	< 0.2
Monocrotophos	2	mg/kg	-	-	< 2	< 2
Naled	0.2	mg/kg	-	-	< 0.2	< 0.2
Omethoate	2	mg/kg	-	-	< 2	< 2
Phorate	0.2	mg/kg	-	-	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	-	-	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	-	-	< 0.2	< 0.2
Ronnel	0.2	mg/kg	-	-	< 0.2	< 0.2
Terbufos	0.2	mg/kg	-	-	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	-	-	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	-	-	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	-	-	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	-	-	95	92
Nitrate & Nitrite (as N)	5	mg/kg	-	-	< 5	< 5
Total Inorganic Carbon	0.1	%	-	-	0.4	0.3
Total Kjeldahl Nitrogen (as N)	10	mg/kg	-	-	1300	1600
Total Nitrogen (as N)	10	mg/kg	-	-	1300	1600
Total Organic Carbon	0.1	%	-	-	3.4	3.0
Phosphorus	5	mg/kg	-	-	780	860
% Moisture	1	%	-	-	62	62
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	-	-	34000	36000
Arsenic	2	mg/kg	-	-	12	10
Barium	10	mg/kg	-	-	180	210
Beryllium	2	mg/kg	-	-	< 2	< 2
Boron	10	mg/kg	-	-	< 10	< 10
Cadmium	0.4	mg/kg	-	-	< 0.4	< 0.4
Chromium	5	mg/kg	-	-	61	64
Cobalt	5	mg/kg	-	-	24	24
Copper	5	mg/kg	-	-	50	54
Iron	20	mg/kg	-	-	48000	46000
Lead	5	mg/kg	-	-	17	21
Manganese	5	mg/kg	-	-	2000	1500
Mercury	0.1	mg/kg	-	-	< 0.1	< 0.1
Molybdenum	5	mg/kg	-	-	< 5	< 5
Nickel	5	mg/kg	-	-	52	58
Selenium	2	mg/kg	-	-	< 2	< 2
Silver	0.2	mg/kg	-	-	< 0.2	< 0.2
Vanadium	10	mg/kg	-	-	75	71
Zinc	5	mg/kg	-	-	93	100

Client Sample ID			TALS_SQ_07C 1	TALS_SQ_07C 2	TALS_SQ_03A 1	TALS_SQ_03A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35602	S18-Ma35603	S18-Ma35604	S18-Ma35605
Date Sampled			Mar 26, 2018	Mar 26, 2018	Mar 26, 2018	Mar 26, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	92	87	82	87
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.1.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2-Trichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.1.2.2-Tetrachloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dibromoethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.3-Trichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.2.4-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3-Dichloropropane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.3.5-Trimethylbenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
1.4-Dichlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Butanone (MEK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Propanone (Acetone)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Chlorotoluene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Allyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bromobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromodichloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromoform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Bromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon disulfide	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloroform	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
cis-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TALS_SQ_07C 1	TALS_SQ_07C 2	TALS_SQ_03A 1	TALS_SQ_03A 2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-Ma35602	S18-Ma35603	S18-Ma35604	S18-Ma35605
Date Sampled			Mar 26, 2018	Mar 26, 2018	Mar 26, 2018	Mar 26, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Dibromochloromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibromomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Iodomethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Isopropyl benzene (Cumene)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methylene Chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Styrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
trans-1.2-Dichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
trans-1.3-Dichloropropene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl chloride	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
Total MAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
4-Bromofluorobenzene (surr.)	1	%	92	87	82	87
Toluene-d8 (surr.)	1	%	92	77	87	78
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TALS_SQ_07C 1	TALS_SQ_07C 2	TALS_SQ_03A 1	TALS_SQ_03A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35602**	**S18-Ma35603**	**S18-Ma35604**	**S18-Ma35605**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	88	93	73	81
p-Terphenyl-d14 (surr.)	1	%	91	99	84	86
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	111	76	91	109
Tetrachloro-m-xylene (surr.)	1	%	97	68	77	105
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			TALS_SQ_07C 1	TALS_SQ_07C 2	TALS_SQ_03A 1	TALS_SQ_03A 2
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-Ma35602**	**S18-Ma35603**	**S18-Ma35604**	**S18-Ma35605**
Date Sampled			**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**	**Mar 26, 2018**
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	89	104	80	90
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.7	0.4	0.3	0.2
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1200	1400	1200	1100
Total Nitrogen (as N)	10	mg/kg	1200	1400	1200	1100
Total Organic Carbon	0.1	%	2.5	2.9	3.8	3.2
Phosphorus	5	mg/kg	670	550	560	560
% Moisture	1	%	59	48	57	56
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	25000	25000	36000	35000
Arsenic	2	mg/kg	6.7	5.2	5.6	5.9
Barium	10	mg/kg	140	140	180	170
Beryllium	2	mg/kg	< 2	< 2	2.3	2.2
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	42	44	35	35
Cobalt	5	mg/kg	16	17	13	12
Copper	5	mg/kg	40	44	28	28
Iron	20	mg/kg	37000	34000	26000	26000
Lead	5	mg/kg	13	13	32	33
Manganese	5	mg/kg	850	1000	1300	1300
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	33	34	29	29
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	51	56	45	44
Zinc	5	mg/kg	67	71	72	72

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins | mgt Suite B4			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Apr 06, 2018	14 Day
- Method: LTM-ORG-2010 TRH C6-C36			
BTEX	Melbourne	Apr 06, 2018	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Apr 06, 2018	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Apr 06, 2018	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Polycyclic Aromatic Hydrocarbons	Melbourne	Apr 06, 2018	14 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Volatile Organics	Melbourne	Apr 06, 2018	7 Days
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Organochlorine Pesticides	Melbourne	Apr 06, 2018	14 Day
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Organophosphorus Pesticides	Melbourne	Apr 06, 2018	14 Day
- Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS			
Total Inorganic Carbon	Melbourne	Apr 10, 2018	28 Day
- Method: APHA 5310B Total Inorganic Carbon			
Total Organic Carbon	Melbourne	Apr 10, 2018	28 Day
- Method: APHA 5310B Total Organic Carbon			
Phosphorus	Melbourne	Apr 06, 2018	180 Day
- Method: USEPA 6010			
Heavy Metals	Melbourne	Apr 06, 2018	180 Day
- Method: LTM-MET-3030 by ICP-OES (hydride ICP-OES for Mercury)			
Total Nitrogen Set (as N)			
Nitrate & Nitrite (as N)	Melbourne	Apr 06, 2018	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Apr 06, 2018	28 Day
- Method: LTM-INO-4310 TKN in Waters & Soils by FIA			
% Moisture	Melbourne	Mar 29, 2018	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name:	Cardno (NSW/ACT) Pty Ltd	**Order No.:**		**Received:**	Mar 29, 2018 3:39 PM
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	St Leonards	**Phone:**	0294967700	**Priority:**	5 Day
	NSW 2065	**Fax:**	02 9499 3902	**Contact Name:**	Andrew Bradford
Project Name:	SNOWY HYDRO 2.0				
Project ID:	59918111/003				

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No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID	Aluminium	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Particle Size Distribution by Sieve and Hydrometer	Phosphorus	Selenium	Silver	Total Inorganic Carbon	Total Organic Carbon	Vanadium	Zinc	Organochlorine Pesticides	Organophosphorus Pesticides	Total Nitrogen Set (as N)	Volatile Organics	Moisture Set	Eurofins | mgt Suite B4
Sample Detail																																		
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																		
Brisbane Laboratory - NATA Site # 20794																																		
Perth Laboratory - NATA Site # 23736																																		
External Laboratory																					X													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																													
1	TALN_SQ_03 D1	Mar 26, 2018		Soil	S18-Ma35519	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	TALN_SQ_03 D2	Mar 26, 2018		Soil	S18-Ma35520	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	TALS_SQ_11 A1	Mar 27, 2018		Soil	S18-Ma35521	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4	TALS_SQ_11 A2	Mar 27, 2018		Soil	S18-Ma35522	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	TALS_SQ_11 B1	Mar 27, 2018		Soil	S18-Ma35523	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	TALS_SQ_11	Mar 27, 2018		Soil	S18-Ma35524	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Fax: 02 9499 3902

Received: Mar 29, 2018 3:39 PM
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Contact Name: Andrew Bradford

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Aluminium	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Particle Size Distribution by Sieve and Hydrometer	Phosphorus	Selenium	Silver	Total Inorganic Carbon	Total Organic Carbon	Vanadium	Zinc	Organochlorine Pesticides	Organophosphorus Pesticides	Total Nitrogen Set (as N)	Volatile Organics	Moisture Set	Eurofins | mgt Suite B4
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																		
Brisbane Laboratory - NATA Site # 20794																																		
Perth Laboratory - NATA Site # 23736																																		
	B2																																	
7	TALS_SQ_11 C1	Mar 27, 2018		Soil	S18-Ma35525	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8	TALS_SQ_11 C2	Mar 27, 2018		Soil	S18-Ma35526	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9	TALS_SQ_11 D1	Mar 27, 2018		Soil	S18-Ma35527	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	TALS_SQ_11 D2	Mar 27, 2018		Soil	S18-Ma35528	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11	TALS_SQ_01 A1	Mar 27, 2018		Soil	S18-Ma35529	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12	TALS_SQ_01 A2	Mar 27, 2018		Soil	S18-Ma35530	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	TALN_SQ_AS	Mar 27, 2018		Soil	S18-Ma35531	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		Phone:	0294967700
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		Priority:	5 Day
		Contact Name:	Andrew Bradford

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Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																		
Brisbane Laboratory - NATA Site # 20794																																		
Perth Laboratory - NATA Site # 23736																																		
	1																																	
14	TALN_SQ_AS 2	Mar 27, 2018		Soil	S18-Ma35532	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15	TANN_SQ_09 A1	Mar 28, 2018		Soil	S18-Ma35533	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
16	TANN_SQ_09 A2	Mar 28, 2018		Soil	S18-Ma35534	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
17	TANN_SQ_09 B1	Mar 28, 2018		Soil	S18-Ma35535	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
18	TANN_SQ_09 B2	Mar 28, 2018		Soil	S18-Ma35536	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
19	TANN_SQ_09 C1	Mar 28, 2018		Soil	S18-Ma35537	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
20	TANN_SQ_09	Mar 28, 2018		Soil	S18-Ma35538	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		Fax:	02 9499 3902	**Contact Name:**	Andrew Bradford
Project Name:	SNOWY HYDRO 2.0				
Project ID:	59918111/003				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

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Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																		
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Perth Laboratory - NATA Site # 23736																																		
	C2																																	
21	TANN_SQ_09 D1	Mar 28, 2018		Soil	S18-Ma35539	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
22	TANN_SQ_09 D2	Mar 28, 2018		Soil	S18-Ma35540	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
23	TANN_SQ_07 A1	Mar 28, 2018		Soil	S18-Ma35541	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
24	TANN_SQ_07 A2	Mar 28, 2018		Soil	S18-Ma35542	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
25	TANN_SQ_07 B1	Mar 28, 2018		Soil	S18-Ma35543	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26	TANN_SQ_07 B2	Mar 28, 2018		Soil	S18-Ma35544	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
27	TANN_SQ_07	Mar 28, 2018		Soil	S18-Ma35545	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		Fax:	02 9499 3902	**Contact Name:**	Andrew Bradford
Project Name:	SNOWY HYDRO 2.0				
Project ID:	59918111/003				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Aluminium	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Particle Size Distribution by Sieve and Hydrometer	Phosphorus	Selenium	Silver	Total Inorganic Carbon	Total Organic Carbon	Vanadium	Zinc	Organochlorine Pesticides	Organophosphorus Pesticides	Total Nitrogen Set (as N)	Volatile Organics	Moisture Set	Eurofins | mgt Suite B4
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																		
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Perth Laboratory - NATA Site # 23736																																		
	C1																																	
28	TANN_SQ_07 C2	Mar 28, 2018		Soil	S18-Ma35546	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
29	TANN_SQ_07 D1	Mar 28, 2018		Soil	S18-Ma35547																X													
30	TANN_SQ_07 D2	Mar 28, 2018		Soil	S18-Ma35548	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
31	TANS_SQ_05 A1	Mar 28, 2018		Soil	S18-Ma35549	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
32	TANS_SQ_05 A2	Mar 28, 2018		Soil	S18-Ma35550	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
33	TANS_SQ_05 B1	Mar 28, 2018		Soil	S18-Ma35551	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
34	TANS_SQ_05	Mar 28, 2018		Soil	S18-Ma35552	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																		
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Perth Laboratory - NATA Site # 23736																																		
	B2																																	
35	TANS_SQ_05 C1	Mar 28, 2018		Soil	S18-Ma35553	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
36	TANS_SQ_05 C2	Mar 28, 2018		Soil	S18-Ma35554	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
37	TANS_SQ_05 D1	Mar 28, 2018		Soil	S18-Ma35555																X													
38	TANS_SQ_05 D2	Mar 28, 2018		Soil	S18-Ma35556	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
39	TALS_SQ_07 A1	Mar 26, 2018		Soil	S18-Ma35596	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
40	TALS_SQ_07 A2	Mar 26, 2018		Soil	S18-Ma35597	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
41	TALS_SQ_07	Mar 26, 2018		Soil	S18-Ma35598																X													

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Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Aluminium	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Particle Size Distribution by Sieve and Hydrometer	Phosphorus	Selenium	Silver	Total Inorganic Carbon	Total Organic Carbon	Vanadium	Zinc	Organochlorine Pesticides	Organophosphorus Pesticides	Total Nitrogen Set (as N)	Volatile Organics	Moisture Set	Eurofins | mgt Suite B4
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																		
Brisbane Laboratory - NATA Site # 20794																																		
Perth Laboratory - NATA Site # 23736																																		
	B1																																	
42	TALS_SQ_07 B2	Mar 26, 2018		Soil	S18-Ma35599																X													
43	TALS_SQ_07 D1	Mar 26, 2018		Soil	S18-Ma35600	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
44	TALS_SQ_07 D2	Mar 26, 2018		Soil	S18-Ma35601	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
45	TALS_SQ_07 C1	Mar 26, 2018		Soil	S18-Ma35602	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
46	TALS_SQ_07 C2	Mar 26, 2018		Soil	S18-Ma35603	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
47	TALS_SQ_03 A1	Mar 26, 2018		Soil	S18-Ma35604	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
48	TALS_SQ_03	Mar 26, 2018		Soil	S18-Ma35605	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Company Name:	Cardno (NSW/ACT) Pty Ltd	**Order No.:**		**Received:**	Mar 29, 2018 3:39 PM
Address:	Level 9, 203 Pacific Highway	**Report #:**	591871	**Due:**	Apr 9, 2018
	St Leonards	**Phone:**	0294967700	**Priority:**	5 Day
	NSW 2065	**Fax:**	02 9499 3902	**Contact Name:**	Andrew Bradford
Project Name:	SNOWY HYDRO 2.0				
Project ID:	59918111/003				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail	Aluminium	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Particle Size Distribution by Sieve and Hydrometer	Phosphorus	Selenium	Silver	Total Inorganic Carbon	Total Organic Carbon	Vanadium	Zinc	Organochlorine Pesticides	Organophosphorus Pesticides	Total Nitrogen Set (as N)	Volatile Organics	Moisture Set	Eurofins | mgt Suite B4
Melbourne Laboratory - NATA Site # 1254 & 14271	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																													
Brisbane Laboratory - NATA Site # 20794																													
Perth Laboratory - NATA Site # 23736																													
A2																													
Test Counts	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	48	44	44	44	44	44	44	44	44	44	44	44	44	44

