Construction Environmental Management Plan:

SSD 8922 – Major alterations to the Stevenson Library Building

Stage 1: Early Works

7th November 2019

- Amended 6th December 2019 -

The following information and attached reports have been produced to address condition C15 of Development Consent relating to SSD 8922 for major alterations and additions to the Stevenson Library Building located at 29-53 Victoria Road Bellevue Hil, NSW 2023.

The works will be undertaken in two stages, an early works package consisting of partial demolition, services diversions and the construction of an internal access road, and the main works package consisting of the construction of a new 5 storey library facility at the location of the current library site.

This report relates to the works to be completed in stage 1: Early Works.

i. Hours of Work

Between 7am and 6pm Monday to Fridays

Between 8am and 1pm Saturdays

No works are to be carried out on Sundays or Public Holidays

ii. 24-Hour Contact Details of The Site Manager

Mr. Terrence Watson – Senior Site Manager (Rohrig NSW) – (p) 9695 1668 (m) 0447 716 554

iii. Management of Dust And Odour To Protect The Amenity of The Neighbourhood;

<u>Air and Dust Control</u>
We have identified the following activities or possible causes of dust that shall be monitored and managed as required by the methods identified below:

Demolition & Excavation

During demolition and excavation work affected areas will be sprayed with water to minimise airborne dust. This will include masonry demolition, on grade excavations, stockpiling and loading out of these elements.

All construction plant and machinery will be fitted with adequate emission control devices maintained and serviced regularly in good working order and there shall be no excessive exhaust emissions (e.g. longer than 10 seconds after start-up).

iv. Stormwater Control And Discharge;

<u>Stormwater & Sediment Control</u>
The stormwater & sediment control measures shall be implemented throughout the project. Construction of all temporary & permanent sediment management devices and erosion protection shall be completed and effective prior to commencing the following:

- Bulk Earthworks to the site
- Detailed excavation
- Groundworks

- Building Demolition

The temporary and permanent stormwater / erosion control devices shall be maintained at a suitable level / condition throughout construction. Temporary downpipes connected to the existing stormwater system will installed to take any runoff from the building.

V. Measures To Ensure That Sediment And Other Materials Are Not Tracked Onto The Roadway By Vehicles Leaving The Site;

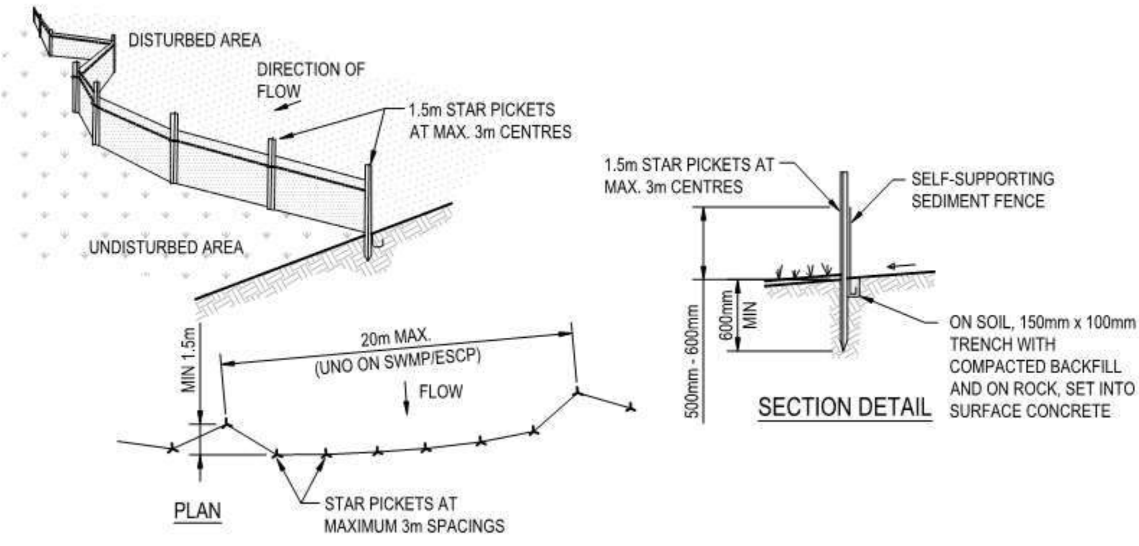
Grates / shakedown grids will be placed at Project access points entering and exiting the site. Construction vehicles transporting demolition and excavated materials from site will have their loads covered to assist in minimising dust. Vehicles tyres will be hosed down as required as not to track dust and mud onto the surround carpark and roadways.

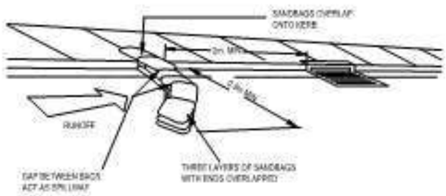
Vi. Groundwater Management Plan Including Measures To Prevent Groundwater Contamination;

Groundwater control measures shall be implemented throughout the project. Construction of all temporary & permanent sediment management devices and erosion protection shall be completed and effective prior to commencing the following:

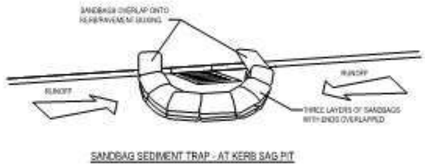
- Bulk Earthworks to the site
- Detailed excavation
- Groundworks
- Building Demolition

The temporary and permanent groundwater /stormwater / erosion control devices shall be maintained at a suitable level / condition throughout construction. Temporary downpipes connected to the existing stormwater system will installed to take any run off from the building.





SANDBAG SEDIMENT TRAP
N.T.S.



SANDBAG SEDIMENT TRAP DETAILS
NTS

vii. External lighting in accordance with AS 4282-1997

No additional external lighting is anticipated to be required during the early works project.

Attachments & Reports

B. Construction Traffic and Pedestrian Management Sub Plan.
Ptc Consultants 6th December 2019.

C. Construction Noise and Vibration Management Sub Plan.
Resonate Consultants 16 October 2019

D. Construction Waste Management Sub-Plan.
SLR Consulting Australia 18 April 2018

E. Construction Soil and Water Management Sub-Plan
JCL Developments Stormwater Drainage and Sediment, Erosion and Dust Control Management Report No 2017-T29B

F. Unexpected Finds Protocol (Contamination)
Aargus Hazardous Materials Assessment 22 March 2018

G. Unexpected Finds Protocol (Aboriginal and Non-Aboriginal Heritage)
Extent Heritage Advisors, 9 April 2018

H. Waste Classification
Aargus Detailed Site Investigation, March 2018

CTPMSP;

Stevenson Library

For The Scots College
6 December 2019

parking;
traffic;
civil design;
wayfinding;
ptc.

Document Control

Stevenson Library, CTPMSP

Issue	Date	Issue Details	Author	Reviewed	For the attention of
1	22/10/2019	Draft Issue	JJ/SW	AM	Rhys Jack
2	28/10/2019	Final Issue	JJ/SW	AM	Rhys Jack
3	06/12/2019	Revision 1	JJ/SW	AM	Rhys Jack

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Contents

1. Introduction

1.1 Project Summary

ptc. has been engaged by The Scots College to prepare a Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) for submission to the Department of Planning, associated with the proposed development of the Stevenson Library at The Scots College, Bellevue Hill.

This report has been prepared as required by the Secretary's Environmental Assessment Requirements (SEARs).

The location of the subject site is shown in Figure 1.