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Volatile Organics							
1.1-Dichloroethane	mg/kg	< 0.5			0.5	Pass	
1.1-Dichloroethene	mg/kg	< 0.5			0.5	Pass	
1.1.1-Trichloroethane	mg/kg	< 0.5			0.5	Pass	
1.1.1.2-Tetrachloroethane	mg/kg	< 0.5			0.5	Pass	
1.1.2-Trichloroethane	mg/kg	< 0.5			0.5	Pass	
1.1.2.2-Tetrachloroethane	mg/kg	< 0.5			0.5	Pass	
1.2-Dibromoethane	mg/kg	< 0.5			0.5	Pass	
1.2-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2-Dichloroethane	mg/kg	< 0.5			0.5	Pass	
1.2-Dichloropropane	mg/kg	< 0.5			0.5	Pass	
1.2.3-Trichloropropane	mg/kg	< 0.5			0.5	Pass	
1.2.4-Trimethylbenzene	mg/kg	< 0.5			0.5	Pass	
1.3-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.3-Dichloropropane	mg/kg	< 0.5			0.5	Pass	
1.3.5-Trimethylbenzene	mg/kg	< 0.5			0.5	Pass	
1.4-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
2-Butanone (MEK)	mg/kg	< 0.5			0.5	Pass	
2-Propanone (Acetone)	mg/kg	< 0.5			0.5	Pass	
4-Chlorotoluene	mg/kg	< 0.5			0.5	Pass	
4-Methyl-2-pentanone (MIBK)	mg/kg	< 0.5			0.5	Pass	
Allyl chloride	mg/kg	< 0.5			0.5	Pass	
Benzene	mg/kg	< 0.1			0.1	Pass	
Bromobenzene	mg/kg	< 0.5			0.5	Pass	
Bromochloromethane	mg/kg	< 0.5			0.5	Pass	
Bromodichloromethane	mg/kg	< 0.5			0.5	Pass	
Bromoform	mg/kg	< 0.5			0.5	Pass	
Bromomethane	mg/kg	< 0.5			0.5	Pass	
Carbon disulfide	mg/kg	< 0.5			0.5	Pass	
Carbon Tetrachloride	mg/kg	< 0.5			0.5	Pass	
Chlorobenzene	mg/kg	< 0.5			0.5	Pass	
Chloroethane	mg/kg	< 0.5			0.5	Pass	
Chloroform	mg/kg	< 0.5			0.5	Pass	
Chloromethane	mg/kg	< 0.5			0.5	Pass	
cis-1.2-Dichloroethene	mg/kg	< 0.5			0.5	Pass	
cis-1.3-Dichloropropene	mg/kg	< 0.5			0.5	Pass	
Dibromochloromethane	mg/kg	< 0.5			0.5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dibromomethane	mg/kg	< 0.5			0.5	Pass	
Dichlorodifluoromethane	mg/kg	< 0.5			0.5	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
Iodomethane	mg/kg	< 0.5			0.5	Pass	
Isopropyl benzene (Cumene)	mg/kg	< 0.5			0.5	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
Methylene Chloride	mg/kg	< 0.5			0.5	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Styrene	mg/kg	< 0.5			0.5	Pass	
Tetrachloroethene	mg/kg	< 0.5			0.5	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
trans-1.2-Dichloroethene	mg/kg	< 0.5			0.5	Pass	
trans-1.3-Dichloropropene	mg/kg	< 0.5			0.5	Pass	
Trichloroethene	mg/kg	< 0.5			0.5	Pass	
Trichlorofluoromethane	mg/kg	< 0.5			0.5	Pass	
Vinyl chloride	mg/kg	< 0.5			0.5	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Organophosphorus Pesticides							
Azinphos-methyl	mg/kg	< 0.2			0.2	Pass	
Bolstar	mg/kg	< 0.2			0.2	Pass	
Chlorfenvinphos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos-methyl	mg/kg	< 0.2			0.2	Pass	
Coumaphos	mg/kg	< 2			2	Pass	
Demeton-S	mg/kg	< 0.2			0.2	Pass	
Demeton-O	mg/kg	< 0.2			0.2	Pass	
Diazinon	mg/kg	< 0.2			0.2	Pass	
Dichlorvos	mg/kg	< 0.2			0.2	Pass	
Dimethoate	mg/kg	< 0.2			0.2	Pass	
Disulfoton	mg/kg	< 0.2			0.2	Pass	
EPN	mg/kg	< 0.2			0.2	Pass	
Ethion	mg/kg	< 0.2			0.2	Pass	
Ethoprop	mg/kg	< 0.2			0.2	Pass	
Ethyl parathion	mg/kg	< 0.2			0.2	Pass	
Fenitrothion	mg/kg	< 0.2			0.2	Pass	
Fensulfothion	mg/kg	< 0.2			0.2	Pass	
Fenthion	mg/kg	< 0.2			0.2	Pass	
Malathion	mg/kg	< 0.2			0.2	Pass	
Merphos	mg/kg	< 0.2			0.2	Pass	
Methyl parathion	mg/kg	< 0.2			0.2	Pass	
Mevinphos	mg/kg	< 0.2			0.2	Pass	
Monocrotophos	mg/kg	< 2			2	Pass	
Naled	mg/kg	< 0.2			0.2	Pass	
Omethoate	mg/kg	< 2			2	Pass	
Phorate	mg/kg	< 0.2			0.2	Pass	
Pirimiphos-methyl	mg/kg	< 0.2			0.2	Pass	
Pyrazophos	mg/kg	< 0.2			0.2	Pass	
Ronnel	mg/kg	< 0.2			0.2	Pass	
Terbufos	mg/kg	< 0.2			0.2	Pass	
Tetrachlorvinphos	mg/kg	< 0.2			0.2	Pass	
Tokuthion	mg/kg	< 0.2			0.2	Pass	
Trichloronate	mg/kg	< 0.2			0.2	Pass	
Method Blank							
Nitrate & Nitrite (as N)	mg/kg	< 5			5	Pass	
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Aluminium	mg/kg	< 10			10	Pass	
Arsenic	mg/kg	< 2			2	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Barium	mg/kg	< 10			10	Pass	
Beryllium	mg/kg	< 2			2	Pass	
Boron	mg/kg	< 10			10	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Cobalt	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Iron	mg/kg	< 20			20	Pass	
Lead	mg/kg	< 5			5	Pass	
Manganese	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Molybdenum	mg/kg	< 5			5	Pass	
Nickel	mg/kg	< 5			5	Pass	
Selenium	mg/kg	< 2			2	Pass	
Silver	mg/kg	< 0.2			0.2	Pass	
Vanadium	mg/kg	< 10			10	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	103			70-130	Pass	
TRH C10-C14	%	96			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	117			70-130	Pass	
Toluene	%	111			70-130	Pass	
Ethylbenzene	%	112			70-130	Pass	
m&p-Xylenes	%	113			70-130	Pass	
Xylenes - Total	%	114			70-130	Pass	
LCS - % Recovery							
Volatile Organics							
1.1-Dichloroethene	%	83			70-130	Pass	
1.1.1-Trichloroethane	%	107			70-130	Pass	
1.2-Dichlorobenzene	%	117			70-130	Pass	
1.2-Dichloroethane	%	120			70-130	Pass	
Benzene	%	79			70-130	Pass	
Ethylbenzene	%	86			70-130	Pass	
m&p-Xylenes	%	88			70-130	Pass	
Toluene	%	83			70-130	Pass	
Trichloroethene	%	99			70-130	Pass	
Xylenes - Total	%	87			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	81			70-130	Pass	
TRH C6-C10	%	95			70-130	Pass	
TRH >C10-C16	%	88			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	72			70-130	Pass	
Acenaphthylene	%	80			70-130	Pass	
Anthracene	%	84			70-130	Pass	
Benz(a)anthracene	%	72			70-130	Pass	
Benzo(a)pyrene	%	72			70-130	Pass	
Benzo(b&j)fluoranthene	%	91			70-130	Pass	
Benzo(g.h.i)perylene	%	76			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(k)fluoranthene	%	104			70-130	Pass	
Chrysene	%	82			70-130	Pass	
Dibenz(a.h)anthracene	%	82			70-130	Pass	
Fluoranthene	%	113			70-130	Pass	
Fluorene	%	74			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	84			70-130	Pass	
Naphthalene	%	72			70-130	Pass	
Phenanthrene	%	78			70-130	Pass	
Pyrene	%	107			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
4.4'-DDD	%	101			70-130	Pass	
4.4'-DDE	%	96			70-130	Pass	
4.4'-DDT	%	118			70-130	Pass	
a-BHC	%	91			70-130	Pass	
Aldrin	%	97			70-130	Pass	
b-BHC	%	86			70-130	Pass	
d-BHC	%	79			70-130	Pass	
Dieldrin	%	100			70-130	Pass	
Endosulfan I	%	102			70-130	Pass	
Endosulfan II	%	100			70-130	Pass	
Endosulfan sulphate	%	92			70-130	Pass	
Endrin	%	87			70-130	Pass	
Endrin aldehyde	%	88			70-130	Pass	
Endrin ketone	%	94			70-130	Pass	
g-BHC (Lindane)	%	90			70-130	Pass	
Heptachlor	%	95			70-130	Pass	
Heptachlor epoxide	%	100			70-130	Pass	
Hexachlorobenzene	%	83			70-130	Pass	
Methoxychlor	%	116			70-130	Pass	
LCS - % Recovery							
Organophosphorus Pesticides							
Diazinon	%	88			70-130	Pass	
Dimethoate	%	71			70-130	Pass	
Ethion	%	83			70-130	Pass	
Fenitrothion	%	89			70-130	Pass	
Methyl parathion	%	72			70-130	Pass	
Mevinphos	%	90			70-130	Pass	
LCS - % Recovery							
Total Organic Carbon	%	98			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	107			80-120	Pass	
Barium	%	116			80-120	Pass	
Beryllium	%	119			80-120	Pass	
Boron	%	120			80-120	Pass	
Cadmium	%	108			80-120	Pass	
Chromium	%	115			80-120	Pass	
Cobalt	%	117			80-120	Pass	
Copper	%	112			80-120	Pass	
Lead	%	118			80-120	Pass	
Manganese	%	114			80-120	Pass	
Mercury	%	97			75-125	Pass	
Molybdenum	%	109			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Nickel			%	112			80-120	Pass	
Selenium			%	103			80-120	Pass	
Silver			%	114			80-120	Pass	
Vanadium			%	111			80-120	Pass	
Zinc			%	108			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M18-Ap00812	NCP	%	84			70-130	Pass	
Acenaphthylene	M18-Ap00812	NCP	%	85			70-130	Pass	
Anthracene	M18-Ap00812	NCP	%	81			70-130	Pass	
Benz(a)anthracene	M18-Ap00812	NCP	%	86			70-130	Pass	
Benzo(a)pyrene	M18-Ap00812	NCP	%	94			70-130	Pass	
Benzo(b&j)fluoranthene	M18-Ap00812	NCP	%	84			70-130	Pass	
Benzo(g.h.i)perylene	M18-Ap00812	NCP	%	82			70-130	Pass	
Benzo(k)fluoranthene	M18-Ap00812	NCP	%	93			70-130	Pass	
Chrysene	M18-Ap00812	NCP	%	88			70-130	Pass	
Dibenz(a.h)anthracene	M18-Ap00812	NCP	%	81			70-130	Pass	
Fluoranthene	M18-Ap00812	NCP	%	109			70-130	Pass	
Fluorene	M18-Ap00812	NCP	%	77			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M18-Ap00812	NCP	%	81			70-130	Pass	
Naphthalene	M18-Ap00812	NCP	%	85			70-130	Pass	
Phenanthrene	M18-Ap00812	NCP	%	90			70-130	Pass	
Pyrene	M18-Ap00812	NCP	%	86			70-130	Pass	
Spike - % Recovery									
				Result 1					
Total Kjeldahl Nitrogen (as N)	S18-Ma35520	CP	%	116			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	S18-Ma35521	CP	%	94			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S18-Ma35521	CP	%	83			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S18-Ma35521	CP	%	103			75-125	Pass	
Barium	S18-Ma35521	CP	%	98			75-125	Pass	
Beryllium	S18-Ma35521	CP	%	123			75-125	Pass	
Boron	S18-Ma35521	CP	%	113			75-125	Pass	
Cadmium	S18-Ma35521	CP	%	108			75-125	Pass	
Chromium	S18-Ma35521	CP	%	104			75-125	Pass	
Cobalt	S18-Ma35521	CP	%	105			75-125	Pass	
Copper	S18-Ma35521	CP	%	107			75-125	Pass	
Lead	S18-Ma35521	CP	%	111			75-125	Pass	
Manganese	S18-Ma35521	CP	%	92			75-125	Pass	
Mercury	S18-Ma35521	CP	%	95			70-130	Pass	
Molybdenum	S18-Ma35521	CP	%	110			75-125	Pass	
Nickel	S18-Ma35521	CP	%	103			75-125	Pass	
Selenium	S18-Ma35521	CP	%	98			75-125	Pass	
Silver	S18-Ma35521	CP	%	108			75-125	Pass	
Vanadium	S18-Ma35521	CP	%	103			75-125	Pass	
Zinc	S18-Ma35521	CP	%	101			75-125	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
TRH C6-C9	S18-Ma35524	CP	%	93			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S18-Ma35524	CP	%	90			70-130	Pass	
Toluene	S18-Ma35524	CP	%	89			70-130	Pass	
Ethylbenzene	S18-Ma35524	CP	%	99			70-130	Pass	
m&p-Xylenes	S18-Ma35524	CP	%	99			70-130	Pass	
o-Xylene	S18-Ma35524	CP	%	102			70-130	Pass	
Xylenes - Total	S18-Ma35524	CP	%	100			70-130	Pass	
Spike - % Recovery									
Volatile Organics				Result 1					
1.1-Dichloroethene	S18-Ma35524	CP	%	80			70-130	Pass	
1.1.1-Trichloroethane	S18-Ma35524	CP	%	79			70-130	Pass	
1.2-Dichlorobenzene	S18-Ma35524	CP	%	83			70-130	Pass	
1.2-Dichloroethane	S18-Ma35524	CP	%	98			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH C6-C10	S18-Ma35524	CP	%	91			70-130	Pass	
Spike - % Recovery									
Organophosphorus Pesticides				Result 1					
Diazinon	S18-Ma35535	CP	%	112			70-130	Pass	
Dimethoate	S18-Ma35535	CP	%	79			70-130	Pass	
Ethion	S18-Ma35535	CP	%	96			70-130	Pass	
Fenitrothion	S18-Ma35535	CP	%	81			70-130	Pass	
Methyl parathion	S18-Ma35535	CP	%	82			70-130	Pass	
Mevinphos	S18-Ma35535	CP	%	104			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
4.4'-DDD	S18-Ma35545	CP	%	102			70-130	Pass	
4.4'-DDE	S18-Ma35545	CP	%	92			70-130	Pass	
a-BHC	S18-Ma35545	CP	%	94			70-130	Pass	
Aldrin	S18-Ma35545	CP	%	97			70-130	Pass	
b-BHC	S18-Ma35545	CP	%	83			70-130	Pass	
d-BHC	S18-Ma35545	CP	%	89			70-130	Pass	
Dieldrin	S18-Ma35545	CP	%	96			70-130	Pass	
Endosulfan I	S18-Ma35545	CP	%	99			70-130	Pass	
Endosulfan II	S18-Ma35545	CP	%	93			70-130	Pass	
Endosulfan sulphate	S18-Ma35545	CP	%	94			70-130	Pass	
Endrin	S18-Ma35545	CP	%	115			70-130	Pass	
Endrin aldehyde	S18-Ma35545	CP	%	80			70-130	Pass	
Endrin ketone	S18-Ma35545	CP	%	96			70-130	Pass	
g-BHC (Lindane)	S18-Ma35545	CP	%	94			70-130	Pass	
Heptachlor	S18-Ma35545	CP	%	106			70-130	Pass	
Heptachlor epoxide	S18-Ma35545	CP	%	97			70-130	Pass	
Hexachlorobenzene	S18-Ma35545	CP	%	82			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	S18-Ma35552	CP	%	73			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S18-Ma35552	CP	%	79			70-130	Pass	
Spike - % Recovery									
Organophosphorus Pesticides				Result 1					
Diazinon	S18-Ma35596	CP	%	83			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dimethoate	S18-Ma35596	CP	%	73			70-130	Pass	
Ethion	S18-Ma35596	CP	%	86			70-130	Pass	
Fenitrothion	S18-Ma35596	CP	%	84			70-130	Pass	
Methyl parathion	S18-Ma35596	CP	%	118			70-130	Pass	
Mevinphos	S18-Ma35596	CP	%	84			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
4.4'-DDD	S18-Ma35597	CP	%	108			70-130	Pass	
4.4'-DDE	S18-Ma35597	CP	%	113			70-130	Pass	
4.4'-DDT	S18-Ma35597	CP	%	106			70-130	Pass	
a-BHC	S18-Ma35597	CP	%	119			70-130	Pass	
Aldrin	S18-Ma35597	CP	%	129			70-130	Pass	
b-BHC	S18-Ma35597	CP	%	109			70-130	Pass	
d-BHC	S18-Ma35597	CP	%	119			70-130	Pass	
Dieldrin	S18-Ma35597	CP	%	123			70-130	Pass	
Endosulfan I	S18-Ma35597	CP	%	124			70-130	Pass	
Endosulfan II	S18-Ma35597	CP	%	119			70-130	Pass	
Endosulfan sulphate	S18-Ma35597	CP	%	111			70-130	Pass	
Endrin	S18-Ma35597	CP	%	118			70-130	Pass	
Endrin aldehyde	S18-Ma35597	CP	%	81			70-130	Pass	
Endrin ketone	S18-Ma35597	CP	%	118			70-130	Pass	
g-BHC (Lindane)	S18-Ma35597	CP	%	114			70-130	Pass	
Heptachlor	S18-Ma35597	CP	%	113			70-130	Pass	
Heptachlor epoxide	S18-Ma35597	CP	%	122			70-130	Pass	
Hexachlorobenzene	S18-Ma35597	CP	%	122			70-130	Pass	
Methoxychlor	S18-Ma35597	CP	%	121			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S18-Ma35602	CP	%	85			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S18-Ma35602	CP	%	84			70-130	Pass	
Toluene	S18-Ma35602	CP	%	89			70-130	Pass	
Ethylbenzene	S18-Ma35602	CP	%	81			70-130	Pass	
m&p-Xylenes	S18-Ma35602	CP	%	80			70-130	Pass	
o-Xylene	S18-Ma35602	CP	%	84			70-130	Pass	
Xylenes - Total	S18-Ma35602	CP	%	81			70-130	Pass	
Spike - % Recovery									
Volatile Organics				Result 1					
1.1-Dichloroethene	S18-Ma35602	CP	%	76			70-130	Pass	
1.1.1-Trichloroethane	S18-Ma35602	CP	%	84			70-130	Pass	
1.2-Dichlorobenzene	S18-Ma35602	CP	%	79			70-130	Pass	
1.2-Dichloroethane	S18-Ma35602	CP	%	91			70-130	Pass	
Trichloroethene	S18-Ma35602	CP	%	82			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S18-Ma35602	CP	%	74			70-130	Pass	
TRH C6-C10	S18-Ma35602	CP	%	84			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	S18-Ma35604	CP	%	100			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S18-Ma35604	CP	%	89			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S18-Ma35520	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S18-Ma35520	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S18-Ma35520	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S18-Ma35520	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S18-Ma35520	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S18-Ma35520	CP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Kjeldahl Nitrogen (as N)	M18-Ma26504	NCP	mg/kg	370	350	7.0	30%	Pass	
Phosphorus	S18-Ma35520	CP	mg/kg	460	450	1.0	30%	Pass	
% Moisture	S18-Ma35520	CP	%	63	60	4.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-Ma35520	CP	mg/kg	27000	28000	1.0	30%	Pass	
Arsenic	S18-Ma35520	CP	mg/kg	4.5	4.6	3.0	30%	Pass	
Barium	S18-Ma35520	CP	mg/kg	170	170	1.0	30%	Pass	
Beryllium	S18-Ma35520	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	S18-Ma35520	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	S18-Ma35520	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-Ma35520	CP	mg/kg	20	20	1.0	30%	Pass	
Cobalt	S18-Ma35520	CP	mg/kg	7.3	7.4	1.0	30%	Pass	
Copper	S18-Ma35520	CP	mg/kg	28	29	1.0	30%	Pass	
Iron	S18-Ma35520	CP	mg/kg	22000	22000	1.0	30%	Pass	
Lead	S18-Ma35520	CP	mg/kg	22	23	1.0	30%	Pass	
Manganese	S18-Ma35520	CP	mg/kg	480	480	1.0	30%	Pass	
Mercury	S18-Ma35520	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	S18-Ma35520	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-Ma35520	CP	mg/kg	15	15	1.0	30%	Pass	
Selenium	S18-Ma35520	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	S18-Ma35520	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Vanadium	S18-Ma35520	CP	mg/kg	32	33	<1	30%	Pass	
Zinc	S18-Ma35520	CP	mg/kg	66	66	1.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-Ma35521	CP	mg/kg	49000	49000	1.0	30%	Pass	
Arsenic	S18-Ma35521	CP	mg/kg	11	12	3.0	30%	Pass	
Barium	S18-Ma35521	CP	mg/kg	290	290	1.0	30%	Pass	
Beryllium	S18-Ma35521	CP	mg/kg	2.1	2.3	9.0	30%	Pass	
Boron	S18-Ma35521	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	S18-Ma35521	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-Ma35521	CP	mg/kg	110	110	1.0	30%	Pass	
Cobalt	S18-Ma35521	CP	mg/kg	29	30	2.0	30%	Pass	
Copper	S18-Ma35521	CP	mg/kg	51	51	1.0	30%	Pass	
Iron	S18-Ma35521	CP	mg/kg	64000	65000	1.0	30%	Pass	
Lead	S18-Ma35521	CP	mg/kg	21	21	2.0	30%	Pass	
Manganese	S18-Ma35521	CP	mg/kg	1000	1000	2.0	30%	Pass	
Mercury	S18-Ma35521	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	S18-Ma35521	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-Ma35521	CP	mg/kg	100	100	1.0	30%	Pass	
Selenium	S18-Ma35521	CP	mg/kg	< 2	< 2	<1	30%	Pass	

Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Silver	S18-Ma35521	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Vanadium	S18-Ma35521	CP	mg/kg	120	120	1.0	30%	Pass
Zinc	S18-Ma35521	CP	mg/kg	110	110	2.0	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD		
TRH C6-C9	S18-Ma35523	CP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
BTEX				Result 1	Result 2	RPD		
Benzene	S18-Ma35523	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Toluene	S18-Ma35523	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Ethylbenzene	S18-Ma35523	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
m&p-Xylenes	S18-Ma35523	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
o-Xylene	S18-Ma35523	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Xylenes - Total	S18-Ma35523	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass
Duplicate								
Volatile Organics				Result 1	Result 2	RPD		
1.1-Dichloroethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.1-Dichloroethene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.1.1-Trichloroethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.1.1.2-Tetrachloroethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.1.2-Trichloroethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.1.2.2-Tetrachloroethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.2-Dibromoethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.2-Dichlorobenzene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.2-Dichloroethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.2-Dichloropropane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.2.3-Trichloropropane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.2.4-Trimethylbenzene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.3-Dichlorobenzene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.3-Dichloropropane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.3.5-Trimethylbenzene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
1.4-Dichlorobenzene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
2-Butanone (MEK)	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
2-Propanone (Acetone)	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
4-Chlorotoluene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
4-Methyl-2-pentanone (MIBK)	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Allyl chloride	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Bromobenzene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Bromochloromethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Bromodichloromethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Bromoform	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Bromomethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Carbon disulfide	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Carbon Tetrachloride	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Chlorobenzene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Chloroethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Chloroform	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Chloromethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
cis-1.2-Dichloroethene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
cis-1.3-Dichloropropene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Dibromochloromethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Dibromomethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Dichlorodifluoromethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Iodomethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass

Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
Isopropyl benzene (Cumene)	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Methylene Chloride	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Styrene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Tetrachloroethene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.2-Dichloroethene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.3-Dichloropropene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichloroethene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichlorofluoromethane	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Vinyl chloride	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S18-Ma35523	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S18-Ma35523	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Phosphorus	S18-Ma35530	CP	mg/kg	1100	1100	<1	30%	Pass	
% Moisture	S18-Ma35530	CP	%	64	65	2.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-Ma35530	CP	mg/kg	39000	44000	11	30%	Pass	
Arsenic	S18-Ma35530	CP	mg/kg	8.0	8.2	1.0	30%	Pass	
Barium	S18-Ma35530	CP	mg/kg	290	300	4.0	30%	Pass	
Beryllium	S18-Ma35530	CP	mg/kg	2.3	2.3	3.0	30%	Pass	
Boron	S18-Ma35530	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	S18-Ma35530	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-Ma35530	CP	mg/kg	80	85	6.0	30%	Pass	
Cobalt	S18-Ma35530	CP	mg/kg	26	27	4.0	30%	Pass	
Copper	S18-Ma35530	CP	mg/kg	45	47	4.0	30%	Pass	
Iron	S18-Ma35530	CP	mg/kg	45000	47000	4.0	30%	Pass	
Lead	S18-Ma35530	CP	mg/kg	25	26	3.0	30%	Pass	
Manganese	S18-Ma35530	CP	mg/kg	1300	1400	3.0	30%	Pass	
Mercury	S18-Ma35530	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	S18-Ma35530	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-Ma35530	CP	mg/kg	73	78	6.0	30%	Pass	
Selenium	S18-Ma35530	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	S18-Ma35530	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Vanadium	S18-Ma35530	CP	mg/kg	85	87	3.0	30%	Pass	
Zinc	S18-Ma35530	CP	mg/kg	92	95	3.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Inorganic Carbon	S18-Ma35532	CP	%	< 0.1	< 0.1	<1	30%	Pass	
Total Organic Carbon	S18-Ma35532	CP	%	5.8	5.3	7.5	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S18-Ma35534	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	

Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Endosulfan II	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S18-Ma35534	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	S18-Ma35534	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S18-Ma35535	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S18-Ma35535	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	S18-Ma35535	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S18-Ma35540	CP	%	69	69	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Inorganic Carbon	S18-Ma35542	CP	%	0.3	0.3	17	30%	Pass	
Total Organic Carbon	S18-Ma35542	CP	%	1.9	2.1	11	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S18-Ma35544	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S18-Ma35544	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S18-Ma35544	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S18-Ma35544	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S18-Ma35544	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S18-Ma35544	CP	mg/kg	< 100	< 100	<1	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S18-Ma35544	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Azinphos-methyl	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Bolstar	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorfenvinphos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos-methyl	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Coumaphos	S18-Ma35544	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Demeton-S	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Demeton-O	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Diazinon	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dichlorvos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dimethoate	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Disulfoton	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
EPN	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethoprop	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethyl parathion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenitrothion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fensulfothion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenthion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Malathion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Merphos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Methyl parathion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Mevinphos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Monocrotophos	S18-Ma35544	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Naled	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Omethoate	S18-Ma35544	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Phorate	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pirimiphos-methyl	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pyrazophos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ronnel	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Terbufos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tetrachlorvinphos	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tokuthion	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Trichloronate	S18-Ma35544	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	

Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S18-Ma35545	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S18-Ma35545	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	S18-Ma35545	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Phosphorus	S18-Ma35550	CP	mg/kg	1200	1000	14	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-Ma35550	CP	mg/kg	36000	31000	14	30%	Pass	
Arsenic	S18-Ma35550	CP	mg/kg	6.1	5.5	10	30%	Pass	
Barium	S18-Ma35550	CP	mg/kg	260	230	14	30%	Pass	
Beryllium	S18-Ma35550	CP	mg/kg	2.2	< 2	21	30%	Pass	
Boron	S18-Ma35550	CP	mg/kg	16	10	43	30%	Fail	Q15
Cadmium	S18-Ma35550	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-Ma35550	CP	mg/kg	33	29	13	30%	Pass	
Cobalt	S18-Ma35550	CP	mg/kg	21	19	10	30%	Pass	
Copper	S18-Ma35550	CP	mg/kg	25	22	13	30%	Pass	
Iron	S18-Ma35550	CP	mg/kg	33000	31000	9.0	30%	Pass	
Lead	S18-Ma35550	CP	mg/kg	28	24	13	30%	Pass	
Manganese	S18-Ma35550	CP	mg/kg	780	710	9.0	30%	Pass	
Mercury	S18-Ma35550	CP	mg/kg	0.1	< 0.1	17	30%	Pass	
Molybdenum	S18-Ma35550	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-Ma35550	CP	mg/kg	20	17	14	30%	Pass	
Selenium	S18-Ma35550	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	S18-Ma35550	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Vanadium	S18-Ma35550	CP	mg/kg	58	52	12	30%	Pass	
Zinc	S18-Ma35550	CP	mg/kg	99	85	15	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S18-Ma35551	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S18-Ma35551	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S18-Ma35551	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S18-Ma35551	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S18-Ma35551	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S18-Ma35551	CP	mg/kg	< 100	< 100	<1	30%	Pass	

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Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S18-Ma35551	CP	%	69	69	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S18-Ma35556	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Azinphos-methyl	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Bolstar	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorfenvinphos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos-methyl	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Coumaphos	S18-Ma35556	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Demeton-S	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Demeton-O	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Diazinon	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dichlorvos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dimethoate	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Disulfoton	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
EPN	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethoprop	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethyl parathion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenitrothion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fensulfothion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenthion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Malathion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Merphos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Methyl parathion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Mevinphos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Monocrotophos	S18-Ma35556	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Naled	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Omethoate	S18-Ma35556	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Phorate	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pirimiphos-methyl	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pyrazophos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ronnel	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Terbufos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tetrachlorvinphos	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tokuthion	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Trichloronate	S18-Ma35556	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	

Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S18-Ma35596	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S18-Ma35596	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	S18-Ma35596	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S18-Ma35601	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S18-Ma35601	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S18-Ma35601	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S18-Ma35601	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S18-Ma35601	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S18-Ma35601	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S18-Ma35601	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
1.1-Dichloroethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1-Dichloroethene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.1-Trichloroethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.1.2-Tetrachloroethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.2-Trichloroethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.2.2-Tetrachloroethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dibromoethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichlorobenzene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichloroethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichloropropane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3-Trichloropropane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4-Trimethylbenzene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichlorobenzene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichloropropane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3.5-Trimethylbenzene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.4-Dichlorobenzene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Butanone (MEK)	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Propanone (Acetone)	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Chlorotoluene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Methyl-2-pentanone (MIBK)	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
Allyl chloride	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromobenzene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromochloromethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromodichloromethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromoform	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromomethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Carbon disulfide	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Carbon Tetrachloride	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chlorobenzene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloroethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloroform	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloromethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
cis-1.2-Dichloroethene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
cis-1.3-Dichloropropene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibromochloromethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibromomethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dichlorodifluoromethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Iodomethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Isopropyl benzene (Cumene)	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Methylene Chloride	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Styrene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Tetrachloroethene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.2-Dichloroethene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.3-Dichloropropene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichloroethene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichlorofluoromethane	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Vinyl chloride	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S18-Ma35601	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S18-Ma35601	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S18-Ma35603	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S18-Ma35603	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S18-Ma35603	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S18-Ma35603	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S18-Ma35603	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S18-Ma35603	CP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S18-Ma35603	CP	%	48	48	1.0	30%	Pass	

Comments

Particle Size Distribution (Laser Light Scattering) analysis analysed by: East West Geotechnical, Environment, Agricultural, report reference EW180905

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	Yes

Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Alex Petridis	Senior Analyst-Metal (VIC)
Harry Bacallis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Michael Brancati	Senior Analyst-Inorganic (VIC)

Glenn Jackson
National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Cardno (NSW/ACT) Pty Ltd
Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Attention: **Andrew Bradford**

Report **599074-S**
Project name SNOWY HYDRO 2.0 RESERVOIR SAMPLING
Project ID 59918111/003
Received Date May 18, 2018

Client Sample ID			MBSQ01	MBSQ01B	MBSQ02	MBSQ03
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-My24526	S18-My24527	S18-My24528	S18-My24529
Date Sampled			May 16, 2018	May 16, 2018	May 16, 2018	May 16, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	< 20	-	-
TRH C10-C14	20	mg/kg	-	< 20	-	-
TRH C15-C28	50	mg/kg	-	< 50	-	-
TRH C29-C36	50	mg/kg	-	< 50	-	-
TRH C10-36 (Total)	50	mg/kg	-	< 50	-	-
BTEX						
Benzene	0.1	mg/kg	-	< 0.1	-	-
Toluene	0.1	mg/kg	-	< 0.1	-	-
Ethylbenzene	0.1	mg/kg	-	< 0.1	-	-
m&p-Xylenes	0.2	mg/kg	-	< 0.2	-	-
o-Xylene	0.1	mg/kg	-	< 0.1	-	-
Xylenes - Total	0.3	mg/kg	-	< 0.3	-	-
4-Bromofluorobenzene (surr.)	1	%	-	69	-	-
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	-	< 0.5	-	-
1.1-Dichloroethene	0.5	mg/kg	-	< 0.5	-	-
1.1.1-Trichloroethane	0.5	mg/kg	-	< 0.5	-	-
1.1.1.2-Tetrachloroethane	0.5	mg/kg	-	< 0.5	-	-
1.1.2-Trichloroethane	0.5	mg/kg	-	< 0.5	-	-
1.1.2.2-Tetrachloroethane	0.5	mg/kg	-	< 0.5	-	-
1.2-Dibromoethane	0.5	mg/kg	-	< 0.5	-	-
1.2-Dichlorobenzene	0.5	mg/kg	-	< 0.5	-	-
1.2-Dichloroethane	0.5	mg/kg	-	< 0.5	-	-
1.2-Dichloropropane	0.5	mg/kg	-	< 0.5	-	-
1.2.3-Trichloropropane	0.5	mg/kg	-	< 0.5	-	-
1.2.4-Trimethylbenzene	0.5	mg/kg	-	< 0.5	-	-
1.3-Dichlorobenzene	0.5	mg/kg	-	< 0.5	-	-
1.3-Dichloropropane	0.5	mg/kg	-	< 0.5	-	-
1.3.5-Trimethylbenzene	0.5	mg/kg	-	< 0.5	-	-
1.4-Dichlorobenzene	0.5	mg/kg	-	< 0.5	-	-
2-Butanone (MEK)	0.5	mg/kg	-	< 0.5	-	-
2-Propanone (Acetone)	0.5	mg/kg	-	< 0.5	-	-
4-Chlorotoluene	0.5	mg/kg	-	< 0.5	-	-
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	-	< 0.5	-	-
Allyl chloride	0.5	mg/kg	-	< 0.5	-	-

Client Sample ID			MBSQ01	MBSQ01B	MBSQ02	MBSQ03
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-My24526	S18-My24527	S18-My24528	S18-My24529
Date Sampled			May 16, 2018	May 16, 2018	May 16, 2018	May 16, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
Benzene	0.1	mg/kg	-	< 0.1	-	-
Bromobenzene	0.5	mg/kg	-	< 0.5	-	-
Bromochloromethane	0.5	mg/kg	-	< 0.5	-	-
Bromodichloromethane	0.5	mg/kg	-	< 0.5	-	-
Bromoform	0.5	mg/kg	-	< 0.5	-	-
Bromomethane	0.5	mg/kg	-	< 0.5	-	-
Carbon disulfide	0.5	mg/kg	-	< 0.5	-	-
Carbon Tetrachloride	0.5	mg/kg	-	< 0.5	-	-
Chlorobenzene	0.5	mg/kg	-	< 0.5	-	-
Chloroethane	0.5	mg/kg	-	< 0.5	-	-
Chloroform	0.5	mg/kg	-	< 0.5	-	-
Chloromethane	0.5	mg/kg	-	< 0.5	-	-
cis-1.2-Dichloroethene	0.5	mg/kg	-	< 0.5	-	-
cis-1.3-Dichloropropene	0.5	mg/kg	-	< 0.5	-	-
Dibromochloromethane	0.5	mg/kg	-	< 0.5	-	-
Dibromomethane	0.5	mg/kg	-	< 0.5	-	-
Dichlorodifluoromethane	0.5	mg/kg	-	< 0.5	-	-
Ethylbenzene	0.1	mg/kg	-	< 0.1	-	-
Iodomethane	0.5	mg/kg	-	< 0.5	-	-
Isopropyl benzene (Cumene)	0.5	mg/kg	-	< 0.5	-	-
m&p-Xylenes	0.2	mg/kg	-	< 0.2	-	-
Methylene Chloride	0.5	mg/kg	-	< 0.5	-	-
o-Xylene	0.1	mg/kg	-	< 0.1	-	-
Styrene	0.5	mg/kg	-	< 0.5	-	-
Tetrachloroethene	0.5	mg/kg	-	< 0.5	-	-
Toluene	0.1	mg/kg	-	< 0.1	-	-
trans-1.2-Dichloroethene	0.5	mg/kg	-	< 0.5	-	-
trans-1.3-Dichloropropene	0.5	mg/kg	-	< 0.5	-	-
Trichloroethene	0.5	mg/kg	-	< 0.5	-	-
Trichlorofluoromethane	0.5	mg/kg	-	< 0.5	-	-
Vinyl chloride	0.5	mg/kg	-	< 0.5	-	-
Xylenes - Total	0.3	mg/kg	-	< 0.3	-	-
Total MAH*	0.5	mg/kg	-	< 0.5	-	-
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	-	< 0.5	-	-
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	-	< 0.5	-	-
4-Bromofluorobenzene (surr.)	1	%	-	69	-	-
Toluene-d8 (surr.)	1	%	-	71	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	< 0.5	-	-
TRH C6-C10	20	mg/kg	-	< 20	-	-
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	< 20	-	-
TRH >C10-C16	50	mg/kg	-	< 50	-	-
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	< 50	-	-
TRH >C16-C34	100	mg/kg	-	< 100	-	-
TRH >C34-C40	100	mg/kg	-	< 100	-	-

Client Sample ID Sample Matrix Eurofins | mgt Sample No. Date Sampled Test/Reference	LOR	Unit	MBSQ01 Soil S18-My24526 May 16, 2018	MBSQ01B Soil S18-My24527 May 16, 2018	MBSQ02 Soil S18-My24528 May 16, 2018	MBSQ03 Soil S18-My24529 May 16, 2018
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	< 0.5	-	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	0.6	-	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	1.2	-	-
Acenaphthene	0.5	mg/kg	-	< 0.5	-	-
Acenaphthylene	0.5	mg/kg	-	< 0.5	-	-
Anthracene	0.5	mg/kg	-	< 0.5	-	-
Benz(a)anthracene	0.5	mg/kg	-	< 0.5	-	-
Benzo(a)pyrene	0.5	mg/kg	-	< 0.5	-	-
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	-	< 0.5	-	-
Benzo(g.h.i)perylene	0.5	mg/kg	-	< 0.5	-	-
Benzo(k)fluoranthene	0.5	mg/kg	-	< 0.5	-	-
Chrysene	0.5	mg/kg	-	< 0.5	-	-
Dibenz(a.h)anthracene	0.5	mg/kg	-	< 0.5	-	-
Fluoranthene	0.5	mg/kg	-	< 0.5	-	-
Fluorene	0.5	mg/kg	-	< 0.5	-	-
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	-	< 0.5	-	-
Naphthalene	0.5	mg/kg	-	< 0.5	-	-
Phenanthrene	0.5	mg/kg	-	< 0.5	-	-
Pyrene	0.5	mg/kg	-	< 0.5	-	-
Total PAH*	0.5	mg/kg	-	< 0.5	-	-
2-Fluorobiphenyl (surr.)	1	%	-	86	-	-
p-Terphenyl-d14 (surr.)	1	%	-	84	-	-
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	< 0.1	-	-
4.4'-DDD	0.05	mg/kg	-	< 0.05	-	-
4.4'-DDE	0.05	mg/kg	-	< 0.05	-	-
4.4'-DDT	0.05	mg/kg	-	< 0.05	-	-
a-BHC	0.05	mg/kg	-	< 0.05	-	-
Aldrin	0.05	mg/kg	-	< 0.05	-	-
b-BHC	0.05	mg/kg	-	< 0.05	-	-
d-BHC	0.05	mg/kg	-	< 0.05	-	-
Dieldrin	0.05	mg/kg	-	< 0.05	-	-
Endosulfan I	0.05	mg/kg	-	< 0.05	-	-
Endosulfan II	0.05	mg/kg	-	< 0.05	-	-
Endosulfan sulphate	0.05	mg/kg	-	< 0.05	-	-
Endrin	0.05	mg/kg	-	< 0.05	-	-
Endrin aldehyde	0.05	mg/kg	-	< 0.05	-	-
Endrin ketone	0.05	mg/kg	-	< 0.05	-	-
g-BHC (Lindane)	0.05	mg/kg	-	< 0.05	-	-
Heptachlor	0.05	mg/kg	-	< 0.05	-	-
Heptachlor epoxide	0.05	mg/kg	-	< 0.05	-	-
Hexachlorobenzene	0.05	mg/kg	-	< 0.05	-	-
Methoxychlor	0.05	mg/kg	-	< 0.05	-	-
Toxaphene	1	mg/kg	-	< 1	-	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	< 0.05	-	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	< 0.05	-	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	< 0.1	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	< 0.1	-	-
Dibutylchlorendate (surr.)	1	%	-	144	-	-
Tetrachloro-m-xylene (surr.)	1	%	-	124	-	-

Client Sample ID			MBSQ01	MBSQ01B	MBSQ02	MBSQ03
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-My24526	S18-My24527	S18-My24528	S18-My24529
Date Sampled			May 16, 2018	May 16, 2018	May 16, 2018	May 16, 2018
Test/Reference	LOR	Unit				
Ammonia (as N)	5	mg/kg	79	82	86	74
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.2	0.1	< 0.1	0.1
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1100	1100	930	1000
Total Organic Carbon	0.1	%	4.6	4.8	4.1	4.3
Phosphorus	5	mg/kg	510	470	470	470
Sulphur	5	mg/kg	400	380	330	360
% Moisture	1	%	62	60	59	59
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	21000	20000	22000	22000
Arsenic	2	mg/kg	9.2	9.0	10	10
Barium	10	mg/kg	180	180	180	180
Beryllium	2	mg/kg	< 2	< 2	< 2	< 2
Boron	10	mg/kg	11	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	42	42	44	45
Cobalt	5	mg/kg	12	12	13	14
Copper	5	mg/kg	57	56	58	62
Iron	20	mg/kg	24000	24000	25000	26000
Lead	5	mg/kg	26	25	26	26
Manganese	5	mg/kg	400	400	420	400
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	48	47	49	51
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	28	28	29	30
Zinc	5	mg/kg	86	85	87	90

Client Sample ID			MBSQ04	MBSQ05	MBSQ06	MBSQ07
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-My24530	S18-My24531	S18-My24532	S18-My24533
Date Sampled			May 16, 2018	May 16, 2018	May 16, 2018	May 16, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	-	< 20	-
TRH C10-C14	20	mg/kg	-	-	< 20	-
TRH C15-C28	50	mg/kg	-	-	< 50	-
TRH C29-C36	50	mg/kg	-	-	< 50	-
TRH C10-36 (Total)	50	mg/kg	-	-	< 50	-
BTEX						
Benzene	0.1	mg/kg	-	-	< 0.1	-
Toluene	0.1	mg/kg	-	-	< 0.1	-
Ethylbenzene	0.1	mg/kg	-	-	< 0.1	-
m&p-Xylenes	0.2	mg/kg	-	-	< 0.2	-
o-Xylene	0.1	mg/kg	-	-	< 0.1	-
Xylenes - Total	0.3	mg/kg	-	-	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	-	-	97	-

Client Sample ID			MBSQ04	MBSQ05	MBSQ06	MBSQ07
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			S18-My24530	S18-My24531	S18-My24532	S18-My24533
Date Sampled			May 16, 2018	May 16, 2018	May 16, 2018	May 16, 2018
Test/Reference	LOR	Unit				
Volatile Organics						
1.1-Dichloroethane	0.5	mg/kg	-	-	< 0.5	-
1.1-Dichloroethene	0.5	mg/kg	-	-	< 0.5	-
1.1.1-Trichloroethane	0.5	mg/kg	-	-	< 0.5	-
1.1.1.2-Tetrachloroethane	0.5	mg/kg	-	-	< 0.5	-
1.1.2-Trichloroethane	0.5	mg/kg	-	-	< 0.5	-
1.1.2.2-Tetrachloroethane	0.5	mg/kg	-	-	< 0.5	-
1.2-Dibromoethane	0.5	mg/kg	-	-	< 0.5	-
1.2-Dichlorobenzene	0.5	mg/kg	-	-	< 0.5	-
1.2-Dichloroethane	0.5	mg/kg	-	-	< 0.5	-
1.2-Dichloropropane	0.5	mg/kg	-	-	< 0.5	-
1.2.3-Trichloropropane	0.5	mg/kg	-	-	< 0.5	-
1.2.4-Trimethylbenzene	0.5	mg/kg	-	-	< 0.5	-
1.3-Dichlorobenzene	0.5	mg/kg	-	-	< 0.5	-
1.3-Dichloropropane	0.5	mg/kg	-	-	< 0.5	-
1.3.5-Trimethylbenzene	0.5	mg/kg	-	-	< 0.5	-
1.4-Dichlorobenzene	0.5	mg/kg	-	-	< 0.5	-
2-Butanone (MEK)	0.5	mg/kg	-	-	< 0.5	-
2-Propanone (Acetone)	0.5	mg/kg	-	-	< 0.5	-
4-Chlorotoluene	0.5	mg/kg	-	-	< 0.5	-
4-Methyl-2-pentanone (MIBK)	0.5	mg/kg	-	-	< 0.5	-
Allyl chloride	0.5	mg/kg	-	-	< 0.5	-
Benzene	0.1	mg/kg	-	-	< 0.1	-
Bromobenzene	0.5	mg/kg	-	-	< 0.5	-
Bromochloromethane	0.5	mg/kg	-	-	< 0.5	-
Bromodichloromethane	0.5	mg/kg	-	-	< 0.5	-
Bromoform	0.5	mg/kg	-	-	< 0.5	-
Bromomethane	0.5	mg/kg	-	-	< 0.5	-
Carbon disulfide	0.5	mg/kg	-	-	< 0.5	-
Carbon Tetrachloride	0.5	mg/kg	-	-	< 0.5	-
Chlorobenzene	0.5	mg/kg	-	-	< 0.5	-
Chloroethane	0.5	mg/kg	-	-	< 0.5	-
Chloroform	0.5	mg/kg	-	-	< 0.5	-
Chloromethane	0.5	mg/kg	-	-	< 0.5	-
cis-1.2-Dichloroethene	0.5	mg/kg	-	-	< 0.5	-
cis-1.3-Dichloropropene	0.5	mg/kg	-	-	< 0.5	-
Dibromochloromethane	0.5	mg/kg	-	-	< 0.5	-
Dibromomethane	0.5	mg/kg	-	-	< 0.5	-
Dichlorodifluoromethane	0.5	mg/kg	-	-	< 0.5	-
Ethylbenzene	0.1	mg/kg	-	-	< 0.1	-
Iodomethane	0.5	mg/kg	-	-	< 0.5	-
Isopropyl benzene (Cumene)	0.5	mg/kg	-	-	< 0.5	-
m&p-Xylenes	0.2	mg/kg	-	-	< 0.2	-
Methylene Chloride	0.5	mg/kg	-	-	< 0.5	-
o-Xylene	0.1	mg/kg	-	-	< 0.1	-
Styrene	0.5	mg/kg	-	-	< 0.5	-
Tetrachloroethene	0.5	mg/kg	-	-	< 0.5	-
Toluene	0.1	mg/kg	-	-	< 0.1	-
trans-1.2-Dichloroethene	0.5	mg/kg	-	-	< 0.5	-
trans-1.3-Dichloropropene	0.5	mg/kg	-	-	< 0.5	-

Client Sample ID Sample Matrix Eurofins | mgt Sample No. Date Sampled Test/Reference	LOR	Unit	MBSQ04 Soil S18-My24530 May 16, 2018	MBSQ05 Soil S18-My24531 May 16, 2018	MBSQ06 Soil S18-My24532 May 16, 2018	MBSQ07 Soil S18-My24533 May 16, 2018
Volatile Organics						
Trichloroethene	0.5	mg/kg	-	-	< 0.5	-
Trichlorofluoromethane	0.5	mg/kg	-	-	< 0.5	-
Vinyl chloride	0.5	mg/kg	-	-	< 0.5	-
Xylenes - Total	0.3	mg/kg	-	-	< 0.3	-
Total MAH*	0.5	mg/kg	-	-	< 0.5	-
Vic EPA IWRG 621 CHC (Total)*	0.5	mg/kg	-	-	< 0.5	-
Vic EPA IWRG 621 Other CHC (Total)*	0.5	mg/kg	-	-	< 0.5	-
4-Bromofluorobenzene (surr.)	1	%	-	-	97	-
Toluene-d8 (surr.)	1	%	-	-	99	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	-	< 0.5	-
TRH C6-C10	20	mg/kg	-	-	< 20	-
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	-	< 20	-
TRH >C10-C16	50	mg/kg	-	-	< 50	-
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	-	< 50	-
TRH >C16-C34	100	mg/kg	-	-	< 100	-
TRH >C34-C40	100	mg/kg	-	-	< 100	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	-	< 0.5	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	-	0.6	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	-	1.2	-
Acenaphthene	0.5	mg/kg	-	-	< 0.5	-
Acenaphthylene	0.5	mg/kg	-	-	< 0.5	-
Anthracene	0.5	mg/kg	-	-	< 0.5	-
Benz(a)anthracene	0.5	mg/kg	-	-	< 0.5	-
Benzo(a)pyrene	0.5	mg/kg	-	-	< 0.5	-
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	-	-	< 0.5	-
Benzo(g.h.i)perylene	0.5	mg/kg	-	-	< 0.5	-
Benzo(k)fluoranthene	0.5	mg/kg	-	-	< 0.5	-
Chrysene	0.5	mg/kg	-	-	< 0.5	-
Dibenz(a.h)anthracene	0.5	mg/kg	-	-	< 0.5	-
Fluoranthene	0.5	mg/kg	-	-	< 0.5	-
Fluorene	0.5	mg/kg	-	-	< 0.5	-
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	-	-	< 0.5	-
Naphthalene	0.5	mg/kg	-	-	< 0.5	-
Phenanthrene	0.5	mg/kg	-	-	< 0.5	-
Pyrene	0.5	mg/kg	-	-	< 0.5	-
Total PAH*	0.5	mg/kg	-	-	< 0.5	-
2-Fluorobiphenyl (surr.)	1	%	-	-	57	-
p-Terphenyl-d14 (surr.)	1	%	-	-	58	-
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	-	< 0.1	-
4.4'-DDD	0.05	mg/kg	-	-	< 0.05	-
4.4'-DDE	0.05	mg/kg	-	-	< 0.05	-
4.4'-DDT	0.05	mg/kg	-	-	< 0.05	-
a-BHC	0.05	mg/kg	-	-	< 0.05	-
Aldrin	0.05	mg/kg	-	-	< 0.05	-
b-BHC	0.05	mg/kg	-	-	< 0.05	-
d-BHC	0.05	mg/kg	-	-	< 0.05	-

Client Sample ID Sample Matrix Eurofins | mgt Sample No. Date Sampled Test/Reference	LOR	Unit	MBSQ04 Soil S18-My24530 May 16, 2018	MBSQ05 Soil S18-My24531 May 16, 2018	MBSQ06 Soil S18-My24532 May 16, 2018	MBSQ07 Soil S18-My24533 May 16, 2018
Organochlorine Pesticides						
Dieldrin	0.05	mg/kg	-	-	< 0.05	-
Endosulfan I	0.05	mg/kg	-	-	< 0.05	-
Endosulfan II	0.05	mg/kg	-	-	< 0.05	-
Endosulfan sulphate	0.05	mg/kg	-	-	< 0.05	-
Endrin	0.05	mg/kg	-	-	< 0.05	-
Endrin aldehyde	0.05	mg/kg	-	-	< 0.05	-
Endrin ketone	0.05	mg/kg	-	-	< 0.05	-
g-BHC (Lindane)	0.05	mg/kg	-	-	< 0.05	-
Heptachlor	0.05	mg/kg	-	-	< 0.05	-
Heptachlor epoxide	0.05	mg/kg	-	-	< 0.05	-
Hexachlorobenzene	0.05	mg/kg	-	-	< 0.05	-
Methoxychlor	0.05	mg/kg	-	-	< 0.05	-
Toxaphene	1	mg/kg	-	-	< 1	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	-	< 0.05	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	-	< 0.05	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	-	< 0.1	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	-	< 0.1	-
Dibutylchlorendate (surr.)	1	%	-	-	125	-
Tetrachloro-m-xylene (surr.)	1	%	-	-	128	-
Ammonia (as N)	5	mg/kg	70	69	110	91
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.1	< 0.1	0.1	0.1
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1000	1000	1000	1000
Total Organic Carbon	0.1	%	5.2	4.1	6.7	4.9
Phosphorus	5	mg/kg	480	430	580	490
Sulphur	5	mg/kg	380	340	480	400
% Moisture	1	%	61	58	70	65
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	23000	21000	24000	22000
Arsenic	2	mg/kg	9.9	9.7	9.2	9.4
Barium	10	mg/kg	190	170	190	170
Beryllium	2	mg/kg	2.0	< 2	2.3	< 2
Boron	10	mg/kg	< 10	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	47	45	46	43
Cobalt	5	mg/kg	14	13	14	13
Copper	5	mg/kg	63	66	54	58
Iron	20	mg/kg	27000	26000	27000	25000
Lead	5	mg/kg	27	26	26	25
Manganese	5	mg/kg	400	350	430	410
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	52	51	51	48
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	31	29	31	28
Zinc	5	mg/kg	92	87	94	85

Client Sample ID			MBSQ08	MBSQ09	MBSQ10	MBSQ11
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S18-My24534**	**S18-My24535**	**S18-My24536**	**S18-My24537**
Date Sampled			**May 16, 2018**	**May 16, 2018**	**May 16, 2018**	**May 16, 2018**
Test/Reference	LOR	Unit				
Ammonia (as N)	5	mg/kg	84	53	68	65
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Total Inorganic Carbon	0.1	%	0.1	0.1	0.1	0.1
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1000	1100	1100	1000
Total Organic Carbon	0.1	%	4.7	4.4	4.3	4.7
Phosphorus	5	mg/kg	460	420	440	410
Sulphur	5	mg/kg	370	350	350	370
% Moisture	1	%	61	59	59	61
Particle Size Distribution by Sieve and Hydrometer			see attached	see attached	see attached	see attached
Heavy Metals						
Aluminium	10	mg/kg	21000	22000	22000	21000
Arsenic	2	mg/kg	10	11	11	8.8
Barium	10	mg/kg	170	180	190	170
Beryllium	2	mg/kg	< 2	< 2	< 2	< 2
Boron	10	mg/kg	11	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	45	47	51	43
Cobalt	5	mg/kg	14	14	14	12
Copper	5	mg/kg	65	71	73	60
Iron	20	mg/kg	26000	26000	27000	24000
Lead	5	mg/kg	26	27	28	24
Manganese	5	mg/kg	400	370	370	340
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	5	mg/kg	< 5	< 5	< 5	< 5
Nickel	5	mg/kg	50	52	57	48
Selenium	2	mg/kg	< 2	< 2	< 2	< 2
Silver	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vanadium	10	mg/kg	29	30	32	28
Zinc	5	mg/kg	87	90	94	83

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins | mgt Suite B4			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	May 21, 2018	14 Day
- Method: LTM-ORG-2010 TRH C6-C36			
BTEX	Melbourne	May 21, 2018	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	May 21, 2018	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	May 21, 2018	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Polycyclic Aromatic Hydrocarbons	Melbourne	May 21, 2018	14 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Volatile Organics	Melbourne	May 21, 2018	7 Days
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Organochlorine Pesticides	Melbourne	May 21, 2018	14 Day
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Ammonia (as N)	Melbourne	May 21, 2018	7 Day
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Nitrate & Nitrite (as N)	Melbourne	May 21, 2018	28 Day
- Method: APHA 4500-NO3/NO2 Nitrate-Nitrite Nitrogen by FIA			
Total Inorganic Carbon	Melbourne	May 23, 2018	28 Day
- Method: APHA 5310B Total Inorganic Carbon			
Total Kjeldahl Nitrogen (as N)	Melbourne	May 21, 2018	28 Day
- Method: LTM-INO-4310 TKN in Waters & Soils by FIA			
Total Organic Carbon	Melbourne	May 23, 2018	28 Day
- Method: APHA 5310B Total Organic Carbon			
Phosphorus	Melbourne	May 21, 2018	180 Day
- Method: USEPA 6010			
Sulphur	Melbourne	May 21, 2018	7 Day
- Method: LTM-MET-3010			
Heavy Metals	Melbourne	May 21, 2018	180 Day
- Method: LTM-MET-3040 Metals in Waters Solids Soils & Sediments by ICP-MS			
Mercury	Melbourne	May 21, 2018	28 Day
- Method: USEPA 7470/1 Mercury			
% Moisture	Melbourne	May 18, 2018	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name:	Cardno (NSW/ACT) Pty Ltd	**Order No.:**	
Address:	Level 9, 203 Pacific Highway St Leonards NSW 2065	**Report #:**	599074
		Phone:	0294967700
		Fax:	02 9499 3902
Project Name:	SNOWY HYDRO 2.0 RESERVOIR SAMPLING	**Received:**	May 18, 2018 4:06 PM
Project ID:	59918111/003	**Due:**	May 23, 2018
		Priority:	3 Day
		Contact Name:	Andrew Bradford

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Aluminium	Ammonia (as N)	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate & Nitrite (as N)	Particle Size Distribution by Sieve and Hydrometer	Phosphorus	Selenium	Silver	Sulphur	Total Inorganic Carbon	Total Kjeldahl Nitrogen (as N)	Total Organic Carbon	Vanadium	Zinc	Organochlorine Pesticides	Volatile Organics	Moisture Set	Eurofins | mgt Suite B4
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																				
Brisbane Laboratory - NATA Site # 20794																																				
Perth Laboratory - NATA Site # 23736																																				
External Laboratory																							X													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																															
1	MBSQ01	May 16, 2018		Soil	S18-My24526	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
2	MBSQ01B	May 16, 2018		Soil	S18-My24527	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	MBSQ02	May 16, 2018		Soil	S18-My24528	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
4	MBSQ03	May 16, 2018		Soil	S18-My24529	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
5	MBSQ04	May 16, 2018		Soil	S18-My24530	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
6	MBSQ05	May 16, 2018		Soil	S18-My24531	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
7	MBSQ06	May 16, 2018		Soil	S18-My24532	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8	MBSQ07	May 16, 2018		Soil	S18-My24533	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
9	MBSQ08	May 16, 2018		Soil	S18-My24534	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	