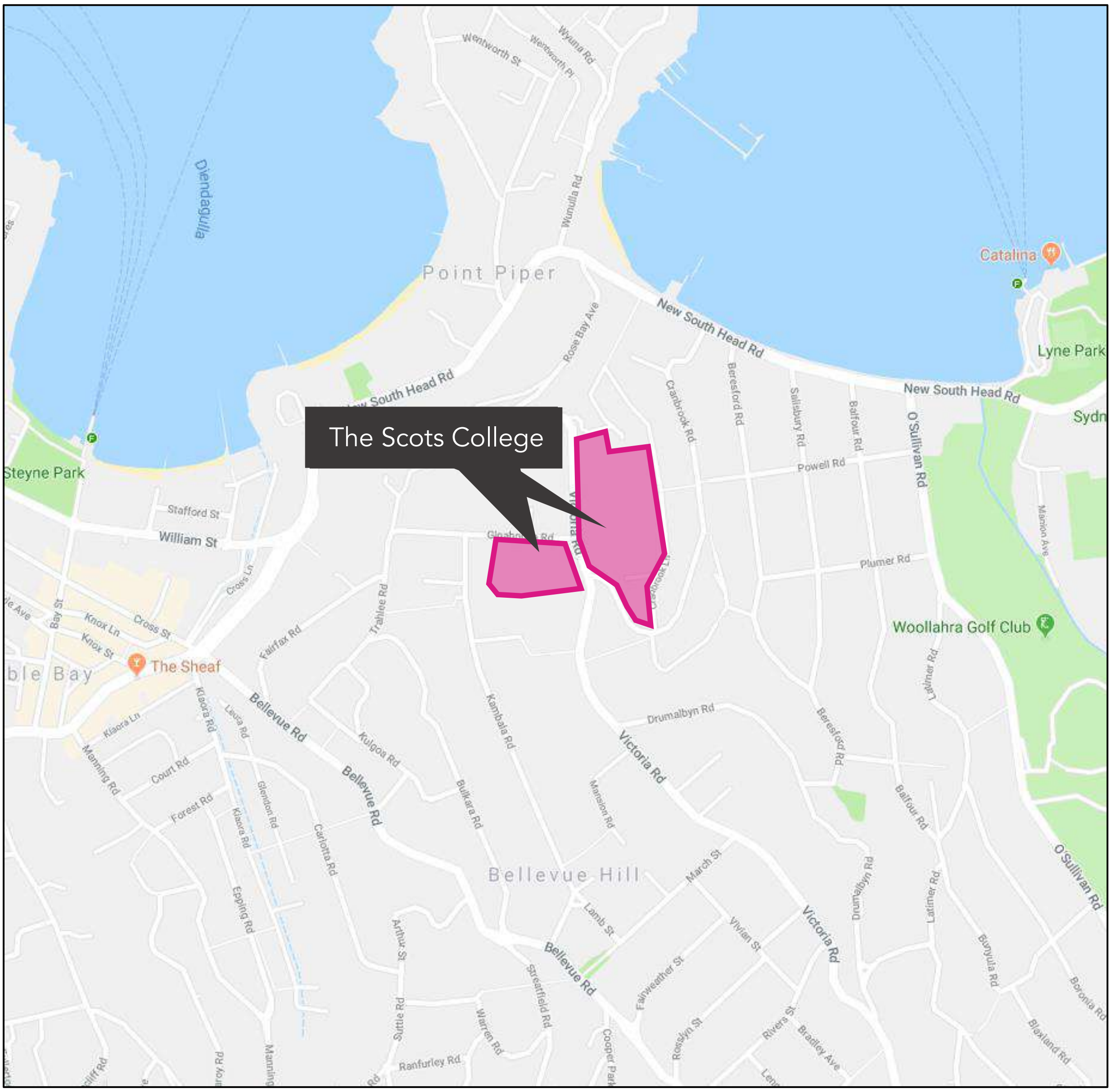

Figure 1 - Site Location

1.2 Purpose of this Report

This report presents the following considerations relating to the traffic and pedestrian management arrangements associated with the construction of the data centre facility development;

Section 1 - Introduction of the project;

Section 2 - Background information

Section 3 - A description of the proposed development;

Section 4 - A description of the road network serving the development site, the existing transportation options and active transport facilities;

Section 5 - A description of the proposed management of construction vehicles and non-site traffic;

Section 6 - Conclusion

2. Background

2.1 Site Context

The Scots College is located in Bellevue Hill, which is approximately 5km east of the Sydney CBD. The nearest town centre, Double Bay, is located approximately 1km west of the College.

The subject site is located to the east and west of Victoria Road.

The current site layout is shown in Figure 2.

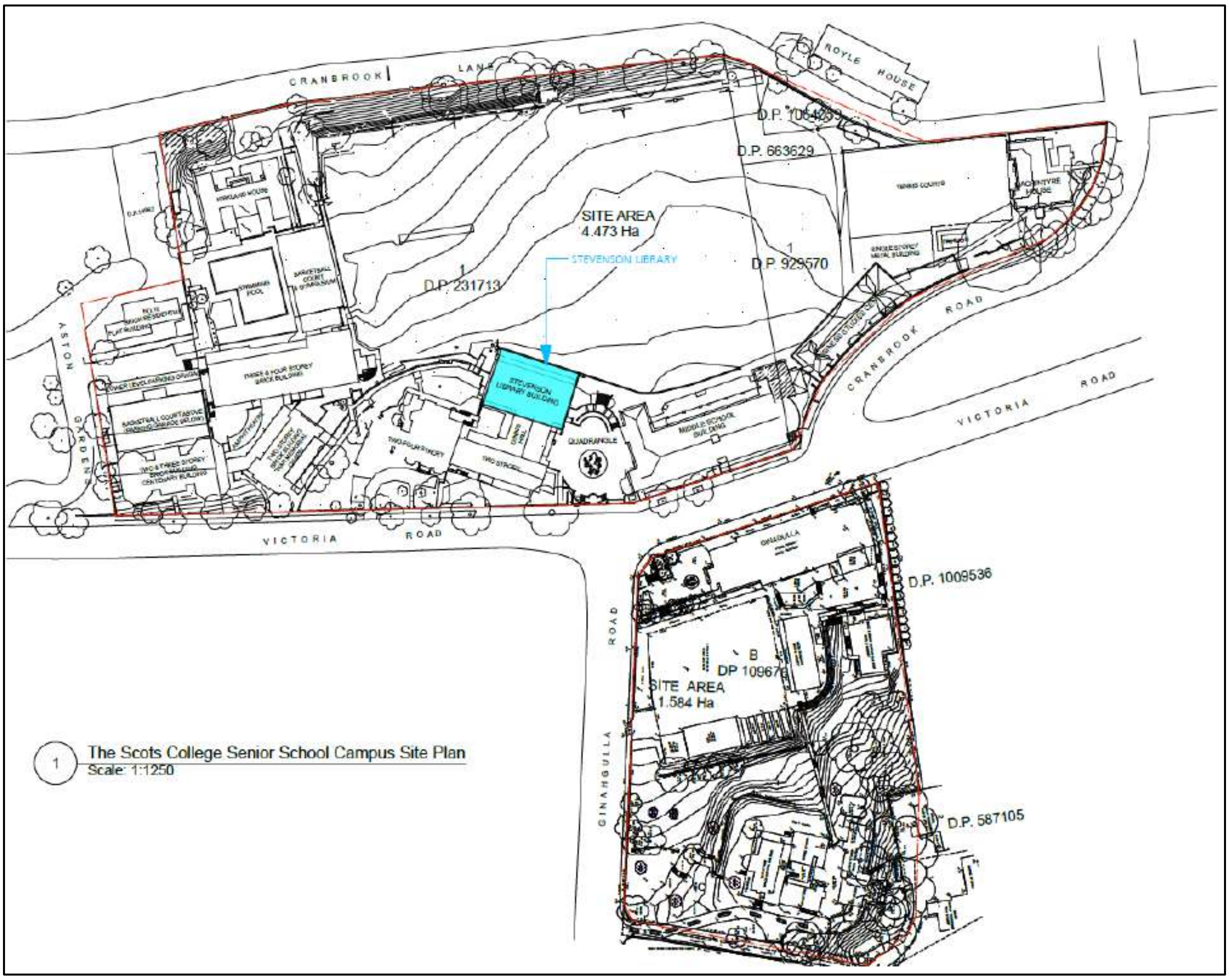

Figure 2 - Existing The Scots College Campus

2.2 School Start and Finish Times

The core school start and finish times are; 8.15am to 3.15pm, with out of school activities running from 6.30am before school and up to 6.30pm after school.

3. Proposed Development

The proposal involves the refurbishment of the Stevenson Library and the location of the library in relation to the overall campus is shown in Figure 2.

The development involves:

- The partial demolition of the existing building,
- Re-construction of the internal and external walls and ceilings,
- Construction of an additional level within the roof void, and
- The refurbishment of the internal building facilities.

Figure 3 is an extract of the proposed development plans, produced by JCA Architects, showing the ground floor level of the proposed library.

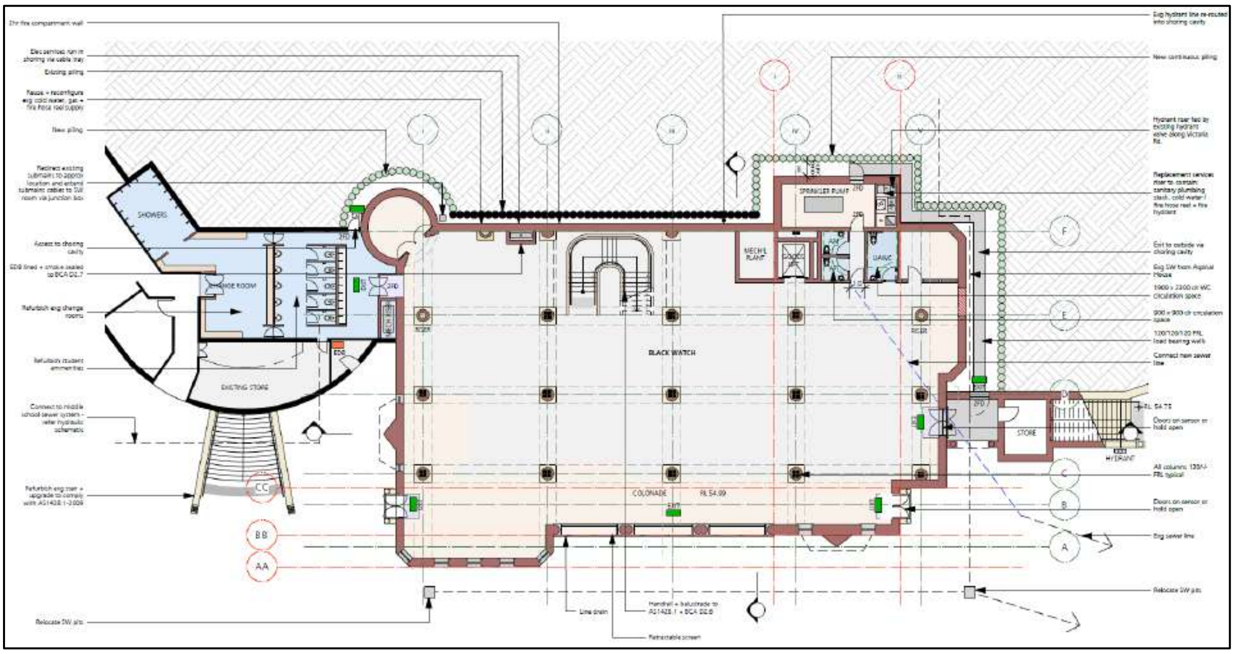

Figure 3 - Proposed Stevenson Library Development

4. Transport Environment

4.1 Road Network

The site is located on the south west side of New South Head Road, in the suburb of Bellevue Hill and in this regard, has a good connection to the eastern Sydney arterial road network and the wider Sydney area.

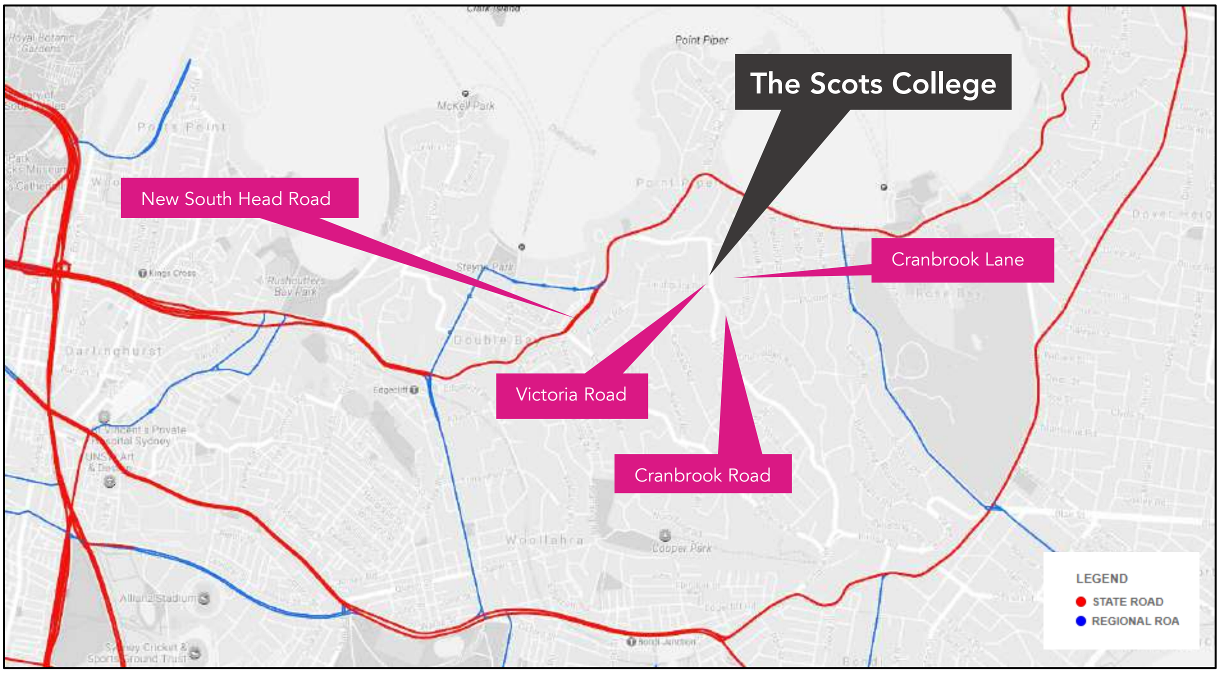

Figure 4 - Road Hierarchy

The NSW administrative road hierarchy comprises the following road classifications, which align with the generic road hierarchy as follows:

- State Roads - Freeways and Primary Arterials (RMS Managed)
- Regional Roads - Secondary or sub arterials (Council Managed, Part funded by the State)
- Local Roads - Collector and local access roads (Council Managed)

The road network servicing the site includes:

Table 1 – New South Head Road

New South Head Road	
Road Classification	State Road
Alignment	East / West
Number of Lanes	2/3 lanes in each direction
Carriageway Type	Un-divided
Carriageway Width	18 metres
Speed Limit	60 kph (outside School Zone times)
School Zone	Yes
Parking Controls	Eastbound - ½P 9am to 4pm Mon to Friday, No parking 4pm to 6pm Westbound – un-restricted
Site Frontage	Yes

Figure 5 - New South Head Road - Westbound towards Victoria Road

Table 2 – Victoria Road

Victoria Road	
Road Classification	Local Road
Alignment	East / West
Number of Lanes	1 lanes in each direction
Carriageway Type	Un-divided
Carriageway Width	12 metres
Speed Limit	50 kph (outside School Zone times)
School Zone	Yes
Parking Controls	Generally un-restricted, with mixed restriction along other sections
Site Frontage	Yes

Figure 6 - Victoria Road - Southbound towards Cranbrook Road

Table 3 – Cranbrook Road

Cranbrook Road	
Road Classification	Local Road
Alignment	East / West
Number of Lanes	1 lane in each direction
Carriageway Type	Un divided
Carriageway Width	12 metres
Speed Limit	50 kph (outside School Zone times)
School Zone	Yes
Parking Controls	Un-restricted
Site Frontage	Yes

Figure 7 - Cranbrook Road - towards Cranbrook Lane

Table 4 – Cranbrook Lane

Cranbrook Lane	
Road Classification	Local Road
Alignment	North / South
Number of Lanes	1 lane in each direction
Carriageway Type	Un-divided
Carriageway Width	8 metres
Speed Limit	50 kph
School Zone	No
Parking Controls	Un-restricted and No-Parking
Site Frontage	Yes

Figure 8 - Cranbrook Lane - towards site access

4.2 Key Intersections

The key intersections within the vicinity of the site and their configurations are listed below and shown in Figure 9.

- New South Head Road and Victoria Road – three arm signalised intersection
- Victoria Road and Cranbrook Road- three arm priority intersection
- Cranbrook Road and Cranbrook Lane – four arm priority intersection

Figure 9 - Key Intersections

4.3 Active Transport

4.3.1 Bicycle Network and Facilities

Woollahra Municipal Council has developed the Woollahra Bicycle Strategy 2009, which reviewed the 'Woollahra Waverly Bike Plan 2000' and set out to develop a bicycle strategy for future implementation.

The key elements of the bicycle strategy are;

- Completing major (regional) routes that provide regional connectivity;
- Every Street a Cycling Street – promoting and facilitating cycling on all local roads with minimum new construction;
- Recreational routes for safe and family-friendly cycling in the vicinity of parks and reserves;
- Developing cycle facilities at/to public transport Interchanges and urban villages;

- Integrated policies and planning instruments – inclusion of cycle facilities and considerations within road construction and maintenance programs as well as in development planning; and
- Targets to provide a balance between civil works and encouraged programs, including a ride-to-school strategy to develop sustainable travel habits and cycling confidence from a young age.

Figure 10 - Local Bicycle Network (Source: Woollahra Municipal Council)

As shown in Figure 10, the school is served by an existing on-road cycle route along Victoria Road and a proposed off-road route along New South Head Road. These routes provide access to the local cycle network and links to the greater Sydney cycle network.

4.3.2 Pedestrian Facilities

Facilities are available to the public within the vicinity of the site. These are summarised in Table 5 and shown in Figure 11.

Table 5 – Pedestrian Facilities

Road	Pedestrian Facilities
Victoria Road	**East Side – 4.0m wide footway** **West Side – 4.0m wide footway** **Signalised crossings on all arms of the Victoria Road / Ginahgulla Road intersection**
Cranbrook Road	**East Side – 1.5m wide footway** **West Side – 1.5m wide footway**
Cranbrook Lane	**East Side – 1.2m wide footway**

Figure 11 - Pedestrian Facilities

4.4 Public Transport

4.4.1 STA Bus Services

The site is well serviced by buses on Route 326 – Edgecliff to Bondi Junction (via Bellevue Hill), which operate from 5 bus stops in close proximity to the site, as shown in Figure 12.