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Company Name:	Cardno (NSW/ACT) Pty Ltd	**Order No.:**		**Received:**	May 18, 2018 4:06 PM
Address:	Level 9, 203 Pacific Highway St Leonards NSW 2065	**Report #:**	599074	**Due:**	May 23, 2018
		Phone:	0294967700	**Priority:**	3 Day
		Fax:	02 9499 3902	**Contact Name:**	Andrew Bradford
Project Name:	SNOWY HYDRO 2.0 RESERVOIR SAMPLING				
Project ID:	59918111/003				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Aluminium	Ammonia (as N)	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate & Nitrite (as N)	Particle Size Distribution by Sieve and Hydrometer	Phosphorus	Selenium	Silver	Sulphur	Total Inorganic Carbon	Total Kjeldahl Nitrogen (as N)	Total Organic Carbon	Vanadium	Zinc	Organochlorine Pesticides	Volatile Organics	Moisture Set	Eurofins | mgt Suite B4
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217																																				
Brisbane Laboratory - NATA Site # 20794																																				
Perth Laboratory - NATA Site # 23736																																				
10	MBSQ09	May 16, 2018		Soil	S18-My24535	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
11	MBSQ10	May 16, 2018		Soil	S18-My24536	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
12	MBSQ11	May 16, 2018		Soil	S18-My24537	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
Test Counts						12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	2	2	12	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Volatile Organics							
1.1-Dichloroethane	mg/kg	< 0.5			0.5	Pass	
1.1-Dichloroethene	mg/kg	< 0.5			0.5	Pass	
1.1.1-Trichloroethane	mg/kg	< 0.5			0.5	Pass	
1.1.1.2-Tetrachloroethane	mg/kg	< 0.5			0.5	Pass	
1.1.2-Trichloroethane	mg/kg	< 0.5			0.5	Pass	
1.1.2.2-Tetrachloroethane	mg/kg	< 0.5			0.5	Pass	
1.2-Dibromoethane	mg/kg	< 0.5			0.5	Pass	
1.2-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.2-Dichloroethane	mg/kg	< 0.5			0.5	Pass	
1.2-Dichloropropane	mg/kg	< 0.5			0.5	Pass	
1.2.3-Trichloropropane	mg/kg	< 0.5			0.5	Pass	
1.2.4-Trimethylbenzene	mg/kg	< 0.5			0.5	Pass	
1.3-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
1.3-Dichloropropane	mg/kg	< 0.5			0.5	Pass	
1.3.5-Trimethylbenzene	mg/kg	< 0.5			0.5	Pass	
1.4-Dichlorobenzene	mg/kg	< 0.5			0.5	Pass	
2-Butanone (MEK)	mg/kg	< 0.5			0.5	Pass	
2-Propanone (Acetone)	mg/kg	< 0.5			0.5	Pass	
4-Chlorotoluene	mg/kg	< 0.5			0.5	Pass	
4-Methyl-2-pentanone (MIBK)	mg/kg	< 0.5			0.5	Pass	
Allyl chloride	mg/kg	< 0.5			0.5	Pass	
Bromobenzene	mg/kg	< 0.5			0.5	Pass	
Bromochloromethane	mg/kg	< 0.5			0.5	Pass	
Bromodichloromethane	mg/kg	< 0.5			0.5	Pass	
Bromoform	mg/kg	< 0.5			0.5	Pass	
Bromomethane	mg/kg	< 0.5			0.5	Pass	
Carbon disulfide	mg/kg	< 0.5			0.5	Pass	
Carbon Tetrachloride	mg/kg	< 0.5			0.5	Pass	
Chlorobenzene	mg/kg	< 0.5			0.5	Pass	
Chloroethane	mg/kg	< 0.5			0.5	Pass	
Chloroform	mg/kg	< 0.5			0.5	Pass	
Chloromethane	mg/kg	< 0.5			0.5	Pass	
cis-1.2-Dichloroethene	mg/kg	< 0.5			0.5	Pass	
cis-1.3-Dichloropropene	mg/kg	< 0.5			0.5	Pass	
Dibromochloromethane	mg/kg	< 0.5			0.5	Pass	
Dibromomethane	mg/kg	< 0.5			0.5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dichlorodifluoromethane	mg/kg	< 0.5			0.5	Pass	
Iodomethane	mg/kg	< 0.5			0.5	Pass	
Isopropyl benzene (Cumene)	mg/kg	< 0.5			0.5	Pass	
Methylene Chloride	mg/kg	< 0.5			0.5	Pass	
Styrene	mg/kg	< 0.5			0.5	Pass	
Tetrachloroethene	mg/kg	< 0.5			0.5	Pass	
trans-1.2-Dichloroethene	mg/kg	< 0.5			0.5	Pass	
trans-1.3-Dichloropropene	mg/kg	< 0.5			0.5	Pass	
Trichloroethene	mg/kg	< 0.5			0.5	Pass	
Trichlorofluoromethane	mg/kg	< 0.5			0.5	Pass	
Vinyl chloride	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Ammonia (as N)	mg/kg	< 5			5	Pass	
Nitrate & Nitrite (as N)	mg/kg	< 5			5	Pass	
Total Kjeldahl Nitrogen (as N)	mg/kg	< 10			10	Pass	
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Aluminium	mg/kg	< 10			10	Pass	
Arsenic	mg/kg	< 2			2	Pass	
Barium	mg/kg	< 10			10	Pass	
Beryllium	mg/kg	< 2			2	Pass	
Boron	mg/kg	< 10			10	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Cobalt	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Iron	mg/kg	< 20			20	Pass	
Lead	mg/kg	< 5			5	Pass	
Manganese	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Molybdenum	mg/kg	< 5			5	Pass	
Nickel	mg/kg	< 5			5	Pass	
Selenium	mg/kg	< 2			2	Pass	
Silver	mg/kg	< 0.2			0.2	Pass	
Vanadium	mg/kg	< 10			10	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	100			70-130	Pass	
TRH C10-C14	%	71			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	117			70-130	Pass	
Toluene	%	107			70-130	Pass	
Ethylbenzene	%	96			70-130	Pass	
m&p-Xylenes	%	89			70-130	Pass	
Xylenes - Total	%	90			70-130	Pass	
LCS - % Recovery							
Volatile Organics							
1.1-Dichloroethene	%	84			70-130	Pass	
1.1.1-Trichloroethane	%	110			70-130	Pass	
1.2-Dichlorobenzene	%	103			70-130	Pass	
1.2-Dichloroethane	%	111			70-130	Pass	
Trichloroethene	%	122			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	114			70-130	Pass	
TRH C6-C10	%	98			70-130	Pass	
TRH >C10-C16	%	71			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	80			70-130	Pass	
Acenaphthylene	%	79			70-130	Pass	
Anthracene	%	76			70-130	Pass	
Benz(a)anthracene	%	82			70-130	Pass	
Benzo(a)pyrene	%	82			70-130	Pass	
Benzo(b&j)fluoranthene	%	73			70-130	Pass	
Benzo(g.h.i)perylene	%	82			70-130	Pass	
Benzo(k)fluoranthene	%	83			70-130	Pass	
Chrysene	%	79			70-130	Pass	
Dibenz(a.h)anthracene	%	88			70-130	Pass	
Fluoranthene	%	70			70-130	Pass	
Fluorene	%	85			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	87			70-130	Pass	
Naphthalene	%	76			70-130	Pass	
Phenanthrene	%	90			70-130	Pass	
Pyrene	%	70			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
4.4'-DDD	%	123			70-130	Pass	
4.4'-DDE	%	121			70-130	Pass	
4.4'-DDT	%	124			70-130	Pass	
a-BHC	%	109			70-130	Pass	
Aldrin	%	120			70-130	Pass	
b-BHC	%	106			70-130	Pass	
d-BHC	%	113			70-130	Pass	
Dieldrin	%	118			70-130	Pass	
Endosulfan I	%	118			70-130	Pass	
Endosulfan II	%	115			70-130	Pass	
Endosulfan sulphate	%	117			70-130	Pass	
Endrin	%	128			70-130	Pass	
Endrin aldehyde	%	116			70-130	Pass	
Endrin ketone	%	119			70-130	Pass	
g-BHC (Lindane)	%	111			70-130	Pass	
Heptachlor	%	119			70-130	Pass	
Heptachlor epoxide	%	120			70-130	Pass	
Hexachlorobenzene	%	106			70-130	Pass	
Methoxychlor	%	104			70-130	Pass	
LCS - % Recovery							
Total Kjeldahl Nitrogen (as N)	%	93			70-130	Pass	
Total Organic Carbon	%	96			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	107			80-120	Pass	
Barium	%	117			80-120	Pass	
Beryllium	%	116			80-120	Pass	
Boron	%	115			80-120	Pass	
Cadmium	%	100			80-120	Pass	
Chromium	%	107			80-120	Pass	
Cobalt	%	109			80-120	Pass	
Copper	%	102			80-120	Pass	
Lead	%	102			80-120	Pass	
Manganese	%	110			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Mercury			%	88			75-125	Pass	
Molybdenum			%	106			80-120	Pass	
Nickel			%	104			80-120	Pass	
Selenium			%	103			80-120	Pass	
Silver			%	102			80-120	Pass	
Vanadium			%	104			80-120	Pass	
Zinc			%	106			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
				Result 1					
Total Kjeldahl Nitrogen (as N)	M18-My24390	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S18-My24527	CP	%	99			75-125	Pass	
Barium	S18-My24527	CP	%	101			75-125	Pass	
Beryllium	S18-My24527	CP	%	113			75-125	Pass	
Boron	S18-My24527	CP	%	104			75-125	Pass	
Cadmium	S18-My24527	CP	%	94			75-125	Pass	
Chromium	S18-My24527	CP	%	98			75-125	Pass	
Cobalt	S18-My24527	CP	%	100			75-125	Pass	
Copper	S18-My24527	CP	%	98			75-125	Pass	
Lead	S18-My24527	CP	%	96			75-125	Pass	
Manganese	S18-My24527	CP	%	104			75-125	Pass	
Mercury	S18-My24527	CP	%	86			70-130	Pass	
Molybdenum	S18-My24527	CP	%	101			75-125	Pass	
Nickel	S18-My24527	CP	%	99			75-125	Pass	
Selenium	S18-My24527	CP	%	95			75-125	Pass	
Silver	S18-My24527	CP	%	98			75-125	Pass	
Vanadium	S18-My24527	CP	%	97			75-125	Pass	
Zinc	S18-My24527	CP	%	101			75-125	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S18-My24532	CP	%	87			70-130	Pass	
TRH C10-C14	S18-My24532	CP	%	75			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S18-My24532	CP	%	87			70-130	Pass	
Toluene	S18-My24532	CP	%	88			70-130	Pass	
Ethylbenzene	S18-My24532	CP	%	89			70-130	Pass	
m&p-Xylenes	S18-My24532	CP	%	84			70-130	Pass	
o-Xylene	S18-My24532	CP	%	87			70-130	Pass	
Xylenes - Total	S18-My24532	CP	%	85			70-130	Pass	
Spike - % Recovery									
Volatile Organics				Result 1					
1.1-Dichloroethene	S18-My24532	CP	%	71			70-130	Pass	
1.1.1-Trichloroethane	S18-My24532	CP	%	74			70-130	Pass	
1.2-Dichlorobenzene	S18-My24532	CP	%	80			70-130	Pass	
1.2-Dichloroethane	S18-My24532	CP	%	102			70-130	Pass	
Trichloroethene	S18-My24532	CP	%	86			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S18-My24532	CP	%	77			70-130	Pass	
TRH C6-C10	S18-My24532	CP	%	86			70-130	Pass	
TRH >C10-C16	S18-My24532	CP	%	71			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S18-My24532	CP	%	94			70-130	Pass	
Acenaphthylene	S18-My24532	CP	%	96			70-130	Pass	
Anthracene	S18-My24532	CP	%	107			70-130	Pass	
Benz(a)anthracene	S18-My24532	CP	%	106			70-130	Pass	
Benzo(a)pyrene	S18-My24532	CP	%	99			70-130	Pass	
Benzo(b&j)fluoranthene	S18-My24532	CP	%	95			70-130	Pass	
Benzo(g.h.i)perylene	S18-My24532	CP	%	104			70-130	Pass	
Benzo(k)fluoranthene	S18-My24532	CP	%	92			70-130	Pass	
Chrysene	S18-My24532	CP	%	103			70-130	Pass	
Dibenz(a.h)anthracene	S18-My24532	CP	%	113			70-130	Pass	
Fluoranthene	S18-My24532	CP	%	86			70-130	Pass	
Fluorene	S18-My24532	CP	%	97			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S18-My24532	CP	%	110			70-130	Pass	
Naphthalene	S18-My24532	CP	%	95			70-130	Pass	
Phenanthrene	S18-My24532	CP	%	107			70-130	Pass	
Pyrene	S18-My24532	CP	%	86			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
4.4'-DDD	S18-My24532	CP	%	126			70-130	Pass	
4.4'-DDE	S18-My24532	CP	%	118			70-130	Pass	
4.4'-DDT	S18-My24532	CP	%	112			70-130	Pass	
a-BHC	S18-My24532	CP	%	113			70-130	Pass	
Aldrin	S18-My24532	CP	%	128			70-130	Pass	
b-BHC	S18-My24532	CP	%	112			70-130	Pass	
d-BHC	S18-My24532	CP	%	125			70-130	Pass	
Dieldrin	S18-My24532	CP	%	130			70-130	Pass	
Endosulfan I	S18-My24532	CP	%	129			70-130	Pass	
Endosulfan II	S18-My24532	CP	%	125			70-130	Pass	
Endosulfan sulphate	S18-My24532	CP	%	125			70-130	Pass	
Endrin	S18-My24532	CP	%	126			70-130	Pass	
Endrin aldehyde	S18-My24532	CP	%	89			70-130	Pass	
Endrin ketone	S18-My24532	CP	%	112			70-130	Pass	
g-BHC (Lindane)	S18-My24532	CP	%	115			70-130	Pass	
Heptachlor	S18-My24532	CP	%	122			70-130	Pass	
Heptachlor epoxide	S18-My24532	CP	%	130			70-130	Pass	
Hexachlorobenzene	S18-My24532	CP	%	114			70-130	Pass	
Methoxychlor	S18-My24532	CP	%	127			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S18-My24537	CP	%	104			75-125	Pass	
Barium	S18-My24537	CP	%	110			75-125	Pass	
Beryllium	S18-My24537	CP	%	118			75-125	Pass	
Boron	S18-My24537	CP	%	113			75-125	Pass	
Cadmium	S18-My24537	CP	%	99			75-125	Pass	
Chromium	S18-My24537	CP	%	104			75-125	Pass	
Cobalt	S18-My24537	CP	%	105			75-125	Pass	
Copper	S18-My24537	CP	%	104			75-125	Pass	
Lead	S18-My24537	CP	%	99			75-125	Pass	
Manganese	S18-My24537	CP	%	114			75-125	Pass	
Mercury	S18-My24537	CP	%	85			70-130	Pass	
Molybdenum	S18-My24537	CP	%	105			75-125	Pass	
Nickel	S18-My24537	CP	%	103			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Selenium	S18-My24537	CP	%	101			75-125	Pass	
Silver	S18-My24537	CP	%	98			75-125	Pass	
Vanadium	S18-My24537	CP	%	102			75-125	Pass	
Zinc	S18-My24537	CP	%	107			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Total Inorganic Carbon	S18-My24526	CP	%	0.2	0.1	6.2	30%	Pass	
Total Organic Carbon	S18-My24526	CP	%	4.6	4.8	3.9	30%	Pass	
Phosphorus	S18-My24526	CP	mg/kg	510	520	2.0	30%	Pass	
Sulphur	S18-My24526	CP	mg/kg	400	410	2.0	30%	Pass	
% Moisture	S18-My24526	CP	%	62	62	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-My24526	CP	mg/kg	21000	23000	7.0	30%	Pass	
Arsenic	S18-My24526	CP	mg/kg	9.2	9.6	4.0	30%	Pass	
Barium	S18-My24526	CP	mg/kg	180	190	6.0	30%	Pass	
Beryllium	S18-My24526	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	S18-My24526	CP	mg/kg	11	< 10	18	30%	Pass	
Cadmium	S18-My24526	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-My24526	CP	mg/kg	42	46	8.0	30%	Pass	
Cobalt	S18-My24526	CP	mg/kg	12	13	7.0	30%	Pass	
Copper	S18-My24526	CP	mg/kg	57	61	8.0	30%	Pass	
Iron	S18-My24526	CP	mg/kg	24000	26000	6.0	30%	Pass	
Lead	S18-My24526	CP	mg/kg	26	27	4.0	30%	Pass	
Manganese	S18-My24526	CP	mg/kg	400	430	7.0	30%	Pass	
Mercury	S18-My24526	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	S18-My24526	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-My24526	CP	mg/kg	48	51	6.0	30%	Pass	
Selenium	S18-My24526	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	S18-My24526	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Vanadium	S18-My24526	CP	mg/kg	28	30	6.0	30%	Pass	
Zinc	S18-My24526	CP	mg/kg	86	91	5.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S18-My24527	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S18-My24527	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S18-My24527	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S18-My24527	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S18-My24527	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S18-My24527	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S18-My24527	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S18-My24527	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S18-My24527	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S18-My24527	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
1.1-Dichloroethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1-Dichloroethene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.1-Trichloroethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.1.2-Tetrachloroethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.1.2-Trichloroethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
1.1.2.2-Tetrachloroethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dibromoethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichlorobenzene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichloroethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2-Dichloropropane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.3-Trichloropropane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.2.4-Trimethylbenzene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichlorobenzene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3-Dichloropropane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.3.5-Trimethylbenzene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
1.4-Dichlorobenzene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Butanone (MEK)	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2-Propanone (Acetone)	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Chlorotoluene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
4-Methyl-2-pentanone (MIBK)	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Allyl chloride	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromobenzene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromochloromethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromodichloromethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromoform	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Bromomethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Carbon disulfide	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Carbon Tetrachloride	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chlorobenzene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloroethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloroform	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chloromethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
cis-1.2-Dichloroethene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
cis-1.3-Dichloropropene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibromochloromethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibromomethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dichlorodifluoromethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Iodomethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Isopropyl benzene (Cumene)	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Methylene Chloride	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Styrene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Tetrachloroethene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.2-Dichloroethene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
trans-1.3-Dichloropropene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichloroethene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Trichlorofluoromethane	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Vinyl chloride	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S18-My24527	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S18-My24527	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	S18-My24527	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S18-My24527	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S18-My24527	CP	mg/kg	< 100	< 100	<1	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	M18-My24691	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S18-My24527	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S18-My24527	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Toxaphene	S18-My24527	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-My24527	CP	mg/kg	20000	20000	<1	30%	Pass	
Arsenic	S18-My24527	CP	mg/kg	9.0	9.0	<1	30%	Pass	
Barium	S18-My24527	CP	mg/kg	180	180	1.0	30%	Pass	
Beryllium	S18-My24527	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	S18-My24527	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	S18-My24527	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-My24527	CP	mg/kg	42	42	1.0	30%	Pass	
Cobalt	S18-My24527	CP	mg/kg	12	13	1.0	30%	Pass	
Copper	S18-My24527	CP	mg/kg	56	56	<1	30%	Pass	
Iron	S18-My24527	CP	mg/kg	24000	24000	1.0	30%	Pass	
Lead	S18-My24527	CP	mg/kg	25	25	<1	30%	Pass	
Manganese	S18-My24527	CP	mg/kg	400	400	1.0	30%	Pass	
Mercury	S18-My24527	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Molybdenum	S18-My24527	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-My24527	CP	mg/kg	47	47	<1	30%	Pass	
Selenium	S18-My24527	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	S18-My24527	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Vanadium	S18-My24527	CP	mg/kg	28	28	2.0	30%	Pass	
Zinc	S18-My24527	CP	mg/kg	85	85	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Inorganic Carbon	S18-My24533	CP	%	0.1	0.1	2.4	30%	Pass	
Total Organic Carbon	S18-My24533	CP	%	4.9	4.9	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Phosphorus	S18-My24536	CP	mg/kg	440	410	9.0	30%	Pass	
Sulphur	S18-My24536	CP	mg/kg	350	340	5.0	30%	Pass	
% Moisture	S18-My24536	CP	%	59	58	1.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-My24536	CP	mg/kg	22000	20000	11	30%	Pass	
Arsenic	S18-My24536	CP	mg/kg	11	9.3	18	30%	Pass	
Barium	S18-My24536	CP	mg/kg	190	180	6.0	30%	Pass	
Beryllium	S18-My24536	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	S18-My24536	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	S18-My24536	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-My24536	CP	mg/kg	51	44	14	30%	Pass	
Cobalt	S18-My24536	CP	mg/kg	14	13	11	30%	Pass	
Copper	S18-My24536	CP	mg/kg	73	64	12	30%	Pass	
Iron	S18-My24536	CP	mg/kg	27000	24000	13	30%	Pass	
Lead	S18-My24536	CP	mg/kg	28	25	14	30%	Pass	
Manganese	S18-My24536	CP	mg/kg	370	340	8.0	30%	Pass	
Mercury	S18-My24536	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	S18-My24536	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-My24536	CP	mg/kg	57	49	15	30%	Pass	
Selenium	S18-My24536	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	S18-My24536	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Vanadium	S18-My24536	CP	mg/kg	32	29	10	30%	Pass	
Zinc	S18-My24536	CP	mg/kg	94	85	10	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S18-My24537	CP	mg/kg	21000	21000	<1	30%	Pass	
Arsenic	S18-My24537	CP	mg/kg	8.8	8.7	1.0	30%	Pass	
Barium	S18-My24537	CP	mg/kg	170	170	<1	30%	Pass	
Beryllium	S18-My24537	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	S18-My24537	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	S18-My24537	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S18-My24537	CP	mg/kg	43	44	1.0	30%	Pass	
Cobalt	S18-My24537	CP	mg/kg	12	12	<1	30%	Pass	
Copper	S18-My24537	CP	mg/kg	60	59	1.0	30%	Pass	
Iron	S18-My24537	CP	mg/kg	24000	24000	<1	30%	Pass	
Lead	S18-My24537	CP	mg/kg	24	24	<1	30%	Pass	
Manganese	S18-My24537	CP	mg/kg	340	340	1.0	30%	Pass	
Mercury	S18-My24537	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	S18-My24537	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	S18-My24537	CP	mg/kg	48	48	<1	30%	Pass	
Selenium	S18-My24537	CP	mg/kg	< 2	< 2	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Silver	S18-My24537	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Vanadium	S18-My24537	CP	mg/kg	28	28	1.0	30%	Pass	
Zinc	S18-My24537	CP	mg/kg	83	84	1.0	30%	Pass	

Comments

Particle size distribution analysed by: East West labs Tamworth, report reference EW181058.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	Yes

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Nibha Vaidya	Analytical Services Manager
Alex Petridis	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Michael Brancati	Senior Analyst-Inorganic (VIC)

Glenn Jackson
National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1815251**	Page	: 1 of 6
Client	: **HASKONING AUSTRALIA- ROYAL HASKONING**	Laboratory	: Environmental Division Sydney
Contact	: ALI WATTERS	Contact	: Customer Services ES
Address	: LEVEL 14 56 Berry Street NORTH SYDNEY 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 8854 5000	Telephone	: +61-2-8784 8555
Project	: Snowy 2.0	Date Samples Received	: 25-May-2018 13:00
Order number	: PA1804	Date Analysis Commenced	: 28-May-2018
C-O-C number	: ----	Issue Date	: 31-May-2018 16:23
Sampler	: CARDNO		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 7		
No. of samples analysed	: 7		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG093: Samples were run under EG094 method due to low TDS content.
- EN68: This analysis in accordance with National Ocean Disposal Guidelines, Commonwealth of Australia, 2002 - (modified). Results reported are those determined on a 1:4 sediment/seawater elutriate without blank correction.

Analytical Results

Sub-Matrix: ELUTRIATE (Matrix: WATER)			Client sample ID	TALS_SQ_11B1	TALS_SQ_01A2	TALS_SQ_07A1	MBSQ 05	MBSW 08
			Client sampling date / time	27-Mar-2018 00:00	27-Mar-2018 00:00	26-Mar-2018 00:00	27-Mar-2018 00:00	16-May-2018 00:00
Compound	CAS Number	LOR	Unit	ES1815251-001	ES1815251-002	ES1815251-003	ES1815251-004	ES1815251-005
				Result	Result	Result	Result	Result
EG093T: Total Metals in Saline Water by ORC-ICPMS								
Arsenic	7440-38-2	0.5	µg/L	4.8	3.5	6.7	5.2	5.1
Chromium	7440-47-3	0.5	µg/L	8.8	4.9	7.4	5.7	2.4
Copper	7440-50-8	1	µg/L	12	10	22	13	8
Lead	7439-92-1	0.2	µg/L	1.9	3.9	6.0	5.3	2.4
Nickel	7440-02-0	0.5	µg/L	8.5	4.2	6.8	5.4	2.4
Zinc	7440-66-6	5	µg/L	52	105	73	44	33

Analytical Results

Sub-Matrix: ELUTRIATE (Matrix: WATER)			Client sample ID	MBSQ 11	BULK WATER	----	----	----
			Client sampling date / time	16-May-2018 00:00	16-May-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1815251-006	ES1815251-007	--------	--------	--------
				Result	Result	----	----	----
EG093T: Total Metals in Saline Water by ORC-ICPMS								
Arsenic	7440-38-2	0.5	µg/L	**5.3**	<0.5	----	----	----
Chromium	7440-47-3	0.5	µg/L	**3.6**	<0.5	----	----	----
Copper	7440-50-8	1	µg/L	**8**	<1	----	----	----
Lead	7439-92-1	0.2	µg/L	**3.0**	<0.2	----	----	----
Nickel	7440-02-0	0.5	µg/L	**3.3**	<0.5	----	----	----
Zinc	7440-66-6	5	µg/L	**34**	<5	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Client sample ID	TALS_SQ_11B1	TALS_SQ_01A2	TALS_SQ_07A1	MBSQ 05	MBSW 08
			Client sampling date / time	27-Mar-2018 00:00	27-Mar-2018 00:00	26-Mar-2018 00:00	27-Mar-2018 00:00	16-May-2018 00:00
Compound	CAS Number	LOR	Unit	ES1815251-001	ES1815251-002	ES1815251-003	ES1815251-004	ES1815251-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	71.1	89.0	80.6	63.7	71.8
EG005-SDH: 1M HCl-Extractable Metals by ICPAES								
Arsenic	7440-38-2	1.0	mg/kg	4.0	5.1	4.7	1.2	3.3
Chromium	7440-47-3	1.0	mg/kg	26.7	15.9	13.9	4.8	5.4
Copper	7440-50-8	1.0	mg/kg	32.6	36.6	40.9	33.7	41.7
Lead	7439-92-1	1.0	mg/kg	17.1	37.5	29.8	22.4	27.3
Nickel	7440-02-0	1.0	mg/kg	34.8	13.7	17.5	10.0	12.0
Zinc	7440-66-6	1.0	mg/kg	39.4	65.8	61.6	29.6	35.0
EN68: Seawater Elutriate Testing Procedure								
Seawater Sampling Date	----	0.1	-	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Client sample ID	MBSQ 11	BULK WATER	----	----	----
			Client sampling date / time	16-May-2018 00:00	16-May-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1815251-006	ES1815251-007	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	75.1	----	----	----	----
EG005-SDH: 1M HCl-Extractable Metals by ICPAES								
Arsenic	7440-38-2	1.0	mg/kg	3.1	----	----	----	----
Chromium	7440-47-3	1.0	mg/kg	6.8	----	----	----	----
Copper	7440-50-8	1.0	mg/kg	38.0	----	----	----	----
Lead	7439-92-1	1.0	mg/kg	28.3	----	----	----	----
Nickel	7440-02-0	1.0	mg/kg	14.6	----	----	----	----
Zinc	7440-66-6	1.0	mg/kg	42.3	----	----	----	----
EN68: Seawater Elutriate Testing Procedure								
Seawater Sampling Date	----	0.1	-	29/05/2018	29/05/2018	----	----	----

Appendix D – Subaqueous Excavated Rock Placement Program

REPORT

Snowy 2.0 Exploratory Works

Technical Report
Subaqueous Excavated Rock Placement Program

Client: Snowy Hydro Limited

Reference: MAPA1814R003D20 - SERP

Revision: 2.0/Final

Date: 13 July 2018

Royal HaskoningDHV
Enhancing Society Together

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Document title:	Snowy 2.0 Exploratory Works
Document short title:	Subaqueous Excavated Rock Placement Program
Reference:	MAPA1814R003D20 - SERP
Revision:	2.0/Final
Date:	13 July 2018
Project name:	Snowy 2.0
Project number:	PA1814
Author(s):	Greg Britton / Rick Plain
Drafted by:	Greg Britton / Rick Plain
Checked by:	Greg Britton
Date / initials:	GB 13/7/18
Approved by:	Greg Britton
Date / initials:	GB 13/7/19

Classification
Project related

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
OHSAS 18001

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1 Project Description

1.1 Overview

A large quantity of excavated rock (approximately 10 million cubic metres (m^3) bulked) requires management and storage as part of Snowy 2.0. Approximately 750,000 m^3 of the excavated rock, including some soil, would be produced during excavation of the exploratory tunnel and associated construction activities in the Exploratory Works.