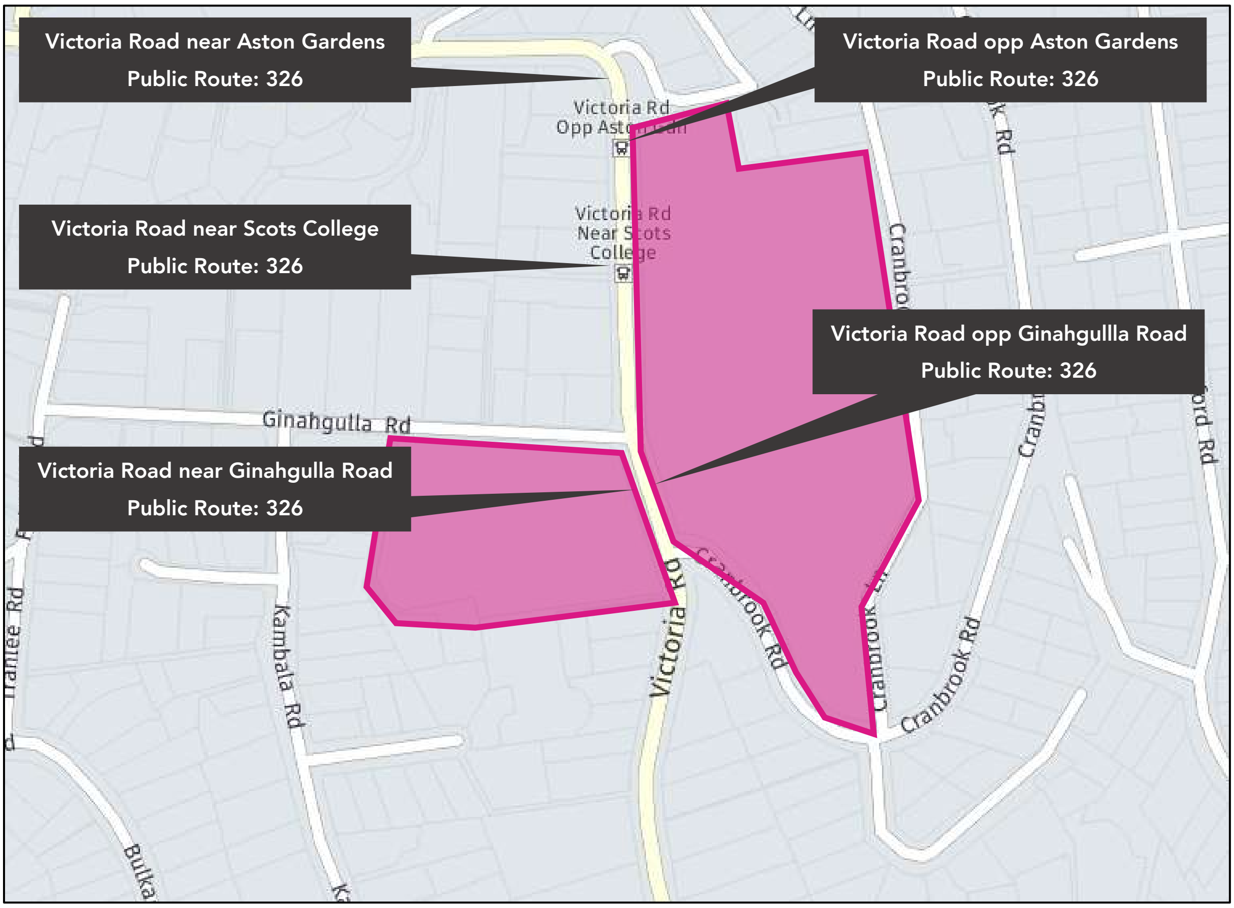

Figure 12 - STA Bus Services

This service are operated by Sydney buses run between 06:30 and 00:15 and provide access from the local area to the City at approximately 60 minute intervals, with additional services at peak times.

4.4.2 School Bus Service

The Scots College provides subsidised private bus services to students from Monday to Friday. The service is extended to other family members who attend neighbouring schools.

There are 15 College bus routes (highlighted in Figure 13) available to students in surrounding suburbs, in addition to this is the Eastern Suburbs Bus Service and State Transit Buses.

Figure 13 - The Scots College Bus Routes

5. Traffic and Pedestrian Management Sub-Plan

5.1 Objective

The traffic and pedestrian management sub-plan associated with the construction activity aims to ensure the safety of all workers and road users within the vicinity of the construction site and the following are the primary objectives:

- To minimise the impact of the construction vehicle traffic on the overall operation of the road network;
- Establishment of a safe pedestrian environment in the vicinity of the site.
- To ensure continuous, safe and efficient movement of traffic for both the general public and construction workers;
- Installation of appropriate advance warning signs to inform users of the changed traffic conditions;
- To provide a description of the construction vehicles and the volume of these construction vehicles accessing the construction site;
- To provide information regarding the changed access arrangement and also a description of the proposed external routes for vehicles including the construction vehicles accessing the site; and

5.2 Hours of Work

The hours of work will be determined through the conditions of consent as advised by the consenting authority. However, it is anticipated that the working hours will be as follows:

- Monday to Friday 7:00am to 5.00pm;
- Saturdays 7:00am to 1.00pm;
- Sunday or public holidays No works to be undertaken without prior approval;

5.3 General Requirements

In accordance with Road and Maritime Services (RMS) requirements, all vehicles transporting loose materials will have the entire load covered and/or secured to prevent any large items, excess dust or dirt particles depositing onto the roadway during travel to and from the site. All subcontractors must be inducted by the lead contractor to ensure that the procedures are met for all vehicles entering and exiting the construction site. The lead contractors will monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by site vehicles.

Vehicles operating to, from and within the site shall do so in a manner, which does not create unreasonable or unnecessary noise or vibration. No tracked vehicles will be permitted or required on any paved roads. Public roads and access points will not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances.

The applicant/contractor is required to follow and abide by the any specific standard requirements for construction management as set out by the Woollahra Municipal Council.

5.4 Construction Vehicle Types

The maximum construction vehicle size likely to be utilised during the construction is a 19m Truck and Dog.

During the peak construction periods, it is estimated that the construction activity is likely to generate up to 20 vehicle movements per day (approximately 2 vehicles per hour). Construction vehicle activity will be programmed (wherever possible) to occur outside network peak times and the school drop off and pick up periods.

A management system will be put in place to:

- Stagger all contractors' deliveries to ensure that back logs do not occur with multiple deliveries arriving at the same time. This is common practice and involves radio contact with approaching truck drivers.
- The provision of internal lay over areas for vehicles to stand and wait to be loaded/unloaded.
- Traffic control measures to be in place at all entry and exit points to the site outlined in Section 5.7.
- Works to be sequenced so that activities that require multiple deliveries (i.e. concrete pours and removal of spoil) do not occur and the same day.
- Prefabrication (wherever possible) of materials off site.

5.5 Construction Vehicle Access Routes

The site is located in the suburb of Bellevue Hill and the proposed vehicle construction routes have regard for the surrounding traffic arrangements within the vicinity of the site and the access location/arrangements within the campus, as illustrated in Figure 14.

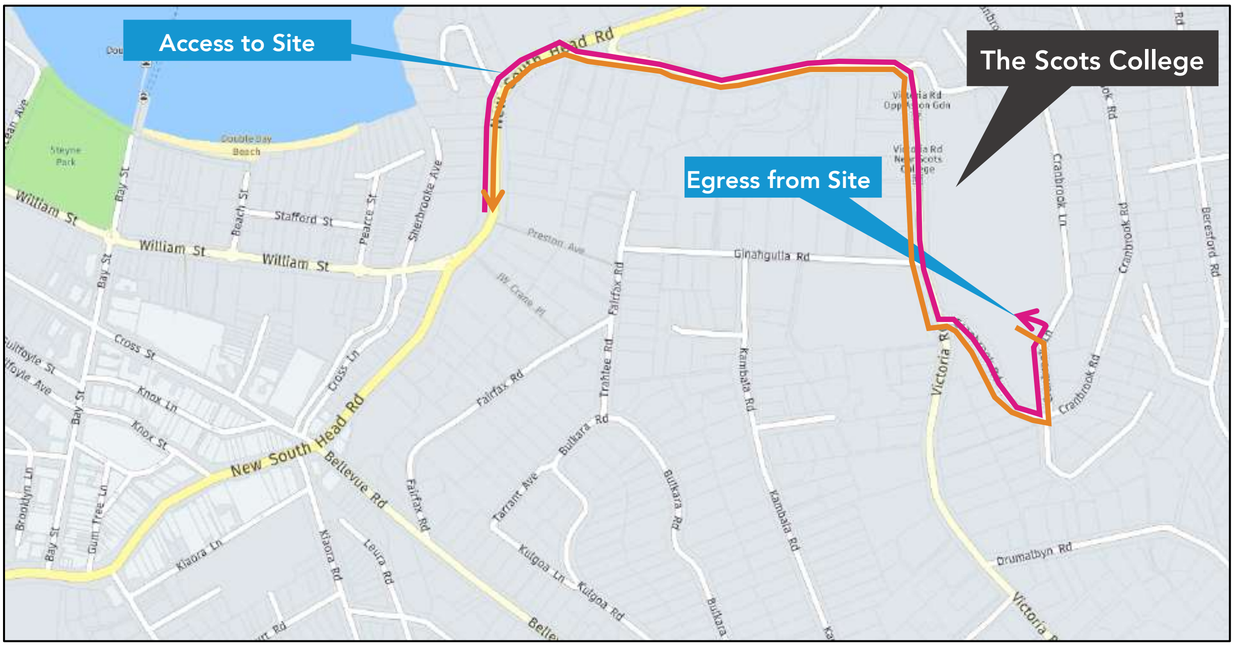

Figure 14 - Construction Vehicle Access and Egress Routes

The library is located centrally within the campus, with no proximate road frontage. Therefore it is proposed that access will be provided around the edge of the oval via the existing gate on Cranbrook Lane. This also has the benefit of separating the construction activity and the primary student activity on Victoria Road.

All vehicles will access the site from the west via New South Head Road and turn right into Victoria Road. Vehicles will then proceed southbound along Victoria Road, turn left into Cranbrook Road, left into Cranbrook Lane and access the site.

Vehicles exiting the site will do so via the site access off Cranbrook Lane, turning right into Cranbrook Lane, right into Cranbrook Road, right into Victoria Road and then proceed northbound to re-join New South Head Road.

To assess their suitability for the proposed construction vehicle swept path analysis has been undertaken on the three key intersections:

- New South Head Road and Victoria Road
- Victoria Road and Cranbrook Road
- Cranbrook Road and Cranbrook Lane

The swept path analysis has been undertaken using the largest vehicle expected (19m Truck and Dog) and is shown in Figure 15, Figure 16 and Figure 17.

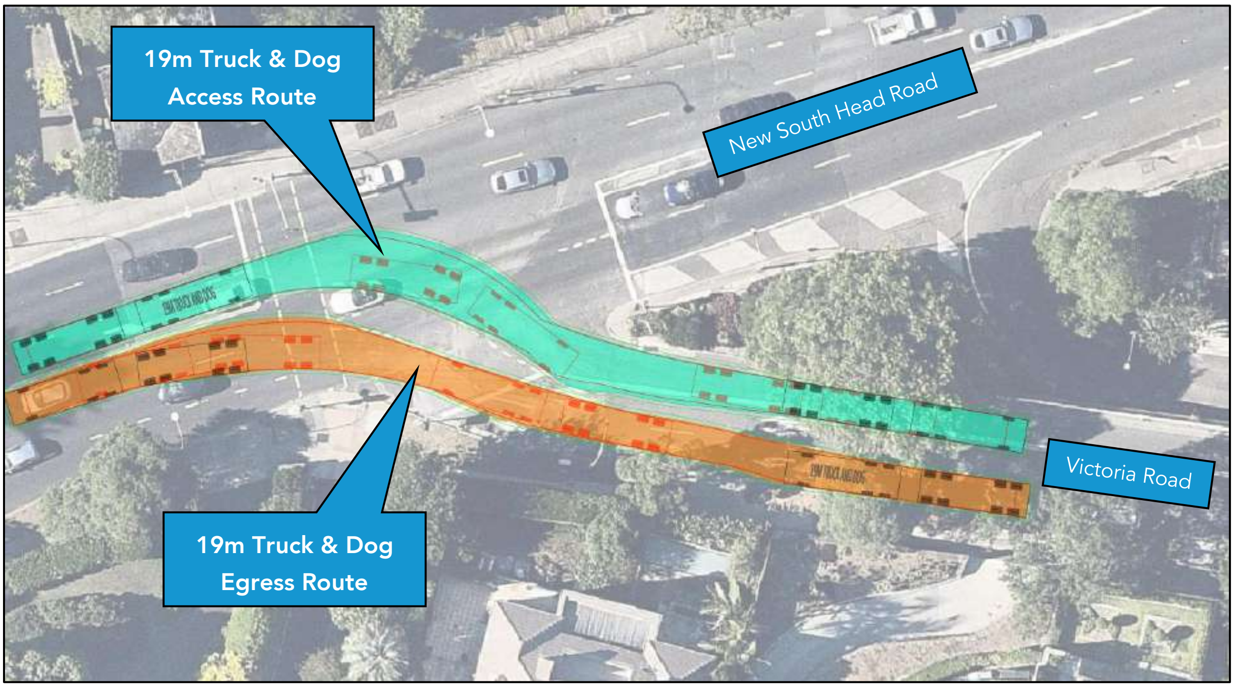

Figure 15 - New South Head Road and Victoria Road

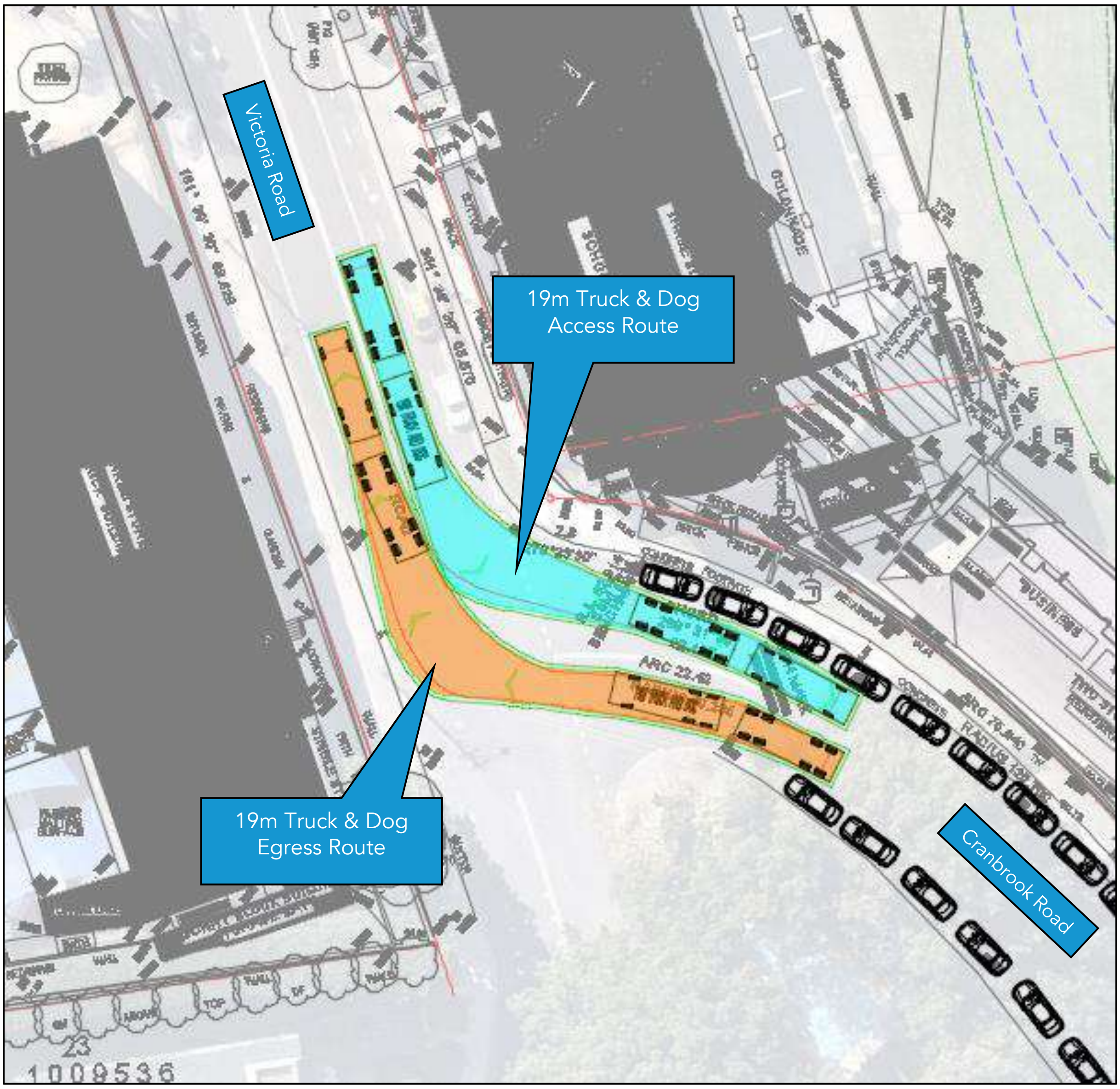

Figure 16 - Victoria Road and Cranbrook Road

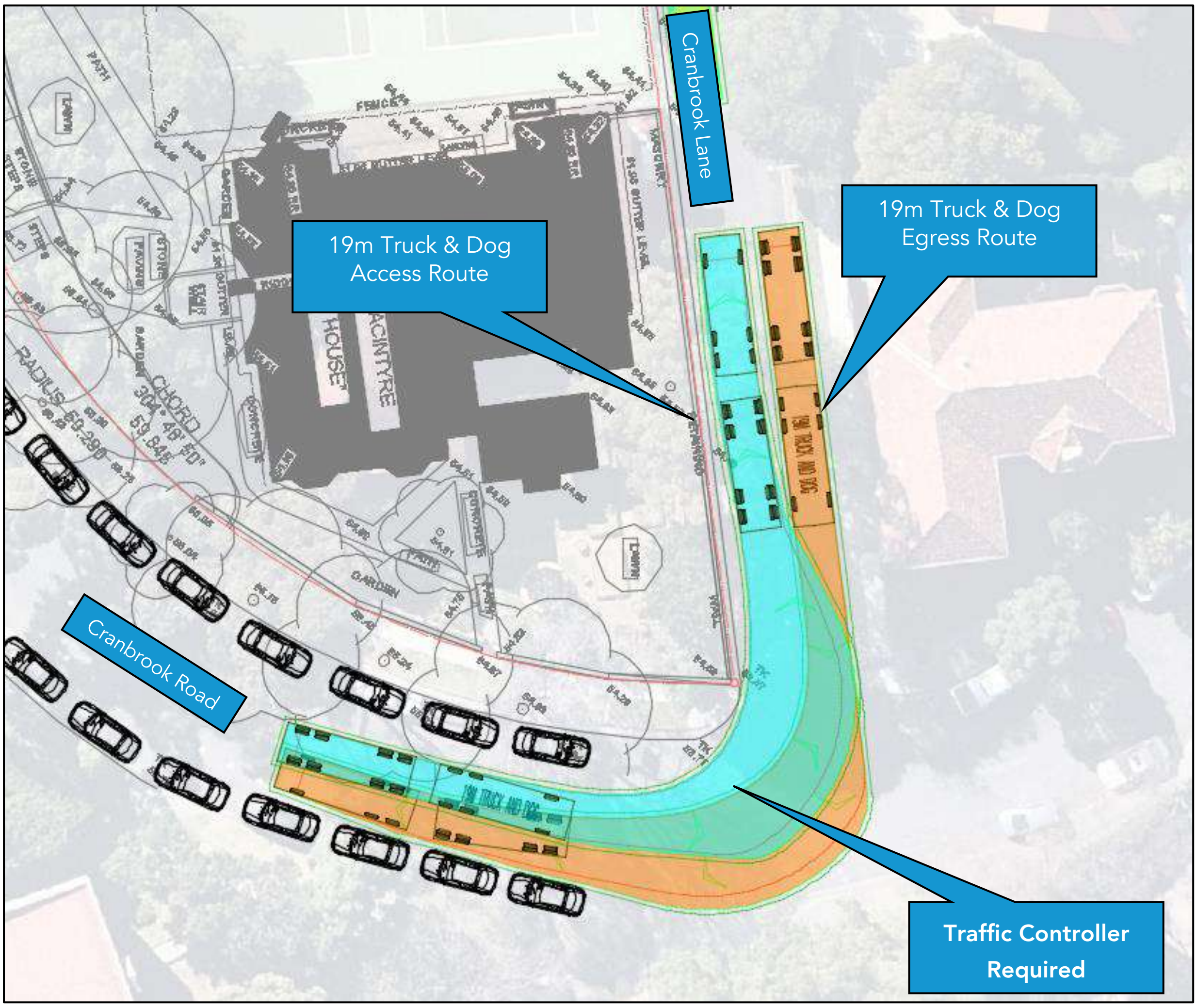

Figure 17 - Cranbrook Road and Cranbrook Lane

As previously discussed, vehicles will enter and exit the site via the existing 8m access off Cranbrook lane, as shown in Figure 18.

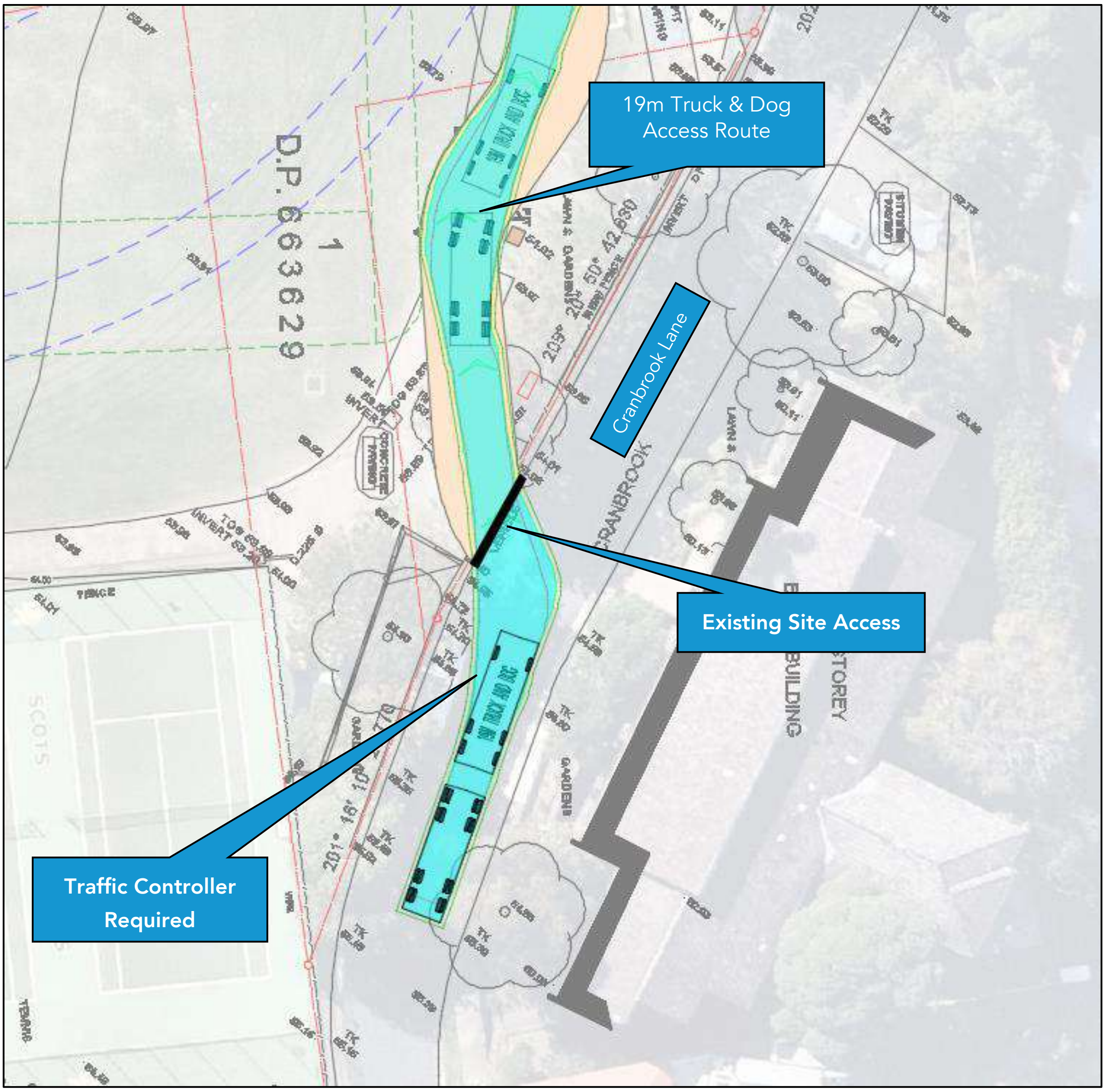

Figure 18 - Site Access

Within the site, the trucks will access the construction area by driving between the oval and the eastern boundary of the college, as shown in Figure 19. The path is to be set out as a one-way lane and the truck deliveries will be managed accordingly to accommodate this provision.

Figure 19 - Internal Vehicle Movements

It should be note that traffic controllers will be required to manage vehicle movements at the Cranbrook Road / Cranbrook Lane intersection and the Cranbrook Lane Access Gate. Traffic control plans will be provided prior to construction for approval by Council.