Subaqueous excavated rock placement below the Minimum Operating Level in Talbingo Reservoir is currently the preferred placement option for excavated rock produced during the main works for Snowy 2.0. Two main investigations are underway to confirm the suitability of this option, which are:

1. Investigation of the geochemical and mineralogical characteristics of the rock and the impacts of placement of rock on the water and sediment quality within the reservoir; and
2. Determination of the potential for resuspension of the material following placement due to physical processes such as currents.

A subaqueous excavated rock placement program is proposed for Exploratory Works. It would involve an initial phase of 50,000m^3 of excavated rock (less than 10% of the total volume of excavation during the Exploratory Works). The program would utilise the barging infrastructure constructed in Middle Bay.

The initial phase would be conducted in accordance with a detailed management plan and subject to a range of environmental controls and monitoring. Should the initial phase be successful, Snowy Hydro may propose to expand the quantity of rock placed in the reservoir during Exploratory Works beyond 50,000m^3, in consultation with relevant authorities.

This report sets out the objectives of the program, the proposed methodology, the strategy for managing and monitoring impacts, and an environmental impact assessment for Exploratory Works.

1.2 Objectives of the program

The performance of a subaqueous excavated rock placement program during Exploratory Works is considered to have a number of benefits.

The opportunity to trial subaqueous excavated rock placement would enable:

- testing and refining the effectiveness of environmental controls and monitoring;
- refining site-specific placement methods and controls; and
- refining material-specific handling methods.

If the program is successful it would also be possible to reduce the total volume of excavated rock that requires on-land placement during Exploratory Works.

1.3 Proposed locations for placement of excavated rock

The proposed location for the subaqueous placement of 50,000m^3 of excavated rock in the initial phase is Plain Creek Bay (refer **Figure 1**). **Figure 1** also identifies two other potential subaqueous placement locations discussed in this report. The Plain Creek Bay location was selected following consideration of a range of criteria including:

- aquatic ecology;
- other environmental and social considerations such as waterway use for recreation;
- available water depth and surface area (storage volume);
- potential for resuspension of placed material (hydrodynamics);
- proximity to load-out point in Middle Bay (cycle time, cost);
- Snowy Hydro operational considerations; and
- ability to incorporate environmental controls during placement.

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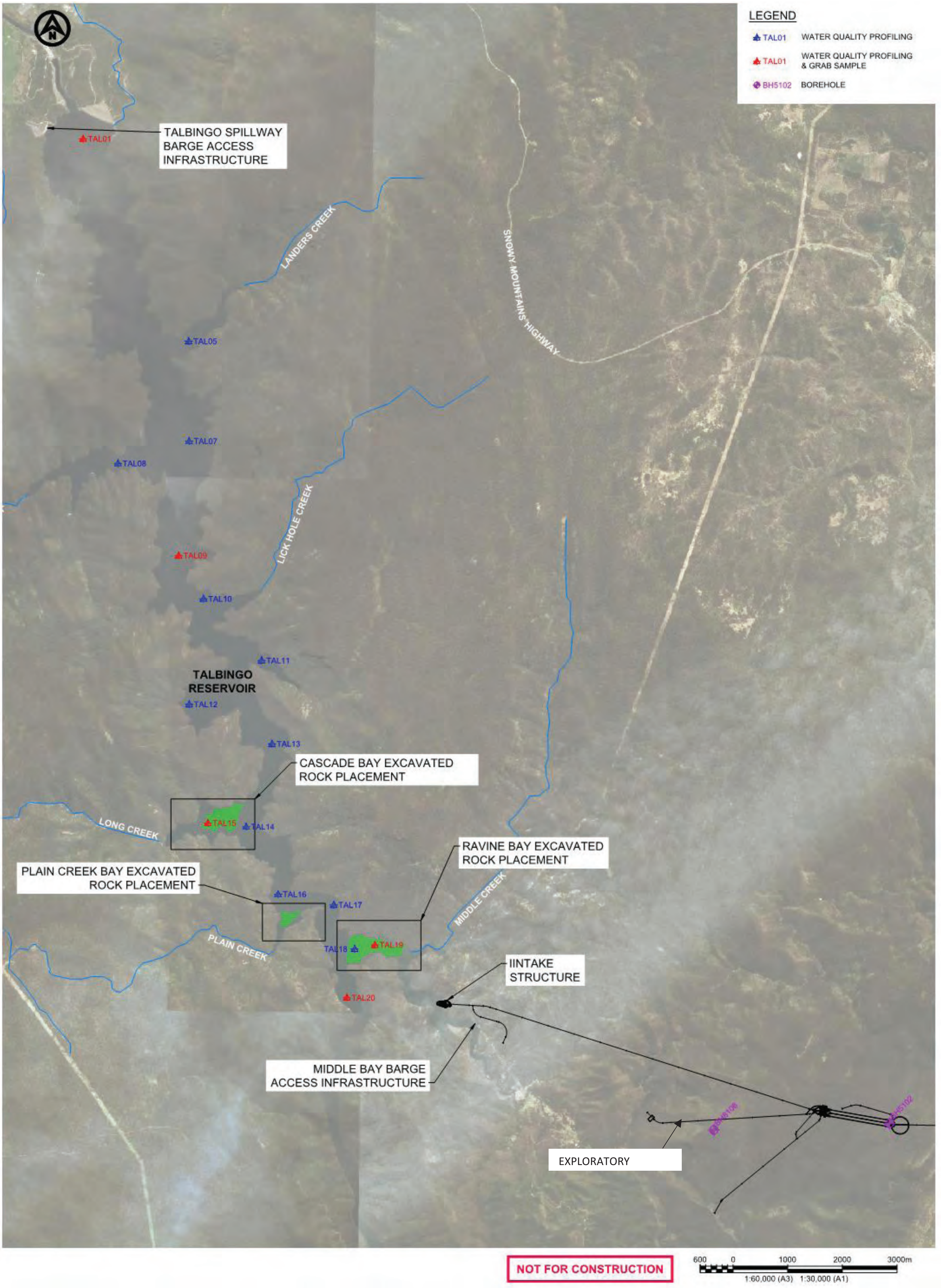

Figure 1 : Proposed locations of subaqueous excavated rock placement.

Favourable attributes of Plain Creek Bay include:

- the potential storage volume in Plain Creek Bay below the Minimum Operating Level is more than sufficient for the initial phase placement, by a factor of approximately 10[1];
- the bay is in relatively close proximity (approximately 5 km) to the load out point at the barge ramp in Middle Bay;
- the semi-enclosed shape of the side bay provides good opportunity to incorporate environmental controls such as silt curtains; and
- the potential for resuspension of placed material is conceptually expected to be less than for locations situated along the main axis of the reservoir.

A more detailed view of the proposed placement location within Plain Creek Bay is shown in **Figure 2**. The placement location has a surface area of approximately 50,000 m^2. Existing water depths within the placement location vary from approximately 30 m to 5 m measured relative to the Minimum Operating Level[2].

Should the initial phase of subaqueous placement be successful, Snowy Hydro would proceed with placement of additional excavated rock in Talbingo Reservoir during Exploratory Works. It is proposed this would take place as a continuation within Plain Creek Bay and also at Cascade Bay and Ravine Bay. Cascade Bay and Ravine Bay are shown in **Figure 1** and can be described as follows:

- Cascade Bay is a side bay on the western side of Talbingo Reservoir to the north of Plain Creek Bay, located approximately 7-8 km from the load out point at the barge ramp in Middle Bay. Maximum water depths in the bay are approximately 35 m relative to Minimum Operating Level. The estimated storage volume in Cascade Bay is approximately 3.2 million m^3 based on similar assumptions as those adopted for Plain Creek Bay (refer Footnote 1);

- Ravine Bay is a bay situated near the confluence of the Yarrangobilly and Tumut Rivers, located 2-3 km from the load out point at the barge ramp in Middle Bay. Maximum water depths in the bay are approximately 25 m relative to Minimum Operating Level. The estimated storage volume in Ravine Bay is approximately 3.8 million m^3 based on similar assumptions as those adopted for Plain Creek Bay (refer Footnote 1).

A more detailed view of the placement locations in Cascade Bay and Ravine Bay are shown in **Figure 3** and **Figure 4** respectively.

---

[1] The estimated storage volume in Plain Creek Bay is approximately 500,000 m^3 based on the available bathymetry and the following main assumptions:
- Underwater batter slopes 1 Vertical : 4 Horizontal (1V:4H); and
- Surface level of underwater storage approximately 3 m below the Minimum Operating Level of 534.3 m AHD, i.e. surface level approximately 531 m AHD.

[2] The water level in Talbingo Reservoir at any time varies over a 9 m range from the Full Supply Level of 543.2 m AHD to the Minimum Operating Water Level of 534.3 m AHD. The mean operating water level in the reservoir, based on approximately 20 years of records is in the range 541 to 542 m AHD or about 7 m above Minimum Operating Level. Reference to a mean operating water level is more relevant for some impact assessments of the placement, such as impacts on aquatic ecology, as noted later in this report.

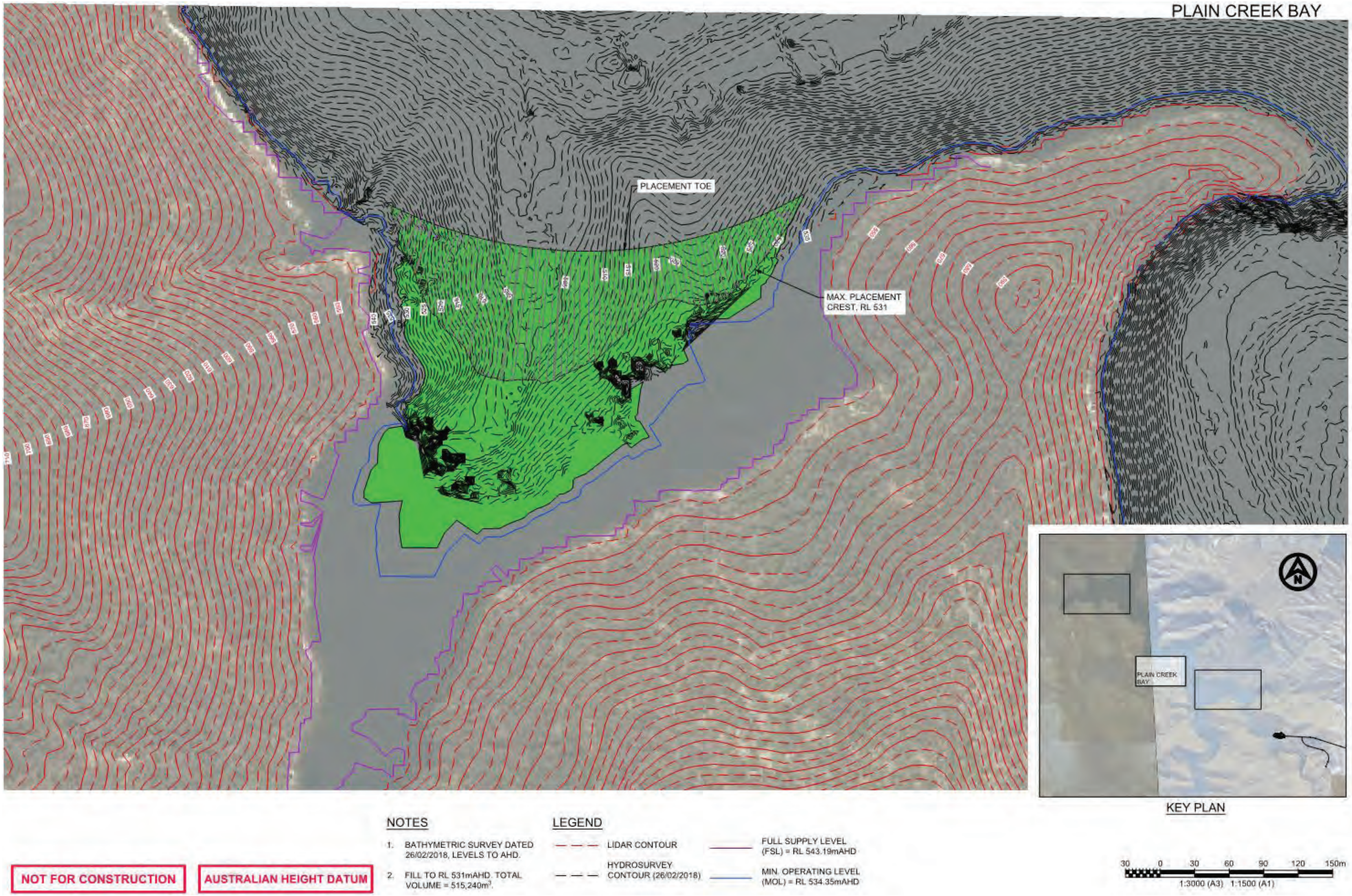

Figure 2 : Detailed plan of Plain Creek Bay showing bathymetry

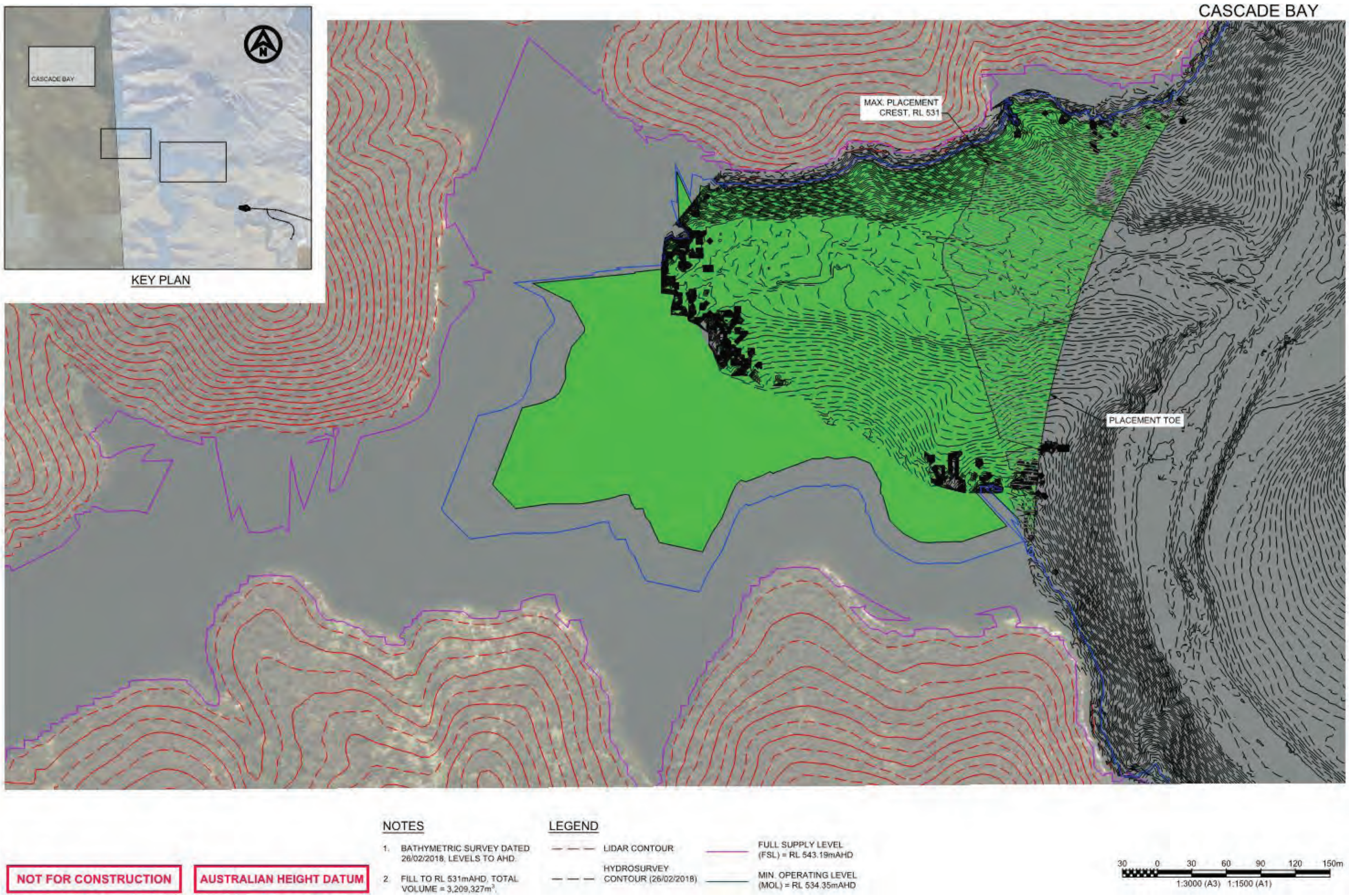

Figure 3 : Detailed plan of Cascade Bay showing bathymetry

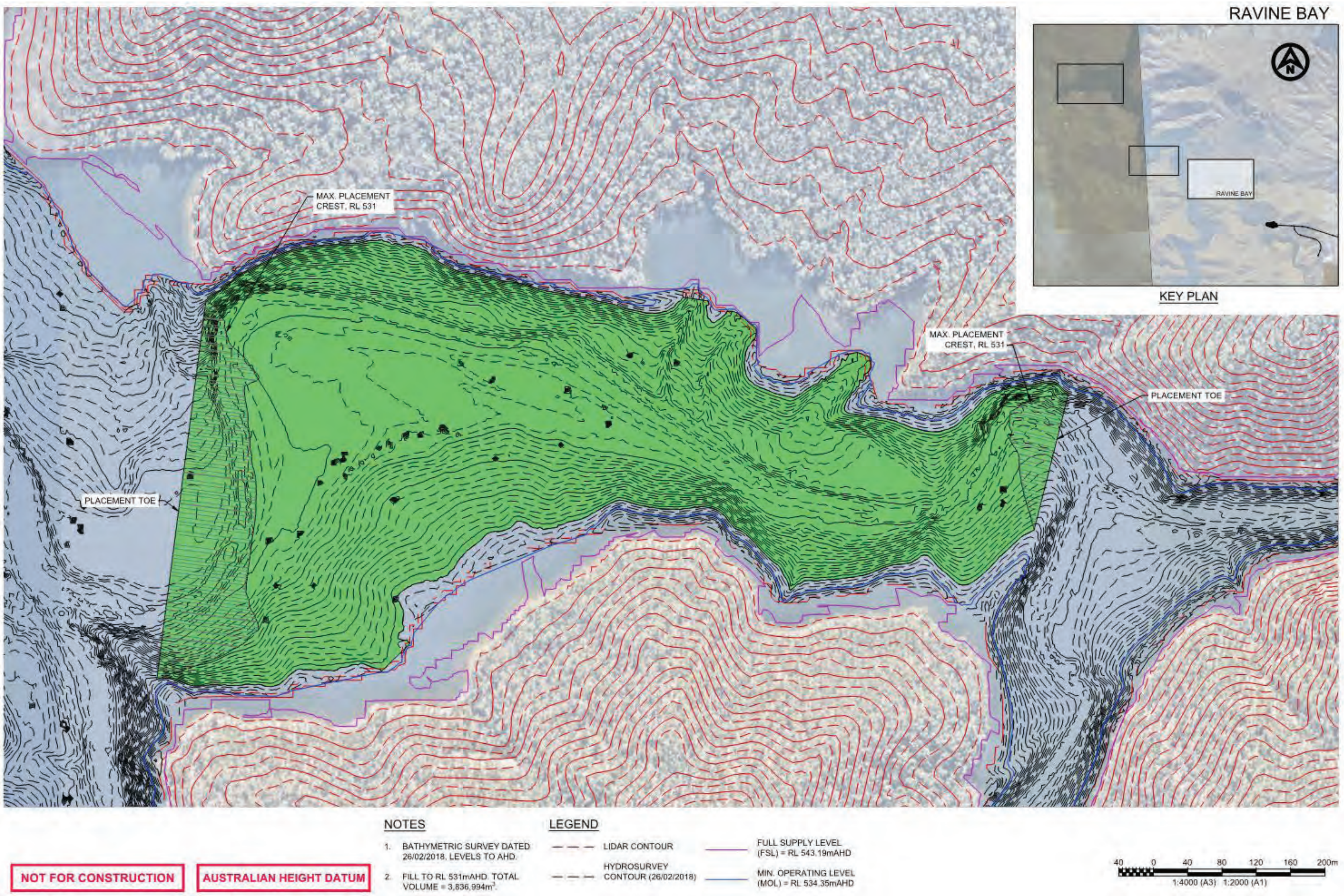

Figure 4 : Detailed plan of Ravine Bay showing bathymetry

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1.4 Methodology for subaqueous excavated rock placement

1.4.1 General

The proposed methodology for subaqueous placement of excavated rock involves mechanical handling and transport of the rock. The excavated rock from the Exploratory Works would be temporarily stockpiled on land near Lobs Hole. Following a geochemical testing and screening process (to be discussed later in this Section 1.5) selected material would be loaded onto trucks and delivered to the barge access infrastructure at Middle Bay.

The excavated rock would be tipped from the trucks onto transport barges. An alternative option would be to tip the excavated rock into a stockpile near the shoreline and transfer the material onto transport barges by front end loaders or conveyor. Once loaded the transport barges would be towed to the subaqueous placement location in Plain Creek Bay. An excavator situated on the transport barge would transfer material into a receiving well (hopper) located on a dedicated discharge barge. The well would funnel material into a fall pipe to discharge the excavated rock below the water surface. The exit point of the fall pipe would be a minimum of 5 m below the water surface. The use of a well and fall pipe minimises surface turbidity.

1.4.2 Barges for transport and discharge of excavated rock

The barges for transport of excavated rock would be modular flat top barges approximately 50 m long and 20 m wide. The modular barges comprise numerous modules (units) that are supplied in standard sizes typically 6.1 m or 12.2 m long, 2.4 m wide and between 1.1 and 2.9 m high. The modular units would be transported by truck to the northern end of the reservoir and assembled locally to form a single working platform. The modular transport barge would be fitted with bow ramps to facilitate loading of the excavated rock.

The barges would be fitted with bulwarks (‘hungry boards’), made watertight to avoid unplanned loss of material into the water column. The barges would also be fitted with an elevated platform to support a 40-70t excavator for transfer of the excavated material to the well on the discharge barge. Alternatively, front end loaders may operate on the barges.

The transport barges would be dumb (un-propelled) barges. They would be transferred and positioned using a shallow draft pusher tug. The minimum engine capacity of the tug would be approximately 600 horsepower. The tug would be a twin propeller vessel, which enhances manoeuvrability for navigating the narrow channels. The pusher tug would also be of modular construction and would be transported by truck to the northern end of the reservoir within containers.

The discharge barge would be a modular flat top barge approximately 20 m long and 20 m wide. As noted above, it would be fitted with a receiving well and fall pipe to discharge excavated rock below the water surface. The discharge barge would be fixed in position with anchors and wires. Winches on board the discharge barge would be used to move the barge over the placement location to distribute the excavated rock material (refer below).

The use of flat top barges for the subaqueous excavated rock placement is proposed for a number of reasons:

- they can be readily supplied to site by truck in modular form and assembled to the size (capacity) required;
- they have shallower draft for a given storage capacity, compared to a split hopper barge for example, which reduces the dredging requirement in Middle Bay and also allows access into shallower areas for the placement activity;
- flat top barges would already have been mobilised to site for the transfer of plant, equipment and materials during the initial phases of the Exploratory Works and a number of these modular units could be modified for use as transport barges and a discharge barge.

1.4.3 Placement distribution of excavated rock

As noted earlier, the volume of rock proposed to be used in the initial phase of the program is 50,000 m^3 compared to an available area and storage volume in the proposed placement location (Plain Creek Bay) of 50,000 m^2 and 500,000 m^3 respectively.

If the volume of rock in the initial phase was distributed evenly over the available area, the thickness of the placement would be approximately 1 m. In practice, the intent is to vary the thickness of placement with the aim of assessing the efficacy of placement techniques which would achieve outcomes likely to be important to inform the excavated rock management program for the Snowy 2.0 Main Works, namely:

- creation of underwater linear rock bunds; and
- ability to cap one class of rock material with another.

Having regard to the above, the thickness of the placement of excavated rock above the reservoir bed would exceed 1m in places but would not be expected to exceed 5 m. In all cases the top surface level of the placed rock would not encroach within 3 m below Minimum Operating Level.

1.5 Nature of rock to be excavated in Exploratory Works and selection of rock for initial phase

1.5.1 General

The tunnel to be excavated during Exploratory Works will be excavated within a geological domain referred to as the ‘Ravine Incised Area’, which comprises three geological units:

- Ravine Beds (siltstone and sandstone, weathered);
- Ravine Beds (siltstone and sandstone, competent fractured rock);
- Boraig Group (Rhyolite).

Investigations of the geological, geotechnical and reactive properties of the rock to be excavated during Exploratory Works are ongoing. The following information was available at the time of preparation of this report to assist in development of the guiding principles or strategy for selection of excavated rock for the initial phase of placement:

- an assessment of the potential for acid rock drainage , spontaneous combustion and the presence of asbestiforms, completed for seven samples from bore hole BH5102 near the eastern area of the exploratory tunnel and reported in Excavated Rock Emplacement Area Assessment prepared for EMM Consulting by SGMenvironmental (July 2018). The location of BH5102 is shown in **Figure 1**;

- visual examination by Royal HaskoningDHV (RHDHV) of a section of core from BH8106 to the west of BH5102, comprising siltstone. The location of BH8106 is shown in **Figure 1**.

A summary of the above assessment and visual examination of the core is provided below, followed by the proposed methodology for selection of excavated rock for the initial phase of placement.

1.5.2 Summary of assessment of rock samples from BH5102

The assessment of the potential for acid rock drainage and presence of asbestiforms, based on the seven samples from BH5102, is summarised below. The issue of spontaneous combustion is not relevant for subaqueous placement and is not considered further. The full results of the investigation are included in SGMenvironmental (2018).

Potential for acid rock drainage

Whether the rock is potentially acid forming (PAF) or non-acid forming (NAF) and / or acid consuming (AC) was determined from the acid-base account.

The results showed that two of the seven samples collected at the proposed depth of the exploratory tunnel are PAF. However, it was noted that the other five rock samples had excess acid neutralising capacity (ANC) and were classified as AC.

As such, it was noted there is the potential that any acidity produced by PAF rock is consumed by the AC rock. Further, the pH results showed that all rock samples are alkaline (pH 8.70-9.10) and the electrical conductivity (EC) results showed no indication of the potential for salinity risk.

Overall, the risk of acid rock drainage from the excavated rock was considered to be low.

Potential for asbestiform mineral fibres

An early geological report (SMEHA, 1953) identified amphibole[4] minerals in some samples from the Ravine beds. In order to better understand the potential occurrences of asbestiform minerals in the project area, SGMenvironmental carried out a desktop geological assessment. This assessment is reproduced below.

> *An early geological report (SMEHA 1953) has identified amphibole minerals in some samples from the Ravine Beds. To better understand the potential occurrences of asbestiform minerals in the project area a desktop geological assessment was carried out.*
>
> *According to Deer et al. (1970), rock forming amphiboles have a range of compositions, but the calcic rich Hornblende is the most common amphibole. Drilling (part of the Exploratory Works) has tentatively identified tremolite and actinolite in the Gooandra Formation. Tremolite is calcic rich and is associated with low grade metamorphic rocks. Including the mineral chlorite-greenschist facies metamorphism that is seen across the project area, including in the Ravine Beds. The propensity to form fibrous minerals is noted, but true asbestiform mineral occurrences are not common.*

[4] Amphibole – any of a class of rock-forming silicate or aluminosilicate minerals typically occurring as fibrous or columnar crystals.

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Although the Ravine Beds are predominantly a sedimentary sequence there are noted occurrences of igneous rocks, such as volcanic tuffs. Drilling (part of the Exploratory Works) to the east of the Yarrangobilly valley, near the surge shaft site has found felsic volcanic rocks but no amphiboles have been observed.

The Boraig Group appears to be dominated by volcanic rocks, being mostly felsic in nature. The record of observations by SMHEA (1953) must be relied upon. Therefore, during the remaining drilling investigations within the Ravine Beds and Boraig Group any occurrences of rock types that may potentially include amphibole minerals need to be carefully examined both in drill cores and under a microscope to check for fibrous or asbestiform minerals. Such occurrences are expected to be well bound in the crystalline fabric of the rock and occurrences of fibrous veining is unlikely.

As noted above, remaining drilling investigations within the Ravine Beds and Boraig Group will include a focus on the possible occurrence and form of amphibole minerals. As the subaqueous excavated rock placement program would not commence until the second half of 2019, adequate time is available for these investigations to be concluded (drilling is programmed to conclude in 2018).

1.5.3 Summary of visual assessment of core from BH8106

A 1 m section of core from BH8106 at a depth below ground level of 632-633 m (slightly above the tunnel alignment) was provided to RHDHV and visually examined. The core was representative of the rock within the tunnel alignment based on review of the bore log. The rock was clearly siltstone.

Based on the manual handling of subsamples from the core and some intentional mechanical fracturing of subsamples by hammer, it is apparent that a proportion of fine grained silt sized and possibly clay sized particles will be produced from the siltstone during the drill and blast activity, transport, stockpiling and rehandling.

The above is of significance in regard to the potential for the subaqueous placement of excavated rock to create turbidity, which would require management.

1.5.4 Selection criteria for excavated rock for initial phase

The general approach proposed to be adopted for selection of excavated rock for use in the initial phase of the placement follows the principle set out in the National Assessment Guidelines for Dredging (Commonwealth of Australia, 2009) for selection of material for disposal at sea, ie only material which can be demonstrated to be suitable via a prior testing regime would be selected.

In the case of the excavated rock from Exploratory Works, three key rock parameters are proposed as a basis for selection with associated selection criteria as set out in **Table 1**.

Table 1 : Parameters and criteria for selection of excavated rock for subaqueous placement

Key Parameter	Criteria
Acid generating potential	Materials must be non-acid forming (NAF)
Potential for asbestiform mineral fibres	Materials must not contain asbestiform mineral fibres
Percentage of ‘fines’ (materials less than 63 microns [silt and clay size fraction])	Percentage must not exceed 10%

The following further comments are provided in relation to the process for selection of excavated rock for the initial phase of placement:

- investigations of the geological, geotechnical and reactive properties of the rock to be excavated are ongoing, as noted earlier. Over the coming months and well in advance of the commencement of the initial phase, studies would be undertaken to gather the following information for each of the two main geological units expected to be encountered, ie Ravine Beds and Boraig Group, as well as any other unit identified by the ongoing drilling investigation:
  - acid generating potential;
  - existence of asbestiform mineral fibres;
  - overall expected particle size grading from drill and blast operations[5];
  - particle size grading of fines fraction (hydrometer);
  - settling performance of the fines in reservoir water; and
  - relationship between total suspended solids (TSS) and turbidity (NTU) for the fines fraction[6].
- while the findings of the above studies would be expected to allow some predetermination of the suitability of each geological unit for use in the initial phase of placement:
  - no material would be transferred directly from the drill and blast operations to the subaqueous placement, stockpiling would always be undertaken to allow visual examination and further testing as required, prior to transfer to the reservoir; and
  - routine screening for key parameters would be undertaken on material in the stockpiles at a minimum of one batch of tests every 5,000 m^3 of material identified as potentially suitable for the initial phase of subaqueous placement.
- the proposed parameters and criteria listed in **Table 1** may be refined and revised following further investigations and initial phase placement, for proposed adoption during any expansion of subaqueous excavated rock placement beyond the initial 50,000m^3 during Exploratory Works[7]. Any proposed revision of parameters and criteria would be the subject of discussion with relevant authorities.

A summary of the excavated rock management for Exploratory Works is shown in the flow chart in **Figure 5**.

[5] It is currently generally expected that particle size grading could vary from sand sized and less up to nominally 1 m boulders. Crushing may be employed to break down larger material for handling purposes. Investigations would include discussions with Contractors.

[6] These relationships are important for monitoring activities during the works.

[7] In particular, detailed investigations are underway by CSIRO on behalf of RHDHV on the geochemical and mineralogical properties of the rock, and the impacts of placement of rock on the water and sediment quality within the reservoirs. RHDHV is also developing a detailed hydrodynamic and sediment transport model of Talbingo Reservoir and Tantangara Reservoir to assist in the design and impact assessment of subaqueous excavated rock placement.

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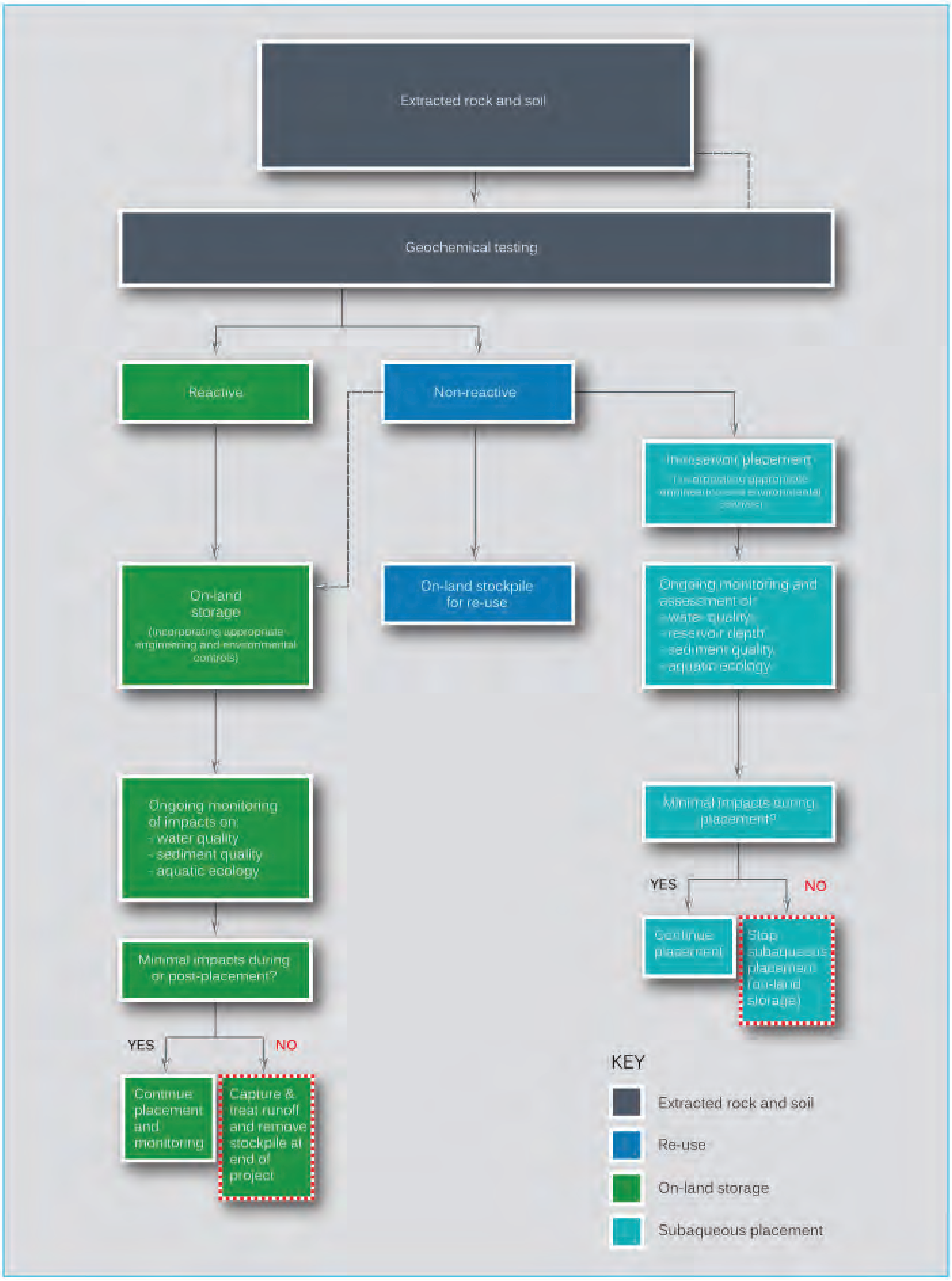

Figure 5 : Flow chart for the management of excavated rock

1.6 Submerged dead trees

It would be necessary to remove any submerged dead trees that would present a hazard to navigation during the rock placement activities. It is proposed the necessary trees would be cut and removed to a level of at least 3 m below Minimum Operating Level.

Following removal, the woody debris would be placed back in the reservoir as close as practical to the original location within a water depth of 0 to 10 m below the mean operating water level. The placement locations for the woody debris are proposed to form snags and enhance existing habitat for fish and other aquatic biota.

The woody debris would be placed in the reservoir as soon as practical after removal to minimise the amount of time the debris is exposed to air. This would ensure the timber does not completely dry out and that fish eggs, etc (if present in/on the debris) would not desiccate.

1.7 Summary of environmental controls during placement activities

Having selected the excavated rock considered suitable for use in the initial phase of subaqueous placement, a number of specific environmental controls are proposed during placement activities as summarised below:

- transport barges would be fitted with bulwarks (‘hungry boards’) which would be made water tight to prevent any loss of material into the water column;
- excavated rock would be discharged via a fall pipe to be fitted to the discharge barge, with an exit point a minimum of 5 m below the water surface, to mitigate the risk of surface turbidity plumes;
- fine material (silt and clay sized fraction) would be ‘conditioned’ before placement by wetting to promote deposition as sediments;
- the fall pipe would be surrounded by a silt curtain to further mitigate turbidity;
- an additional silt curtain (exterior silt curtain) would be placed across Plain Creek Bay between the discharge barge and the main reservoir to further mitigate migration of turbidity;
- a water quality monitoring program would be established for approval by relevant authorities prior to any commencement of subaqueous placement operations. Further discussion of the monitoring program is included in Section 3.

It should be possible to establish relatively deep silt curtains within Plain Creek Bay (and the reservoirs generally) based on the expected very low currents in the reservoirs. Preliminary results of hydrodynamic modelling indicate currents are typically in the range of 0.01 to 0.1 metres per second. As such, it is expected silt curtains having a depth below the water surface of a minimum of 12 to 15 m could be deployed and suitably restrained in position. This is a considerable advantage in limiting the migration of any fine material in suspension.

1.8 Expansion of subaqueous excavated rock placement during Exploratory Works

Should the results of monitoring of the initial placement show that, with the implementation of management measures and environmental controls, there are minimal impacts to the reservoir, Snowy Hydro may expand the quantity of material placed in the reservoir during Exploratory Works beyond 50,000 m^3. The placement locations for the additional rock may include Plain Creek Bay (continuation), Cascade Bay and/or Ravine Bay, as outlined in Section 1.3.

Expansion of the program would be in consultation with relevant authorities and in accordance with any approval issued for Exploratory Works.

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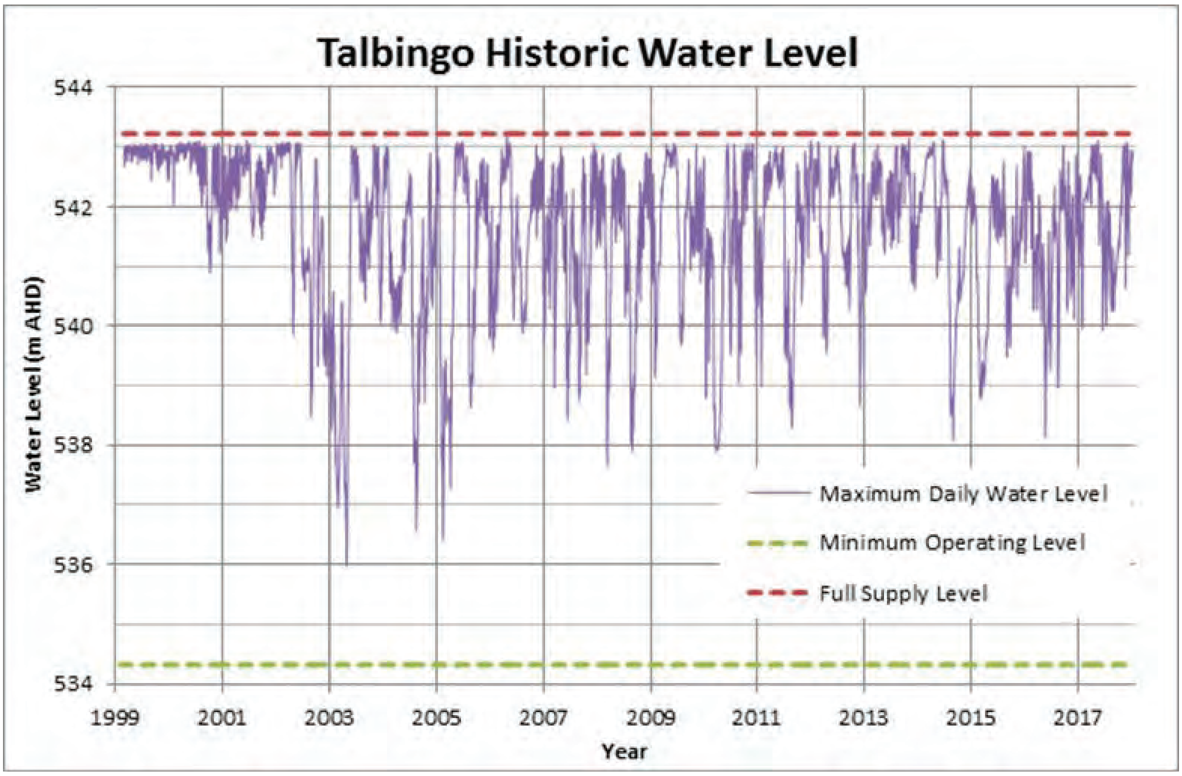
2 Existing site conditions

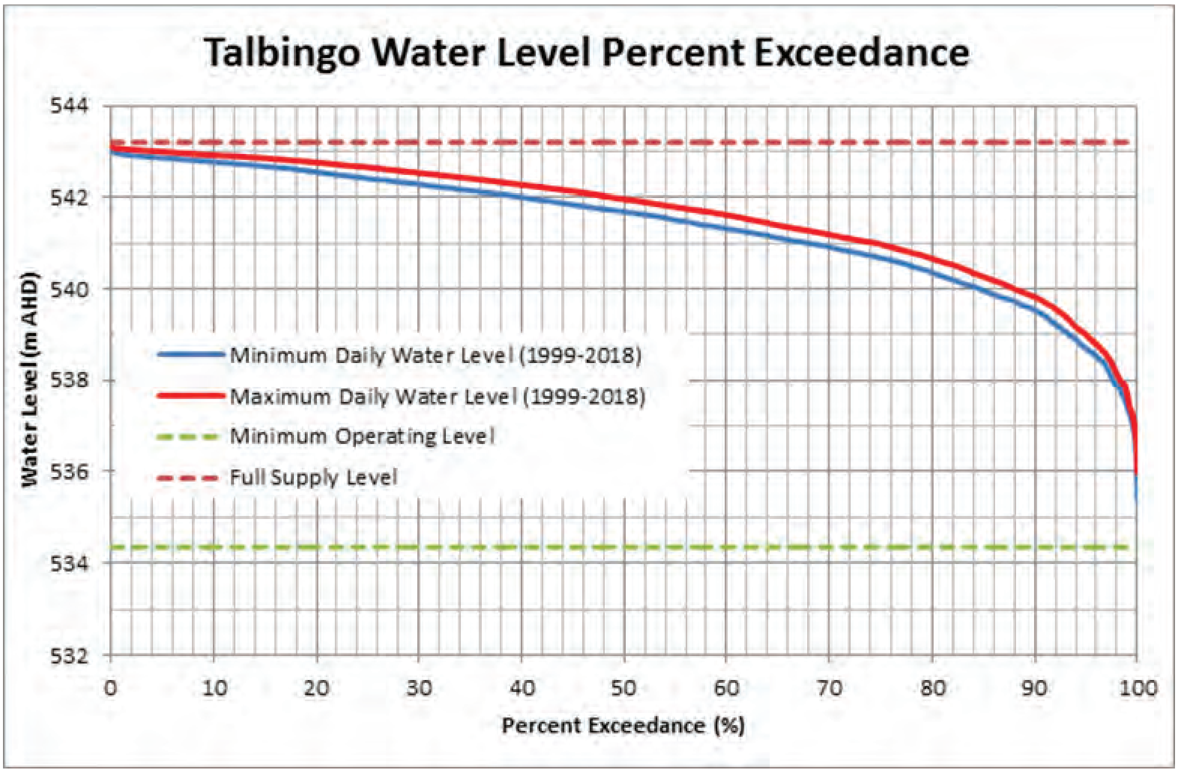
A number of existing site conditions in Talbingo Reservoir and Plain Creek Bay are relevant to the formulation and impact assessment of the subaqueous excavated rock placement program. These existing site conditions are outlined below.

2.1 Water level variation

The Minimum Operating Level and Full Supply Level in Talbingo Reservoir are 534.3 m AHD and 543.2 m AHD respectively. Historically, based on the last 20 years of available records, the water level in the reservoir has been within 3 m of Full Supply Level approximately 80% of the time. The water level fluctuates throughout the year, largely as a result of the operation of the Snowy Hydro scheme with no marked seasonality. The water level variation in Talbingo Reservoir is not expected to change during construction of Snowy 2.0.

The following two graphs have been developed by RHDHV and show the historic water level variation in Talbingo Reservoir since 1999 and the percent exceedance of water level over this time, in relation to the Full Supply Level and the Minimum Operating Level. Two curves are shown for the water level exceedance since, on any one day, a record is taken of both the maximum water level on the day and the minimum water level. It is noted that the mean operating water level in the reservoir over this 20 year period has been in the range 541 to 542 m AHD, approximately 7 m above Minimum Operating Level or 2 m below Full Supply Level.





2.2 Bathymetry

Talbingo Reservoir was formed by the inundation of reaches of the Yarrangobilly River, the Tumut River and their tributaries. Prior to the formation of the reservoir, Plain Creek flowed in a north direction at its point of entry into Plain Creek Bay. The available bathymetry for Plain Creek Bay is shown in **Figure 2**. Within the proposed placement location water depths vary from approximately 30 m to 5m measured relative to Minimum Operating Level. Similarly the available bathymetry for Cascade Bay and Ravine Bay are shown in **Figure 3** and **Figure 4**.

2.3 Water quality

2.3.1 General

Snowy Hydro have historically undertaken periodic water column profiling near Plain Creek Bay at a location referred to as 'Lobs Hole'. The sampling location is in the reservoir within the Tumut River arm near its confluence with the Yarrangobilly River. As such, it is only a relatively short distance south of Plain Creek Bay. Information is presented for the recent period 2014-2017.

A surface water quality program commenced for the broader Snowy 2.0 Project in February 2018. This program includes water quality sampling from Tantangara and Talbingo Reservoirs, all major watercourses that contribute runoff to the reservoirs, and watercourses within proximity to the potential surface infrastructure. At the time of writing this report, results were available for a single round of samples collected from Talbingo Reservoir in March 2018.

Information from the above two sources is summarised in the following sections.

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2.3.2 Historical Lobs Hole data

The water quality profiling at Lobs Hole included testing for temperature, depth, conductivity, dissolved oxygen, pH and turbidity. Profiling has typically been undertaken biannually during spring (Oct/Nov) and autumn (Mar/Apr). Results for the period 2014-2017 are presented in **Figures 6** to **Figure 8** for temperature, conductivity and dissolved oxygen respectively as a guide to the water quality. The following observations are made:

- at the surface and to a depth of approximately 25 m, temperature varies annually and seasonally. At depths greater than 25 m, temperature remains constant at approximately 6^{o}C;
- salinity levels are low with conductivity in the water column generally ranging from 20-35 μS/cm at the surface. Decreases in conductivity were observed with increasing depth. March-April profiles observed a slightly higher conductivity at depths of approximately 5-6 m;
- dissolved oxygen levels were generally highest at the surface in March-April with decreases observed with depth to a minimum of 6 mg/L. During October-November, levels remained generally constant with depth at approximately 8 mg/L with some slight increases with depth.