Material handling and storage area will be situated to the front of existing building, with platforms installed at every level as the development progresses. Exact details of the on-site areas will be provided prior to commencement of construction.

5.6 Construction Program and Process

The project is intended to be undertaken in over a 24 month period and during the pre-construction process, the construction program will be established to provide the most effective construction process.

5.7 Traffic Control Measures

Traffic control will be provided for access and egress to all gates and will be in accordance with the RMS Guide to Traffic Control at Work Sites. Traffic controllers will be required to manage vehicle movements at the Cranbrook Road / Cranbrook Lane intersection and the Cranbrook Lane Access Gate.

Traffic control plans will be provided prior to construction for approval by Council and these traffic controls plans will include any required changes to the on street parking provisions.

Traffic controllers will be used to ensure that all trucks exit the site right towards Cranbrook Road and do not exit left and drive down Cranbrook Lane.

5.8 Work Zone

No Work Zones on local roads are proposed as part of this development.

5.9 Pedestrian Access

Pedestrian access to the school and the surrounding pedestrian network is to be maintained at all times.

The site extent is to be bounded by security fencing and this is discussed further in Section 5.12.

All access points to the site are to be securely locked when construction activities are in place.

5.10 Special Deliveries

Whilst not anticipated, any oversized vehicle that is required to travel to the site will be dealt with separately, with the submission of required permits to and subsequent approval by Council prior to any delivery. Requests shall be submitted 28 days prior to the scheduled date of use of an oversized vehicle.

5.11 Construction Worker Transportation Strategy

The proposal involves the provision of a temporary car park dedicated to the site personnel within part of the sports oval. The temporary car park will be able to accommodate up to 20 vehicles. It is anticipated that the proposed works will require a maximum of 70 workers throughout the main works phase. Site personnel are to be advised that they do not to park in the on-street parking located in the vicinity of the College. Hence, site personnel will be advised to car pool (where ever practicable) and are to be informed of the public transport options available in the vicinity of the subject site (refer to Section 4) and advised to utilise these facilities (where ever practicable).

The location of the temporary car park is shown in Figure 20.

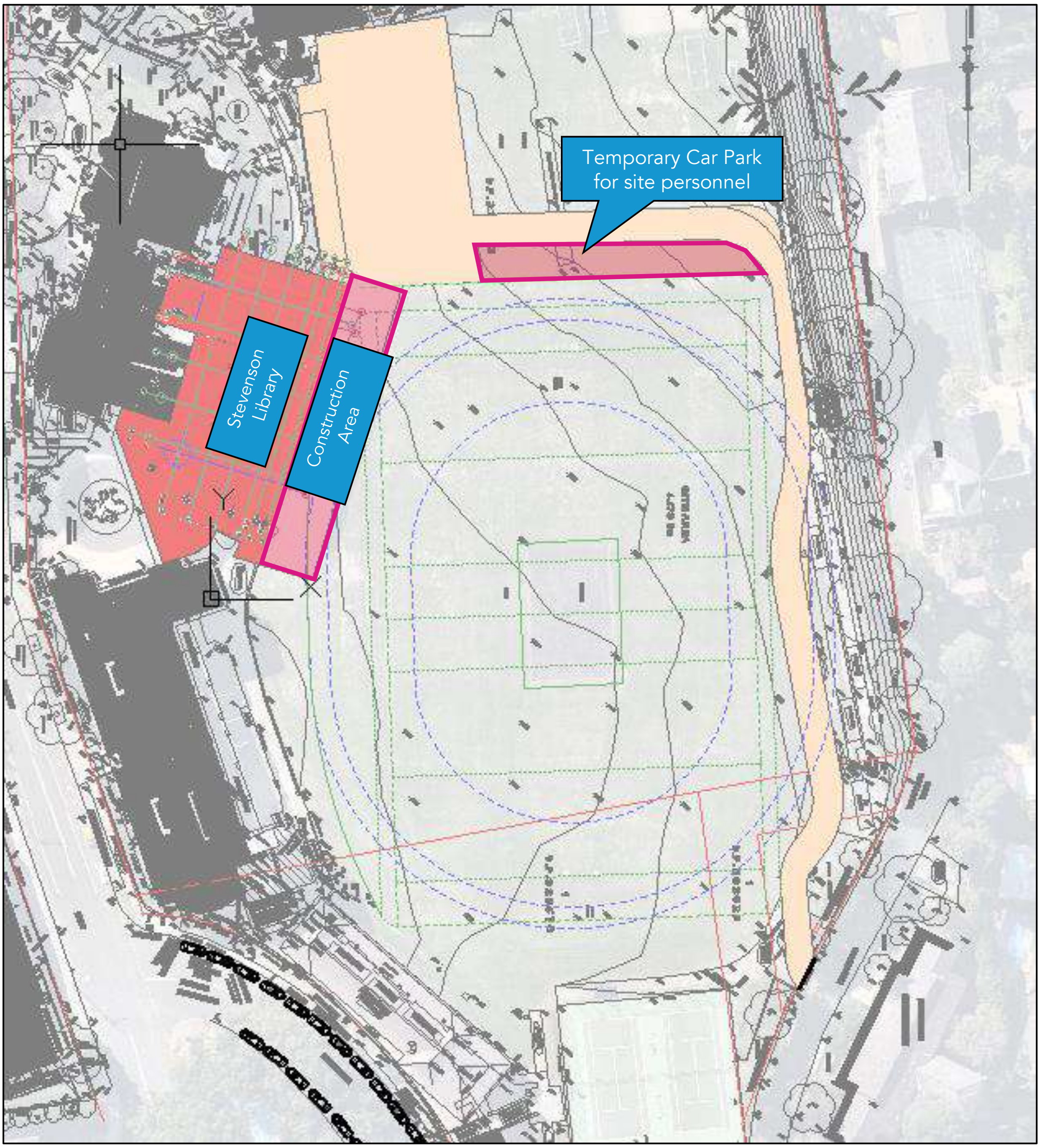

Figure 20 - Location of on-site car park for site personnel

5.12 Work Site Security

To provide security to the works site and protection to the construction staff, students and the general public, the site will be bounded by security fencing with shade cloth, which will be installed and maintained by the principle contractor.

This fence will define the extent of the works site.

All access points to the site are to be securely locked when construction activities are in place.

The exact location of this fencing will be confirmed prior to the commencement of construction and is subject to approval by Council.

5.13 Staff Induction

All staff and subcontractors engaged on site will be required to undergo a site induction. The induction will include permitted access routes to and from the construction site for all vehicles, as well as standard environmental, OH&S, driver protocols and emergency procedures. Additionally, the lead contractor will discuss TMP requirements regularly as a part of toolbox talks and advise workers of public transport and car-pooling opportunities.

5.14 Emergency Vehicles

The proposed traffic control arrangements do not propose closure of any local roads. Any emergency vehicles requiring access to the project site will do so via the relevant site access along Cranbrook Road.

5.15 Occupational Health and Safety

Any workers required to undertake works or traffic control within the public domain shall be suitably trained and will be covered by adequate and appropriate insurances. All traffic control personnel will be required to hold RMS accreditation in accordance with Section 8 of Traffic Control at Worksites.

5.16 Method of Communicating Traffic Changes

Traffic control plans in accordance with Australian Standards (AS 1742.3 – Traffic Control Devices for Works on Roads) and RMS Traffic Control at Worksites manual will advise motorist of upcoming changes in the road network.

During construction the contractor shall, prior to work commencing, ensure all signage is erected in accordance with the TCP and clearly visible. Each evening, upon completion of work, the contractor is to ensure signage is either covered or removed as required. Sign size is to be size “A”.

No deviation from the approved TCP shall be permitted, unless otherwise approved by Council and certified by an RMS accredited personnel.

The associated TCP road signage will inform drivers of works activities in the area including truck movements in operation.

Prior to commencement of works on site the contractor is to inform neighbouring properties of proposed works and provide site contact information by means of a letter box distribution.

5.17 Contact Details for On-Site Enquiries and Site Access

The principal contractor is as of yet unknown and details will be provided prior to commencement of construction.

5.18 Maintenance of Roads and Footways

The roads and footpaths along the route of travel will be kept in a serviceable state at all times. Any damage arising as a result of the proposed truck movements will be treated / repaired by the principal contractor at no cost to Council.

6. Conclusion

This CTPMSP has been prepared to outline the construction traffic measures to improve site safety to the public and workers and the construction process.

With the measures described in the CTPMSP in place, the construction activity is anticipated to have minimal disruption to the daily activities within the vicinity of the site.

It is envisaged that this document will be continually reviewed and amended if required, due to changes in design, RMS, Councils or any other authority requirements.

Stevenson Library Building, The Scots College

Construction Noise and Vibration Management Sub-Plan

S190788RP1 Revision A

Wednesday, 16 October 2019

Document Information

Project	Stevenson Library Building, The Scots College
Client	The Scots College c/ Walker Corporation
Report title	Construction Noise and Vibration Management Sub-Plan
Project Number	S190788

Revision Table

Report revision	**Date**	**Description**	**Author**	**Reviewer**
0	11 October 2019	Draft issue for review	Raymond Sim	Deb James
A	16 October 2019	Final	Raymond Sim	Deb James

Resonate

Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Daytime	Between 7 am and 6 pm as defined in the NPI.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
dB(A)	‘A’ Weighted sound level in dB.
Evening	Between 6 pm and 10 pm as defined in the NPI.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second. The human ear responds to sound in the frequency range of 20 to 20,000 Hz.
ICNG	*Interim Construction Noise Guideline*, 2009
Intrusive Noise	Noise emission that when assessed at a noise-sensitive receiver (principally a residential premises’ boundary) is greater than 5 dB(A) above the background noise level.
L_{10}	Noise level exceeded for 10% of the measurement time. The L_{10} level is commonly referred to as the average maximum noise level.
L_{90}	Noise level exceeded for 90% of the measurement time. The L_{90} level is commonly referred to as the background noise level.
L_{eq}	Equivalent Noise Level—Energy averaged noise level over the measurement time.
L_{max}	Maximum measured sound pressure level in the time period.
mm/s	Millimetres per second—units of vibration velocity.
Night-time	Between 10 pm on one day and 7 am on the following day as defined in the NPI.
NPI	New South Wales *Noise Policy for Industry*, 2017.
PPV	Peak Particle Velocity – measured in mm/s, is the highest (maximum or peak) particle velocity which is recorded during a particular vibration event over the three axes.
Rating Background Level (RBL)	Overall single-figure A-weighted background level representing an assessment period (Day/Evening/Night). For the short-term method, the RBL is simply the measured $L_{A90,15min}$ noise level. For the long-term method, it is the median value of all measured background levels during the relevant assessment period.
Standard hours of construction (ICNG)	Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays
VDV	Vibration Dose Value – a unit used to measure and describe the amount, or dose, of vibration at a location over a period of time. It relates vibration magnitude to exposure time and is a calculated result that uses measured acceleration values that can be interpolated over a longer period of time.