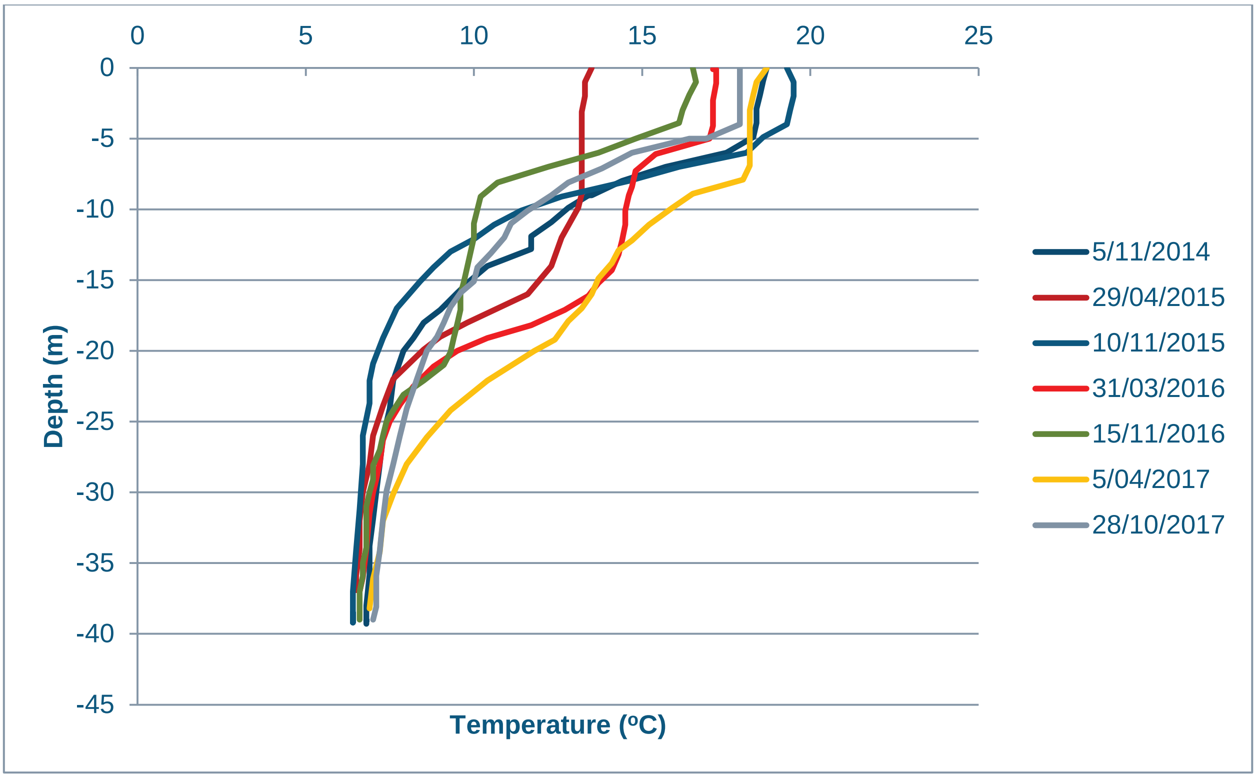

Figure 6 : Lobs Hole historical water temperature profile

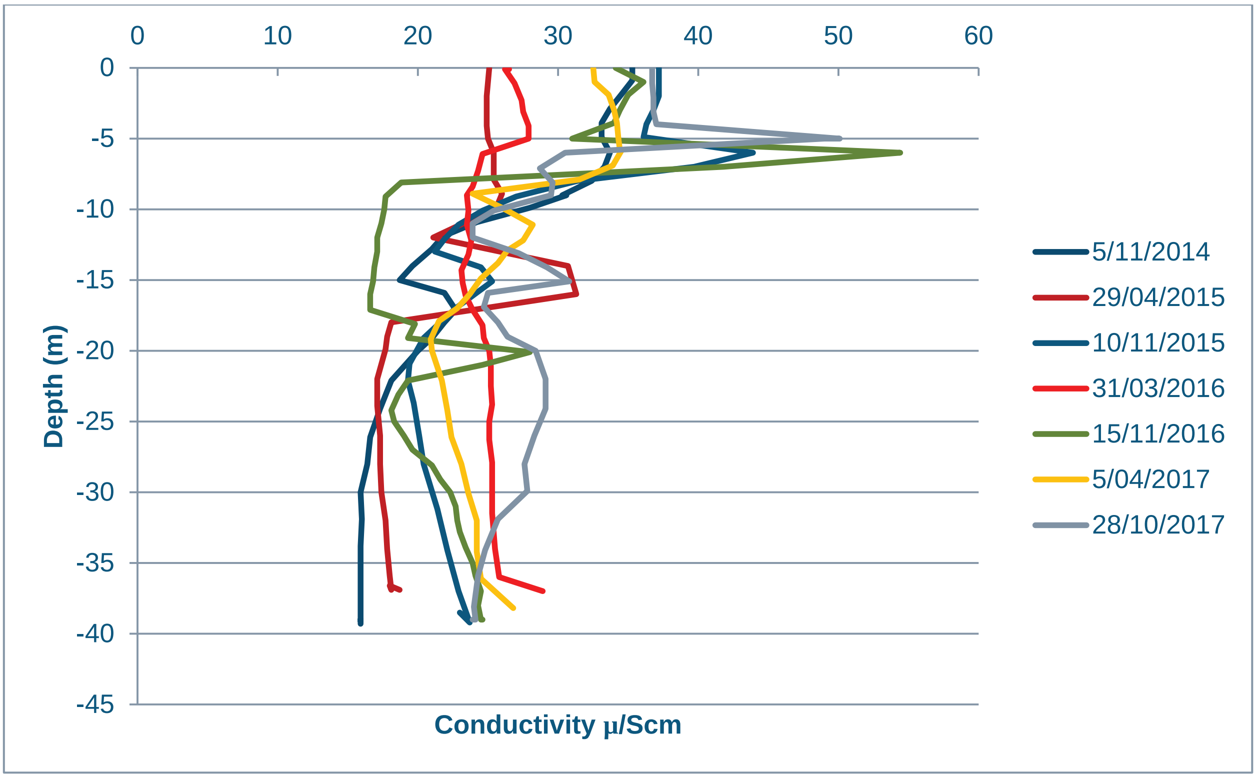

Figure 7 : Lobs Hole historical electrical conductivity profile

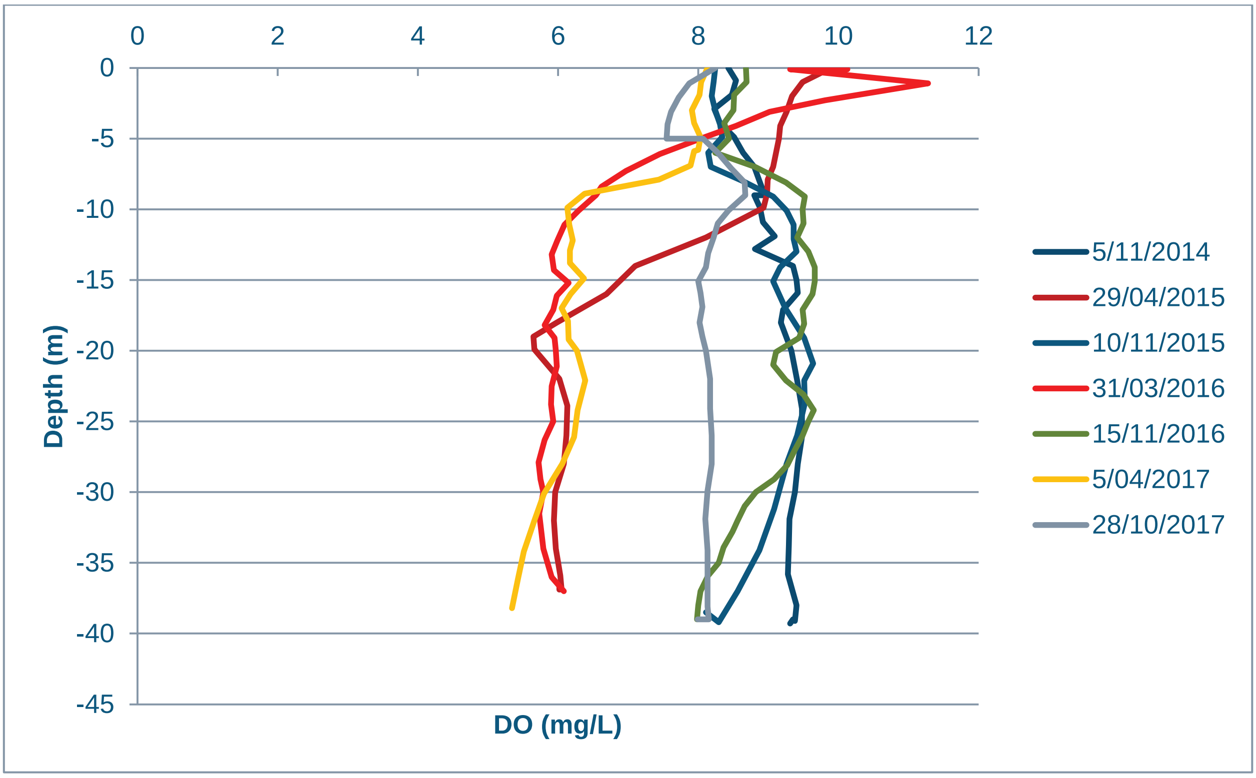

Figure 8 : Lobs Hole historical dissolved oxygen profile

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2.3.3 Snowy 2.0 surface water quality monitoring program

General
Project specific water column profiling campaigns were undertaken at 16 locations in Talbingo Reservoir in March 2018 (refer **Figure 1** for locations). The profiling included testing for the following physio-chemical parameters:

- temperature;
- conductivity;
- depth;
- dissolved oxygen;
- pH;
- turbidity;
- photosynthetically active radiation (PAR); and
- chlorophyll-a (fluorescence).

Water grab sampling was undertaken in March 2018 at 5 locations in Talbingo Reservoir (refer **Figure 1** for locations). All sampling was undertaken during base flow conditions. All water samples underwent laboratory analysis for a wide range of analytes (as indicated in a later tabulation of results).

Water column profiling
The closest water quality profiling location to Plain Creek Bay was location TAL16 just downstream of the bay in approximately 50 m water depth. The results of the profiling are set out in **Table 2**. The results are generally consistent with those for the other locations in Talbingo Reservoir and the historical data for Lobs Hole, indicating in particular high water clarity (low suspended solids/NTU), low conductivity (low salts) and low buffering capacity (low alkalinity).

Table 2 : Baseline environmental conditions for water quality at monitoring site TAL16.

Depth m	pH	Conductivity µS/cm	Temperature deg C	Turbidity NTU	Chlorophyll µg/L	Oxygen mg/L
1.00	6.98	30.8	18.1	1.31	3.13	6.83
2.00	6.99	31.1	18.2	1.33	3.12	6.98
3.00	7.01	31.2	18.2	1.31	3.23	7.08
5.00	6.97	27.1	15.5	1.24	4.11	7.68
10.00	6.68	18.7	13.9	1.20	4.21	7.72
20.00	6.48	21.3	10.2	0.85	4.85	7.15
30.00	6.46	20.0	7.6	0.70	4.89	6.63
40.00	6.32	19.0	7.1	0.76	4.89	6.47
49.00	6.21	18.8	7.0	0.81	4.89	6.44

Water grab sampling
Table 3 provides a summary of water quality results from Talbingo Reservoir. A summary of results from the Yarrangobilly and Tumut Rivers is also provided for context. The results are compared to guideline values that have been established using:

- default trigger values that were sourced from relevant sections of ANZECC (2000) where available; and
- low reliability trigger levels established for analytes that do not have default trigger values in ANZECC (2000) using the methods recommended in Section 8.3.4.5 of ANZECC (2000).

Bold values denote the Guideline Value or Range is exceeded.

Based on the results the water quality of Talbingo Reservoir can be characterised as having a neutral pH, low carbonate (hardness and alkalinity), low salinity, low levels of suspended solids, and low nutrient levels. Again it can be stated that the waters within the reservoirs are generally quite clear, have low conductivity, and have low buffering capacity.

Metal concentrations were below guideline levels with the exception of copper and zinc. Dissolved copper concentrations ranged from below detection to 0.088 mg/L (the 90th percentile value was 0.056 mg/L) relative to a guideline value of 0.0014 mg/L (7 of the 15 samples exceeded the guideline value). Dissolved zinc concentrations ranged from below detection to 0.068 mg/L (the 90th percentile value was 0.065 mg/L) relative to a guideline value of 0.008 mg/L (11 of the 15 samples exceeded the guideline value). Elevated copper and zinc concentrations were not identified in either the Yarrangobilly River or Tumut River inflow locations.

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Table 3 : Water quality results summary: Talbingo Reservoir (March 2018)

			Talbingo Reservoir (March 2018)				Yarrangobilly River (Feb – April 2018)				Tumut River (Tals_SW_001)	
	Unit	**Guideline Value**	**# Samples**	**10th Percentile[5]**	**Median**	**90th Percentile[5]**	**# Samples**	**Min**	**Median**	**Max**	**March 18**	**April 18**
Field Parameters												
Temperature	°C	-	-	-	-	-	11	13	19	22	22	13
Dissolved Oxygen (DO)	%	90 – 110[1]	-	-	-	-	8	**75**	**85**	93	**82**	**74**
Electrical Conductivity (EC)	µS/cm	30 – 350[1]	15	27	29	32	11	32	171	185	86	115
pH		6.5 – 8.5[1]	15	6.8	7.0	7.2	11	7.5	7.9	8.1	7.8	9.5
Oxidising and Reducing Potential (ORP)		-	-	-	-	-	11	112	130	143	137	183
Turbidity	NTU	2 - 25	-	-	-	-	7	<2	<2	5	<2	-
Analytical Results - General												
Suspended Solids (SS)	mg/l	-	15	<1	2	6	11	<5	<5	<5	<5	<5
Total Alkalinity (as $CACO_3$)	mg/l	-	15	<20	<20	<20	7	15	86	109	46	-
Total Hardness (as $CACO_3$)	mg/l	-	15	6	7	10	4	9	89	97	-	30
Analytical Results - Nutrients												
Ammonia	mg/l	0.013	15	<0.01	<0.01	<0.01	7	<0.01	<0.01	<0.01	-	<0.01
Oxidised Nitrogen (NOx)	mg/l	0.015	15	<0.05	<0.05	**0.07**	7	<0.01	**0.03**	**1.9**	-	**0.03**
Total Kjeldahl Nitrogen (TKN)	mg/l	-	15	<0.2	<0.2	<0.2	7	<0.1	<0.1	<0.1	-	<0.1
Total Nitrogen (TN)	mg/l	0.25	15	<0.2	<0.2	<0.2	7	<0.1	<0.1	**1.9**	-	<0.1
Reactive Phosphorus	mg/l	0.015	15	<0.05	<0.05	<0.05	4	<0.01	<0.01	<0.01	-	<0.01
Total Phosphorus (TP)	mg/l	0.020	15	<0.05	<0.05	<0.05	7	0.01	0.01	0.02	-	<0.01
Total Organic Carbon	mg/l	-	15	<5	<5	<5	4	1	11	23	-	<1
Dissolved Organic Carbon	mg/l	-	15	<5	<5	<5	4	<1	<1	<1	-	<1
Analytical Results - Inorganics (Dissolved)												
Fluoride	mg/l	0.115[3]	15	<0.5	<0.5	<0.5	7	0.1	0.1	**0.6**	0.13	-

	Unit	Guideline Value	Talbingo Reservoir (March 2018) # Samples				Yarrangobilly River (Feb – April 2018) # Samples				Tumut River (Tals_SW_001)	
			# Samples	10^{th} Percentile[5]	Median	90^{th} Percentile[5]	# Samples	Min	Median	Max	March 18	April 18
Analytical Results - Metals (Dissolved)												
Aluminium (Al)	mg/l	0.055	15	<0.05	<0.05	<0.05	4	0.01	0.01	**0.06**	-	<0.01
Arsenic (As)	mg/l	0.013	15	<0.001	0.001	0.001	4	<0.001	<0.001	<0.001	-	<0.001
Barium (Ba)	mg/l	0.008[3]	15	<0.02	<0.02	<0.02	4	**0.011**	**0.0285**	**0.042**	-	**0.01**
Boron (B)	mg/l	0.370	15	<0.05	<0.05	<0.05	4	<0.05	<0.05	<0.05	-	<0.05
Cobalt (Co)	mg/l	0.0014[3]	15	<0.001	<0.001	<0.001	4	<0.001	<0.001	<0.001	-	<0.001
Total Chromium (Cr)	mg/l	0.001	15	<0.001	<0.001	<0.001	7	<0.001	<0.001	<0.001	<0.002	-
Copper (Cu)	mg/l	0.0014	15	<0.001	**0.032**	**0.069**	4	<0.001	<0.001	<0.001	-	0.001
Manganese (Mn)	mg/l	1.9	15	<0.005	<0.005	0.007	4	0.001	0.001	0.002	-	0.008
Nickel (Ni)	mg/l	0.011	15	0.001	0.003	0.005	7	0.001	0.001	0.002	-	0.001
Lead (Pb)	mg/l	0.0034	15	<0.001	0.002	0.003	4	<0.001	<0.001	<0.001	-	<0.001
Selenium (Se)	mg/l	0.005	15	<0.001	<0.001	<0.001	4	<0.01	<0.01	<0.01	-	<0.01
Silver (Ag)	mg/l	0.0005	15	<0.005	<0.005	<0.005	4	<0.001	<0.001	<0.001	-	<0.001
Vanadium (V)	mg/l	0.006[3]	15	<0.005	<0.005	<0.005	4	<0.01	<0.01	<0.01	-	<0.01
Zinc (Zn)	mg/l	0.008	15	<0.005	**0.024**	**0.065**	4	<0.005	<0.005	<0.005	-	<0.005
Mercury (Hg)	mg/l	0.00006	15	<0.0001	<0.0001	<0.0001	4	<0.0001	<0.0001	<0.0001	-	<0.0001
Iron (Fe)	mg/l	0.3[3]	15	<0.05	<0.05	<0.05	4	0.05	0.05	0.06	-	0.09

Notes: *1. The Guideline Values for field parameters and nutrients refer to the trigger values for physical and chemical stressors in south-east Australia (upland rivers) that are reported in Tables 3.3.2 and 3.3.3 of ANZECC (2000).*
2. Unless otherwise stated, the Guideline Values for dissolved metals refer to the trigger values for slightly-moderately disturbed ecosystems that are reported in Table 3.4.1 of ANZECC (2000). It is noted that no hardness adjustments have been made.
3. The Guideline Value refers to a low reliability trigger value that has been established using the methods recommended in Section 8.3.4.5 of ANZECC (2000).
4. Value is below guideline values once adjustments for hardness are made using the hardness adjustment algorithms provided in Table 3.4.3 of ANZECC (2000).
5. If less than 10 samples are available, the minim value is reported instead of the 10^{th} percentile value and the maximum value is reported instead of the 90^{th} percentile value.
***Bold** denotes Guideline Value or Range is exceeded.*

2.4 Surface sediments

2.4.1 General

The subaqueous excavated rock placement has the potential to disturb existing sediments due to the physical impact between the rock material falling through the water column and the reservoir bed. Accordingly, knowledge of the physical characteristics of the sediments is important and, if there is a risk of the sediments being disturbed, knowledge of the sediment geochemistry and the potential for release of any contaminants into the water column during the sediment disturbance.

Sampling of the surface sediment took place in March 2018 at four locations throughout Talbingo Reservoir (including at four water depths across each location) . Laboratory testing of all samples included:

- Nutrients: Nitrate/Nitrogen dioxide (NO_3/NO_2), Total Phosphorus P (Total P), Total Kjeldahl Nitrogen (TKN), Total Nitrogen (Total N), Total Inorganic Carbon (TIC), Total Organic Carbon (TOC)
- Particle size distribution (PSD)
- Metals: Aluminium, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Vanadium and Zinc
- Benzene, toluene, ethylbenzene, and xylene (BTEX);
- Organochlorine Pesticides;
- Organophosphorus Pesticides;
- Polycyclic Aromatic Hydrocarbons;
- Total Recoverable Hydrocarbons - 1999 NEPM Fractions;
- Total Recoverable Hydrocarbons - 2013 NEPM Fractions; and
- Volatile Organics.

Surface sediment sampling was also subsequently undertaken at 11 locations in May 2018 within the proposed dredge footprint in Middle Bay, associated with the development of barge access infrastructure.

Due to the observed uniformity of the sediments throughout the reservoir, it is considered reasonable to adopt the results from the above investigations as generally representative of the sediment conditions in Plain Creek Bay.

The results of the above investigations are considered in detail in the Dredging and Dredging Impact Assessment (RHDHV, June 2018) and only the main summary points are provided herein.

2.4.2 Physical characteristics of the sediments

The surface sediments within Talbingo Reservoir are very uniform in texture comprising muds (silts and clays) with a predominance of particles in the coarse silt fraction. Due to their fine grain size, these sediments would be expected to be disturbed locally during subaqueous placement of excavated rock.

2.4.3 Sediment geochemistry and potential for contaminant release

The focus on the sediment geochemistry assessment and potential for contaminant release was the sampling and testing undertaken for the proposed dredging within Middle Bay. This assessment is useful for purposes of the placement program as Middle Bay is located relatively close to Plain Creek Bay, both being situated near the southern end of the reservoir.

Laboratory results of the chemical testing of the sediments in Middle Bay have been summarised and compared to the screening levels provided in the National Assessment Guidelines for Dredging (NAGD) 2009. The NAGD screening levels are generally the same values as the Interim Sediment Quality Guideline (ISQG) low values provided in ANZECC/ ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality: Sediment Quality Guidelines. Updated sediment quality guidelines have also been published by CSIRO in the Sediment Quality Assessment, A Practical Guide, (2016).

The NAGD screening levels and ISQG low trigger values form the basis for the assessment of risk that any sediment contaminants might pose to the environment. Concentrations less than the NAGD screening levels or ISQG low trigger values pose a low risk. Concentrations greater than the screening levels or ISQG low trigger values require further investigations in accordance with the ANZECC/ARMCANZ tiered framework for the assessment of contaminated sediments.

The concentrations in the two samples tested for the full suite of parameters were all below laboratory detection levels for the following parameters:

- BTEX;
- Organochlorine Pesticides;
- Organophosphorus Pesticides;
- Polycyclic Aromatic Hydrocarbons;
- Total Recoverable Hydrocarbons - 1999 NEPM Fractions;
- Total Recoverable Hydrocarbons - 2013 NEPM Fractions; and
- Volatile Organics.

In regard to metals, concentrations of beryllium, boron, cadmium, mercury, molybdenum, selenium, and silver were all below laboratory detection in all samples. Concentrations of arsenic, chromium, lead, mercury, and zinc were all below the NAGD screening levels. Concentrations of nickel were greater than the NAGD screening levels at all locations. Concentrations of copper were greater than the NAGD screening levels at three locations.

As per the ANZECC/ARMCANZ tiered framework for the assessment of potentially contaminated sediments, acid soluble metal analysis (dilute acid extraction, DAE) was undertaken for three samples. Elutriate testing was also undertaken on the same three samples.

Sediment metals and organic contaminants may be present in a variety of forms, but only the bioavailable fraction will affect organisms. While not equivalent to the bioavailable fraction, concentrations measured in a DAE are a closer approximation to the bioavailable fraction than ‘total’ metals measured following a rigorous extraction using strong acids. While the total concentrations of copper and nickel exceeded the NAGD screening level, DAE concentrations of copper and nickel were below the NAGD screening level indicating these that these metals are unlikely to be bioavailable.

Elutriate tests were used to investigate desorption of metals from sediment particulates to waters. They simulate the potential maximum concentrations released during placement of dredged material or in this case due to disturbance of the sediments. This release can occur by physical processes (e.g. directly from sediment pore water) or a variety of chemical changes, such as oxidation of metal sulphides and release of metals adsorbed to particles or organic matter. As described in NAGD (2009), an elutriate test is carried out by shaking the sediment samples with four times the volume of water from the disposal site at room temperature for 30 minutes, then allowing the sediment to settle for one hour. The supernatant is then centrifuged within sixty minutes, and analysed using analytical methods appropriate for determining ultratrace concentrations for comparison to ANZECC/ARMCANZ (2000) water quality trigger values. The relevant trigger values should not be exceeded after allowing for initial dilution, defined as 'that mixing which occurs within four hours of dumping'. Initial dilution will depend on a number of factors, such as water depth, layering in the water column, and current velocities and directions.

The elutriate test uses a dilution of 1:4, wet sediment: added water, and will greatly overestimate water quality impacts given that, within the four-hour period, significant dilution would generally be expected to occur. The test data are therefore corrected for the calculated dilution factor after the four-hour mixing period (after taking account of the test dilution of 1:4) to assess whether or not the water quality guidelines will be exceeded.

The results of the elutriate testing, initially without allowance for dilution beyond the 1:4 test dilution, were compared to the trigger values for dissolved metals for slightly-moderately disturbed ecosystems that are reported in Table 3.4.1 of ANZECC (2000). The results showed exceedances of the water quality guidelines for chromium, copper, lead, and zinc. A total initial dilution of 1:25 would be required for these contaminants to be below the water quality guideline in the water column at the placement location within four hours of disturbance by the placement activity. Based on the proposed subaqueous placement location (Plain Creek Bay), specifically the available water depth and allowance for a four hour mixing period, and the duration over which the initial phase would take place (expected to be several months), an initial dilution of 1:25 is considered to be readily achievable.

As part of the elutriate test, a bulk water sample from Middle Bay used in the elutriate testing was also tested. All contaminant concentrations for all parameters tested were below detection for the Middle Bay bulk water sample.

2.5 Ecology

Talbingo Reservoir provides substantial aquatic habitat, in particular, extensive areas of wood debris (primarily submerged dead trees) and the non-native aquatic macrophyte Elodea canadensis (elodea or Canadian pondweed) along shallow edges and embayments. These habitats would provide important spawning, feeding, nursery and recruitment areas for native fish and potentially some threatened species. One threatened species was identified during survey, Murray Crayfish (Euastacus armatus). Although no threatened fish have been identified during surveys, there is potential for several threatened species to occur (Cardno 2018). Several non-native species of fish are also present in the reservoir.

2.6 Reservoir navigation traffic and transport

Talbingo Reservoir is only accessible to trailerable watercraft. This limits recreational vessels to typically less than 7.5m in length. The majority of the foreshore of Talbingo Reservoir is steep and densely vegetated with submerged snags and woody debris near the shoreline. Boat access to the foreshore for recreational activities is limited. The main boat ramps are:

1. Public boat ramp adjacent to the reservoir wall at the northern end of the reservoir;
2. Public boat ramp near the confluence of Tumut River and Talbingo Reservoir on the Elliot Way; and,
3. An unformed boat launching area at Middle Bay (near the proposed barge ramp) marked on the Roads and Maritime Services Boating Map as a hand launching ramp. The ramp is only accessible via a four wheel drive track.

Boat access to the foreshore is available at the southern end of Talbingo Spillway. The reservoir near the spillway is free of submerged snags and woody debris and the foreshore is suitable for beaching a vessel. The spillway has been levelled and it is accessible by car. This area is frequented by the boating community, particular those partaking in tow sports.

The main recreational activities on Talbingo Reservoir include fishing all year round and tow sports (water skiing, wakeboarding, etc.) during the warmer months (October to May). Fishing vessels would typically be 4 to 5 m in length and tow sport vessels would typically be 5 to 6.5 m in length.

Traffic counts were undertaken on Miles Franklin Drive between March and April 2018 (including Easter and ANZAC Day public holidays). The traffic counts provide an indication of boat launching at the public boat ramp adjacent to the reservoir wall assuming all cars with trailers are towing a boat. The traffic count indicated:

- 144 cars and trailers accessed the boat ramp over Easter with 52 of these occurring on Easter Sunday;
- the average number of cars and trailers accessing the boat ramp on a weekday (excluding public holidays) was 8 with a maximum of 19; and
- the average number of cars and trailers accessing the boat ramp on a weekend (excluding public holidays) was 11 with a maximum of 18.

This data does not include boat launching at the other boat ramps on Talbingo Reservoir. However, demand at the other two boat ramps is assumed to be less due to the isolated locations. Peak public boating demand on Talbingo Reservoir has been assumed to be 75 vessels per day. However, on a typical day, demand would likely be less than approximately 10 vessels.

3 Strategy for managing and monitoring impacts

3.1 General

Prior to presenting the environmental impact assessment for the subaqueous excavated rock placement initial phase (Section 4), it is useful and informative to outline the strategy that has been adopted in the formulation of the placement. This strategy has been specifically targeted at minimising the risk to the environment acknowledging a level of existing uncertainty in that investigations of certain key issues, such as the reactivity of the excavated rock, are ongoing.

In developing the strategy, the following stressors of potential concern have been identified having regard to the nature of the proposed project, possible characteristics of the excavated rock and the characteristics and values of the reservoir.

- physical
  - fine particles
  - suspended solids
  - benthic flocs

- physio-chemical
  - acidity/pH
  - dissolved oxygen
  - salts that increase water conductivity

- chemical
  - metals/metalloids

- lesser stressors of potential concern are nutrients and existing sediments

The following sections summarise the main elements of the strategy.

3.2 Selection of excavated rock placement

Acknowledging the current status of investigations, the following key selection criteria would be observed:

- materials must be non-acid forming (NAF);
- materials must not contain asbestiform mineral fibres; and
- fines content must not exceed 10%.

In addition to the above:

- no direct transfer of excavated rock from tunnelling operations to the reservoirs would take place; and
- routine screening of key rock parameters would be undertaken every 5,000 m^3 of material intended for the initial phase (eg. acid generating potential, potential for asbestiform mineral fibres, and percent fines content).

3.3 Selection of placement location for initial phase

Selection of Plain Creek Bay for the initial phase (volume of 50,000m^3) has been determined based on the following criteria:

- sufficient capacity to accept the initial phase volume of 50,000 m^3 (by an order of magnitude);
- ability to incorporate environmental controls and restrict any suspended sediments (semi-enclosed side bay); and
- low hydrodynamic energy environment (semi-enclosed side bay).

3.4 Methodology for transport and placement

The following controls would be implemented to manage the transport and placement of excavated rock:

- barges fitted with watertight bulwarks;
- use of receiving well and fall pipe on discharge barge;
- wetting of fines prior to placement;
- silt curtain around discharge barge;
- silt curtain across mouth of side bay (exterior silt curtain);
- top surface of placed rock not to encroach within 3 m below Minimum Operating Level; and
- silt curtain across mouth of bay not to be removed unless specified water quality criteria are met (refer below).

3.5 Establishment of water quality criteria / trigger values

It is proposed that water quality criteria / trigger values would be established for key indicators based on the ANZECC/ARMCANZ tiered framework. The criteria / trigger values would be finalised as part of the development of an approved environmental management plan for the program.

Based on review of the existing available data, the following preliminary criteria have been developed during discussions between RHDHV and CSIRO. The criteria would be subject to review and refinement as further monitoring data and the results of additional investigations become available (refer Section 3.6). Some variations in baseline environmental conditions would be expected during the placement but the aim would be for the conditions to return to baseline at the conclusion of the placement.

Water pH, dissolved oxygen and conductivity during placement

- pH greater than 6-8 at all depths;
- dissolved oxygen greater than 5 mg/L at all depths;
- conductivity less than 300 μS/cm within 200 m beyond the exterior silt curtain; and
- conductivity less than 35 μS/cm within 1000 m beyond the exterior silt curtain.

Suspended solids / turbidity during placement[8]

- surface water (30-100 cm depth): turbidity less than 20 NTU at 10 m beyond the exterior silt curtain and less than 2 NTU at 500 m beyond the exterior silt curtain; and
- deep waters (5 m above the bed): turbidity less than 100 NTU, less than 20 NTU and less than 2 NTU at distances of 50, 200 and 1000 m beyond the exterior silt curtain respectively.

[8] *During review and refinement of turbidity criteria, account would be taken of background values, ie. criteria should be established as 'above background'.*

Criteria prior to removal of exterior silt curtain

Within the placement location contained by the exterior silt curtain (shallow water to deep water)

- pH 6.0-7.5;
- dissolved oxygen 5-7 mg/L;
- conductivity less than 35 μS/cm; and
- turbidity less than 2 NTU.

3.6 Monitoring and additional investigations

3.6.1 Ongoing background monitoring

Background water quality and ecological data collection is ongoing in Talbingo Reservoir as part of Snowy 2.0. A further round of data collection was completed in June 2018 (results not available at the time of reporting) and an additional round is planned for Spring 2018. Historical water quality profiling at Lobs Hole during spring and autumn is expected to continue.

3.6.2 Monitoring during the subaqueous excavated rock placement

A specific water quality monitoring program would be developed for the placement together with a management action plan. The following notes provide an outline of the current proposed program and plan:

- key indicators would include, but not necessarily be limited to:
  - pH;
  - dissolved oxygen;
  - conductivity; and
  - turbidity.

- location of monitoring points at a minimum would include:
  - inside exterior silt curtain;
  - outside exterior silt curtain at distances of 50 m, 200 m and 1000 m; and
  - remote background site.

- water depth for measurement:
  - surface waters (30-100 cm);
  - deep waters (5 m above bed); and
  - regular profiling through the water column.

- measurement frequency: 15 minute intervals or as otherwise agreed, including use of telemetry and ‘amber’ alerts to mobile phones;

- temporal processing of data consistent with risk to sensitive receptor(s);

- structured management response to alerts and any exceedances of established triggers:
  - investigate the issue (check data, inspect environmental controls, check background levels, etc);
  - modify work practices if required; and
  - cease work if required.

- preparation of monitoring reports.

In addition to monitoring of water quality, consideration would be given to monitoring any movement of excavated rock (fines) beyond the placement area through use of geochemical tracers. The efficacy of this monitoring technique will be assessed when the results of the geochemical and mineralogical investigations on the rock cores, currently being conducted by CSIRO, are available.

Monitoring will also be undertaken of the bathymetry within the placement location and within the area adjacent to the placement location, prior to, during, and at the completion of the placement activity. This will inform the accuracy and effectiveness of different placement techniques, and the behaviour of the placed rock and existing sediments.

3.6.3 Additional investigations

The following additional key investigations are in progress and will inform the monitoring and management plans for the placement:

- investigations by CSIRO of the geochemical and mineralogical characteristics of the rock and the impacts of the placement of the rock on the water and sediment quality within the reservoirs;
- development of a hydrodynamic and sediment transport model of the reservoir;
- settling tests on the fines fraction of the main rock types following assessment of the likely final particle size grading (after drill and blast operations and various stockpiling and handling activities);
- development of relationships between total suspended solids (TSS) and NTU for the main rock types.

3.7 Reporting

A comprehensive report would be prepared at the conclusion of the initial phase of subaqueous excavated rock placement. This would document the findings from the initial placement works in relation to its objectives as well as document and interpret the various monitoring data.

The purpose of the report would be to inform the design, methodology, monitoring and management for the subaqueous excavated rock placement during any expansion of placement for Exploratory Works beyond 50,000m^3 (and/or in the Main Works for Snowy 2.0, should it proceed).

4 Impact Assessment

4.1 General

The following sections set out an assessment of the impact of the subaqueous excavated rock placement in relation to:

- hydrodynamics;
- water quality;
- aquatic ecology; and
- reservoir navigation traffic.

It is noted that this impact assessment relates to the initial phase of placement (50,000m^3) in Plain Creek Bay. Prior to the expansion of subaqueous excavated rock placement for the Exploratory Works beyond 50,000m^3, including placement in Cascade Bay and Ravine Bay, further consultation would take place with relevant authorities including completion of an updated impact assessment. Environmental controls employed during any expansion of the placement would not be expected to differ significantly from those described for the initial phase placement, but would be informed by the outcomes of the initial phase placement.

4.2 Hydrodynamics

Water movement within Talbingo Reservoir occurs due to several natural forcing functions, eg. streamflow, wind, and density differences, and due to the operation of the Snowy Scheme. The available information indicates that currents are, however, very low, typically in the range 0.01 to 0.1 metres per second. This is a consequence of the vast volume of water within the reservoir. The total capacity of the reservoir is 921 gigalitres (GL), with 761 GL of this volume located below Minimum Operation Level (ie. In 'dead storage'[9]). The existence of muddy bed sediments throughout the reservoir is evidence of a low hydrodynamic energy, depositional, environment.

The volume of excavated rock proposed to be placed in the reservoir below Minimum Operation Level in the initial phase (50,000m^3) would represent only some 0.007% of the 'dead water' storage volume of the reservoir. It follows that any changes to the overall reservoir hydrodynamics would be negligible/immeasurable.

At a local level in Plain Creek Bay, the volume of excavated rock proposed to be placed in the initial phase would be well below 10% of the water volume in the Bay at any time. Note that while the volume to be placed is about 10% of the 'available storage volume' based on certain assumptions, the available storage volume is significantly less than the actual water volume, eg. the top surface of the available storage volume has been taken to be about 3m below Minimum Operating Level and the available storage volume does not extend fully into Plain Creek Bay.

Accordingly, even at a local level no significant change to hydrodynamics would be expected.

[9] Dead storage refers to the volume in a reservoir that is below the height of the lowest outlet and therefore cannot be released from the reservoir under normal operating conditions.

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4.3 Water quality

4.3.1 General

The potential for the subaqueous excavated rock placement to impact on water quality can be conveniently considered under three main headings:

- transport of excavated rock;
- discharge of excavated rock; and
- interaction of the excavated rock with the water column and reservoir bed sediments.

4.3.2 Transport of excavated rock

Excavated rock would be transferred from the barge access infrastructure at Middle Bay to Plain Creek Bay on a transport barge. The transport barge would be fitted with bulwarks (‘hungry boards’) made watertight to prevent the loss of fines into the water column while loading, unloading and in transit. The transport barge would be towed to the placement location by a pusher tug. Fines in the excavated rock would be kept wet during transit.

With the watertight bulwarks in place and normal loading and stockpiling practices on the barge, eg. stockpile height at bulwark to be below height of bulwark, and fines kept wetted, no adverse impacts on water quality during the transport of excavated rock would be expected.

As with all construction activities there would be risk of fuel, hydraulic fluid and oil spills as a result of the proposed works. All activities would be carried out in a manner that minimises the potential for leaks and spills and in compliance with the waste handling and disposal procedures outlined in a construction environmental management plan (CEMP). Oil and fuel spill kits would be kept on all motorised vessels and on barges where plant and equipment are accommodated. In addition, spill kits would be kept near the barge ramp for emergency use.

4.3.3 Discharge of excavated rock

An excavator on the transport barge would transfer excavated rock to the discharge barge. The discharge barge would be fitted with a receiving well and fall pipe to discharge excavated rock a minimum of 5m below the water surface. The use of a discharge barge with full pipe would minimise surface turbidity during subaqueous placement. Fines would be wetted, as noted above, to promote deposition and reduce surface turbidity. The discharge barge would also be enclosed within a silt curtain expected to have a minimum ‘drop’ below the water surface of 12-15m minimum.

Based on the above methodology, no adverse impacts on surface water quality during the discharge of excavated rock would be expected.

4.3.4 Interaction of the excavated rock with the water column and reservoir bed sediments

As discussed earlier in the report (refer Section 1.5.4), strategically, only material considered suitable for subaqueous excavated rock placement via a prior testing regime and routine screening would be selected for placement in the initial phase. In particular, the material selected would be non-acid forming (NAF). As such, the main potential issues associated with the subaqueous placement from a water quality perspective are considered to be:

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- turbidity within the water column generated by the proportion of fines (silt and clay sized fraction) in the excavated rock, notwithstanding that the total amount of fines is proposed to be limited to 10% of the total quantity of material selected for placement[10]; and
- water quality impacts near the reservoir bed due to disturbance of the existing muddy sediments caused by the deposition of the excavated rock.

Turbidity due to fines in the excavated rock

As discussed previously in the report, a range of environmental controls would be introduced to mitigate the risk of turbidity impacts due to fines in the excavated rock, including:

- the proportion of fines would be restricted;
- the fines would be wetted to promote deposition;
- the excavated rock (including the fines) would enter the water column via a full pipe below the discharge barge with an exit point a minimum of 5m below the water surface;
- the disposal barge would be surrounded by a silt curtain with an expected minimum 'drop' below the water surface of 12-15m;
- an additional exterior silt curtain would be situated between the discharge barge and the mouth of the bay, having a minimum 'drop' of 12-15m;
- monitoring of turbidity would be undertaken within the placement area and at distances beyond the exterior silt curtain; and
- the exterior silt curtain would not be removed following the initial phase placement until satisfactory water quality criteria are met within the placement area.

Based on the above controls, and the very low currents in the reservoir, the risk of adverse impacts due to turbidity would be expected to be low and would be localised. The availability of continual monitoring data would enable the situation to be progressively reviewed and for changes to be made to the placement, if required, or for the placement to cease if impacts cannot be adequately managed.

There is considered to be no risk to downstream water users (downstream of Talbingo Reservoir) associated with the subaqueous excavated rock placement given the expected localised nature of any water quality impact and the distance between the placement locations and the reservoir wall (greater than 15km).

Water quality impacts near reservoir bed due to disturbance of existing muddy sediments

The results of the elutriate testing for the existing muddy bed sediments and available dilution indicates that release of contaminants would not be expected to be an issue during sediment disturbance (refer Section 2.4.3).

Elevated turbidity would occur near the reservoir bed during the placement but this would be expected to be localised and short term due to the very low currents and intermittent nature of the placement activities (individual barge loads, separated in time by 4 to 6 hours). The available sediment and water quality data for the reservoir indicate there is a propensity for the sediments in the reservoir (mostly coarse silts) to

[10] It is questionable whether 10% of the total excavated rock quantity would actually 'present' as fines, nevertheless a cap on the quantity of fines is considered prudent for the initial phase placement. It is desirable to include some fines in the initial phase so that the effectiveness of environmental controls on turbidity can be evaluated, while not placing the reservoir at undue environmental risk.

settle to the bed, which would be a function of the low energy environment and settling behaviour of the coarse silts. The same fate for any disturbed sediments would be expected.

4.4 Ecology

4.4.1 General

A detailed assessment of impacts to aquatic ecology from Exploratory Works is included in the Aquatic Ecology Assessment (Cardno 2018), and summarised in this section.

Subaqueous placement has potential to impact aquatic habitat and biota via the following:

- Direct loss of aquatic habitat and associated biota beneath the placement footprint;
- Impacts to water quality. Mobilisation of sediments in the water column could result in increased turbidity and consequently smothering of adjacent aquatic habitat (as particles of sediment settle out), reduction in light penetration and direct impacts on feeding efficiency and respiratory function of fish and macroinvertebrates. Any contaminants in the placement material may also be toxic to aquatic life;
- Potential changed hydrodynamics in the reservoir due to alterations to the reservoir bed morphology following placement.

4.4.2 Assessment

The area of reservoir that would be displaced beneath the initial phase placement of excavated rock material (5.0 ha) is a very small proportion (0.3 %) of the total area (1,935 ha) of reservoir bed. Although there would likely be permanent alteration of the substratum and soft sediment habitat here, this habitat is abundant throughout the reservoir and impacts to aquatic ecology at the scale of the reservoir would be negligible. Sampling of benthic infauna in Talbingo Reservoir indicated that oligochaetes (80 % of individuals) followed by nematodes (13 % of individuals) and small numbers of chironomids and copepods were the most abundant taxa associated with soft sediments. The few corbiculid molluscs, caddisfly and a mayfly were possibly of watercourse origin. These taxa are common and none are of conservation value, though all would provide food for fish and other invertebrates. These biota are not expected to completely recolonise this area due to the depth of placed material (greater than 1 m) and the change in substratum composition. The introduction of large rocks, however, is expected to improve the habitat quality of the area for fish and will likely provide habitat heterogeneity and substratum for other invertebrate taxa. Displacement of more sensitive key fish habitat (wood debris and aquatic plants, including native plants if present) in shallower areas would be avoided due to the proposed placement within deeper (no shallower than -3 m below minimum operating level (MOL)) sections of the reservoir.

Aquatic fauna such fish and large macroinvertebrates could be disturbed by placement activities, though more mobile fauna are expected to actively avoid placement. Highly mobile fish would be expected to actively avoid disturbances and move to nearby unaffected areas. Impacts to these biota are therefore expected to be minor and temporary. Large macroinvertebrates such as the common yabby and the threatened Murray crayfish (though considered to have a low probability of occurring in the reservoir) may be less able to actively avoid placement and it is possible that some may be lost due to placement. Avoidance of placement within shallower shoreline sections of the reservoir (as is proposed), where they are more likely to occur, would minimise any potential loss.

A proportion of the material to be placed in the reservoir is likely to comprise ‘fines’ (particles less than 63 microns) which are more easily mobilised and are a potential source of turbidity. The mobilisation of fine sediments could also result in sedimentation outside of the placement footprint with indirect impacts to shoreline macrophytes and invertebrates. The potential for this and associated impacts to aquatic habitats and biota outside of the placement area is, however, low due given the proposed controls that would be implemented. These would include:

- The proportion of fines would be restricted to a maximum of 10% of the placed material;
- Fines would be wetted prior to placement to assist settling;
- Material would be discharged into the water column via a fall pipe below the disposal barge to reduce any surface turbidity (exit of fall pipe minimum 5m below water surface); and
- The disposal barge would be surrounded by a silt curtain and a second, exterior, silt curtain would be placed across the side bay used for the placement. The exterior silt curtain would not be removed until satisfactory water quality criteria within the placement area are met.

Placement areas have been selected and are of a spatial scale appropriate to incorporation of these controls. The implementation of these controls would minimise elevated turbidity and suspended sediments within and outside the placement area and help ensure elevations were localised to the placement area as far as practicable. Further, turbidity and suspended sediment transport within and outside the placement area is expected to be minimal due to the very low water currents here (typically 0.01 m to 0.1 m per second). The potential for toxicity arising from the placement is low given that the material selected for placement would be non-acid forming. Characterisation of other potential contaminants would also be undertaken to confirm the suitability of the material prior to any placement within the reservoir. Changes to hydrodynamics in the reservoir due to placement are expected to be negligible (RHDHV 2018) and no associated impacts to the aquatic environment are expected.

An associated water quality monitoring program would also be implemented. This would further ensure as far as practicable that changes in water quality are minimised and localised to the area of placement. It is proposed that water quality criteria / trigger values would be established for key indicators based on the ANZECC (2000) tiered framework (RHDHV 2018). The most appropriate criteria / trigger values would be finalised as part of the development of an approved environmental management plan for the placement.

4.4.3 Recommendations to Minimise Residual Risks

- Mapping of aquatic habitat within and adjacent to barge construction and dredging activities and the subaqueous placement area. This will include identification of aquatic vegetation and other sensitive habits and Key Fish Habitat that could be affected. The location of any burrows potentially used by Murray crayfish will also be identified. The results of the mapping will be used to refine the placement area.
- Although considered to have a low probability of occurrence within Talbingo Reservoir (at least deeper sections), deployment of traps within and adjacent to subaqueous placement areas prior to placement and re-location of any Murray crayfish and other mobile invertebrates outside of the potential impact area would help minimise potential impacts to these biota.

4.4.4 Conclusion

Given the relatively small scale and localised nature of the proposed subaqueous placement and the several control measures that would be used to minimise displacement of aquatic habitat, disturbance to aquatic biota and changes in water quality, residual impacts to aquatic ecology would be limited as far as practicable and would be minor at the scale of the reservoir. The recommended control measures would further minimise the risk to aquatic habitat and biota. Although the aquatic habitat and biota within the placement area would be modified, subaqueous placement would not significantly compromise the functionality, long-term connectivity or viability of habitats, or ecological processes within assemblages of biota within the reservoir.

4.5 Reservoir navigation traffic

Barge movements during the transport of excavated rock for the initial phase placement are anticipated to be 2 round trips per day between Middle Bay and Plain Creek Bay (a round journey of approximately 10 km). Barges and tugs would be marked with the required navigation and warning devices (including lights) when in motion and stationary.

The main restrictions on recreational boating use of the reservoir associated with subaqueous excavated rock placement during Exploratory Works would be:

1. Closure of the informal boat launching ramp near Middle Bay.
2. Restricted public boating access to the Yarrangobilly Arm to prevent interactions with barge operations and to prevent members of the public making landfall in Middle Bay construction areas.
3. Restricted public boating access close to the subaqueous placement location in Plain Creek Bay, including in the vicinity of any silt curtains.

Recreational vessel demand and barge movements are relatively minor relative to the size of the reservoir. There would be ample space available to avoid collisions between construction vessels and recreational vessels when abiding by maritime law/regulations. A marine traffic management plan would be prepared and form part of a Construction Environmental Management Plan (CEMP).

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5 Summary of environmental management measures

A construction environmental management plan (CEMP) would be developed for the subaqueous excavated rock placement. The CEMP would include the following management measures.

Impact	Ref #	Environmental management measures
Aquatic ecology		
Removal of submerged dead trees		See Snowy 2.0 Exploratory Works, Aquatic Ecology Assessment, Cardno, July 2018.
Placement location		See Snowy 2.0 Exploratory Works, Aquatic Ecology Assessment, Cardno, July 2018.
Aquatic habitat		See Snowy 2.0 Exploratory Works, Aquatic Ecology Assessment, Cardno, July 2018.
Threatened species		See Snowy 2.0 Exploratory Works, Aquatic Ecology Assessment, Cardno, July 2018.
Land		
Stockpiling excavated rock on land		See Snowy 2.0 Exploratory Works, Excavated Rock Emplacement Areas Assessment, SGM environmental Pty Limited, June 2018.
Water		
Hydrodynamics		Subaqueous placement of excavated rock would be localised in a side bay. Placement of material at least 3m below Minimum Operating Level to reduce the potential for resuspension by waves, currents or river flows.
Water quality associated with transport of rock		Barges would be fitted with bulwarks (hungry boards) made watertight to contain excavated rock while in transit. All activities would be carried out in a manner that minimises the potential for leaks and spills from plant and equipment and in compliance with waste handling and disposal procedures outlined in a construction environmental management plan (CEMP). Pollution controls, spill kits would be available on all plant and equipment and at the barge ramp.
Water quality associated with discharge of excavated rock		Subaqueous placement of any excavated rock would be approximately 3m below Minimum Operating Level. Survey monitoring of pre-placement and post-placement bathymetry at the placement location would be undertaken to assess the accuracy of subaqueous placement, batter slopes of placed material and any underwater spreading of the placed material. A water quality monitoring program would be commenced at the placement location and adjacent waters prior to any subaqueous placement commencing and would continue throughout the initial phase. A total suspended solids (TSS) and turbidity (NTU) relationship would be developed for purposes of water quality monitoring. A discharge barge and fall pipe arrangement would be used at the subaqueous placement location to minimise surface turbidity. Fines would be wetted to promote deposition. A silt curtain would be placed around the discharge barge at the subaqueous placement location to minimise the extent of turbidity.

Impact	Ref #	Environmental management measures
		The placement location in a side bay would improve ability to incorporate environmental controls including silt curtains. An exterior silt curtain would be placed between the discharge barge and the main reservoir.
Water quality associated with interaction of excavated rock with the water column and reservoir bed sediments		Initial stockpiling of materials on land (no direct transfer to subaqueous placement) Testing regime and screening of material in stockpiles to demonstrate suitability for placement based on established criteria (possibly on a geological unit basis), e.g.: - materials must be non-acid forming (NAF); - materials must not contain asbestiform mineral fibres; and - total fines percentage must not exceed 10%. Deployment of silt curtains as noted above. Water quality monitoring program and management plan. Exterior silt curtain not removed until satisfactory water quality met within placement area.
Transport		
Marine Traffic Congestion		Prepare a Marine Traffic Management Plan. Mitigation measures include: • establishing exclusion zones around barge access infrastructure and at other locations where navigation channel widths are constrained; • undertake community consultation prior to 'marine' works and barging. Posting information material at the boat ramps including the location of exclusion zones and informing on legally enforceable speed restrictions around construction plant and equipment in accordance with the Marine Safety Act 2013; and • ensuring construction plant and equipment are fitted with Automatic Identification Systems.

6 Conclusion

A subaqueous excavated rock placement program in Talbingo Reservoir is proposed for Exploratory Works. This would involve an initial phase placement of 50,000m^3 of rock into Plain Creek Bay, a small semi-enclosed side bay approximately 5km from the load out point at the barge access infrastructure in Middle Bay. The placement would be subject to a range of material selection criteria, environmental controls, monitoring and management measures.

Should the initial phase of placement be successful, the quantity of material placed in the reservoir during Exploratory Works beyond 50,000m^3 would be expanded in consultation with relevant authorities. Placement locations for additional quantities of rock are proposed to be Plain Creek Bay (continuation), Cascade Bay and Ravine Bay.

An impact assessment prepared for the initial phase of subaqueous excavated rock placement concluded that no adverse impact on hydrodynamics, water quality, aquatic ecology and reservoir navigation traffic would be expected. This is a result of the strategy proposed for managing and monitoring impacts, and the relatively small scale and localised nature of the proposed subaqueous placement compared to the dimensions and capacity of Talbingo Reservoir.

7 References

Cardno (2018), *Aquatic ecology assessment,* Appendix H of the Snowy 2.0 Exploratory Works EIS.

Royal HaskoningDHV (RHDHV, 2018), *Snowy 2.0 Exploratory Works Technical Study - Dredging and Dredging Impact Assessment,* report number M&APA1804R003D0.3, Appendix E (Barge Access Infrastructure) of the Snowy 2.0 Exploratory Works EIS.

SGM Environmental (SGME, 2018), *Excavated rock emplacement areas assessment,* Appendix Q of the Snowy 2.0 Exploratory Works EIS.

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