Resonate

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Resonate

1 Introduction

Resonate Consultants has been commissioned by Walker Corporation to prepare a Construction Noise and Vibration Management Sub-Plan (CNVMSP) of major alterations and additions works of the new Stevenson Library (the Project) located in The Scot College at 53 Victoria Road, Bellevue Hill. The works would involve the demolition of the existing facades, construction of access roads, installing new facades, construction of an additional storey to the building, as well as other internal upgrades.

This CNVMSP forms part of the Construction Environmental Management Plan for the project. This CNVMSP has been prepared to address the construction noise and vibration requirements listed in the Development Consent, reference SSD 8922, issued by the NSW Department of Planning, Industry and Environment (DPIE).

The purpose of this CNVMSP is to describe how the contractor proposes to manage potential noise and vibration impacts during construction of the Project.

The key objective of the CNVMSP is to ensure that project noise and vibration impacts on nearby sensitive receivers are minimised and within the scope permitted by the planning approval. This includes management procedures to appropriately respond to complaints from the community and stakeholders relating to noise and vibration.

To achieve this objective, the contractor will undertake the following:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or reduce noise and vibration impacts and potential adverse impacts to neighbouring sensitive receivers.
- Ensure reasonable and feasible mitigation measures are implemented with the aim of achieving the requirements in the Development Consent and the management levels detailed in this CNVMSP in accordance with the NSW EPA's *Interim Construction Noise Guideline*.
- Ensure complaints from community and stakeholders are reduced.

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2 Project information

2.1 Description and location

The Scots College is located at 53 Victoria Road, Bellevue Hill. The site is within The Scots College premises which is surrounded by the school's own buildings to the north, south and west and the school's field to the east. The Scots College premises is bounded by Victoria Road to the west and residential receivers to the north, west and south. Figure 1 shows the site location with all identified potentially affected receivers.

Figure 1 Site location

The development will include the partial demolition an existing building and construction of a five-level library building that will provide a range of teaching and support spaces. The new library building will adjoin an existing school building (R5).

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2.2 Sensitive receivers

A number of noise and vibration-sensitive land uses are located in the immediate vicinity of the proposed site as shown on Figure 1, with the most significant being the school buildings on campus. The closest residential building to the project site has been identified to be 40 Victoria Road (R1).

The sensitive land uses are summarised in Table 1 alongside a description of the land use.

Table 1 Noise and vibration sensitive land uses

Reference (See Figure 1)	Description
Residential buildings	
R1 – 40 Victoria Road	Residential properties located around the site with direct line of sight to the proposed construction. R1 being the closest, approximately 60m to the west of the site, and other residential sites approximately 125m to the east.
R2 – 27 Cranbrook Lane	
R3 – 55 Cranbrook Road	
R4 – 57 Cranbrook Road	Student accommodation located 150m to the south east of the site
Education Buildings	
R5 – Scots College Senior School	The site is bound by education buildings to the north, west and south, including direct connection to the dining hall
R6 – Scots College Ginagulla Campus	
Recreation land uses	
R7 – The Scots College Oval	Active recreation land use. Scots College oval is adjoining to the site.

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3 Development consent

This CNVMSP has been prepared to address the noise and vibration requirements specified in the Development Consent issued by the DPIE, specifically Conditions C18, D5 to 8 and D15 to D21. These requirements have been reproduced and presented in Table 2 below.

Table 2 Development Consent Conditions Relating to Noise and Vibration

Clause No.	Condition
C18	The Construction Noise and Vibration Management Sub-Plan must address, but not limited to, the following:
(a)	be prepared by a suitably qualified and experienced noise expert;
(b)	describe procedures for achieving the noise management levels in EPA's *Interim Construction Noise Guideline* (DECC, 2009);
(c)	describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;
(d)	include strategies that have been developed with the community for managing high noise generating works;
(e)	describe the community consultation undertaken to develop the strategies in condition C18(d); and
(f)	include a complaints management system that would be implemented for the duration of the construction.
D5	Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:
(a)	between 7 am and 6 pm, Mondays to Fridays inclusive; and
(b)	between 8 am and 1 pm, Saturdays
(c)	No work may be carried out on Sundays or public holidays
D6	Activities may be undertaken outside of the hours in condition D5 if required:
(a)	by the Police or a public authority for the delivery of vehicles, plant or materials; or
(b)	in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or
(c)	where the works are inaudible at the nearest sensitive receivers; or
(d)	where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works.
D7	Notification of such activities must be given to affected residents before undertaking the activities or as soon as practical afterwards.
D8	Rockbreaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:
(a)	9 am to 12 pm, Monday to Friday
(b)	2 pm to 5 pm, Monday to Friday; and
(c)	9 am to 12 pm, Saturday
D15	The development must be constructed to achieve the construction noise management levels detailed in the *Interim Construction Noise Guideline* (DECC, 2009). All feasible and reasonable

Clause No.	Condition
	noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management and mitigation measures identified in the approved Construction Noise and Vibration Management Plan.
D16	The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the site or surrounding residential precincts outside of the construction hours of work outlined under condition D5
D17	The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use of audible movement alarms of a type that would minimise noise impacts on surrounding noise sensitive receivers.
D18	Any noise generated during construction of the development must not be offensive noise within the meaning of the *Protection of the Environment Operations Act 1997* or exceed approved noise limits for the site.
D19	Vibration caused by construction at any residence or structure outside the site must be limited to:
(a)	For structure damage, the latest version of *DIN 4150-3 (1992-02) Structure vibration – Effects of vibration on structures* (German Institute for Standardisation, 1999); and
(b)	For human exposure, the acceptable vibration values set out in the *Environmental Noise Management Assessing Vibration: a technical guideline* (DEC, 2006) (as may be updated or replaced from time to time)
D20	Vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition D19.
D21	The limits in condition D19 and D20 apply unless otherwise outlined in a Construction Noise and Vibration Management Plan, approved as part of the CEMP required by condition C18 of this consent.

4 Existing noise environment

4.1 Unattended noise monitoring

An unattended noise survey was conducted during the period Tuesday, 3 April 2018 to Wednesday to 11 April 2018 in accordance with the NSW EPA's *Noise Policy for Industry* (NPI). Noise logging was conducted at 40 Victoria Road and at the eastern boundary of 55 Cranbrook Road, as shown in Figure 1 above.

Table 3 below presents the Rating Background Level (RBL) and average ambient noise level for the surrounding environment. Appendix A provides a detailed summary of the noise survey conducted for this reporting procedure.

Table 3 Existing ambient noise levels

Location	Rating Background Level, dB(A) L_{90}			Ambient Noise Level, dB(A) L_{eq}		
	Daytime (7am – 6pm)	Evening (6pm – 10pm)	Night-time (10pm – 7am)	Daytime (7am – 6pm)	Evening (6pm – 10pm)	Night-time (10pm – 7am)
L1 – 40 Victoria Road	48	36	31	60	58	53
L2 – 55 Cranbrook Road	43	38	31	57	49	47

4.2 Attended noise monitoring

Attended noise level measurements were also conducted at the noise logger locations on Wednesday 11 April 2018. The monitoring was conducted during the school's class times in order to minimise the influence of student activity on the measurements.

The measured noise levels over 15-minute periods at receivers R1 and R3 are presented in Table 4 and shown in Figure 1. The measurements indicate that there is a moderate level of existing noise in the environment during the daytime period due to local and distant traffic, as well as different school related activities during the day, especially on Victoria Road.

Table 4 Attended noise level measurement results on Wednesday, 11 April 2018

Location	Measured noise level, dB(A)				Description
	L_{max}	L_{10}	L_{eq}	L_{90}	
R1 – 40 Victoria Road	81	65	63	53	Measurement at 11:40 am. Influenced by local and distant traffic and student activities.
R3 – 55 Cranbrook Road	74	65	60	45	Measurement at 12:00 pm. Influenced by local traffic and student activities with mechanical services running consistently during measurement.

5 Construction noise and vibration criteria

5.1 Construction noise

Construction noise in New South Wales is assessed using the NSW EPA's *Interim Construction Noise Guideline* (ICNG, 2009). The ICNG is also defined as the relevant guideline for construction noise and vibration by the development consent issued by DPIE.

The ICNG aims to manage noise from construction works regulated by the EPA. It is also intended to provide guidance to other interested parties in the management of construction noise, and has therefore been adopted for this construction noise assessment.

The ICNG prescribes $L_{Aeq,15min}$ Noise Management Levels (NML) for sensitive receivers as part of a quantitative construction noise assessment. Where the predicted or measured construction noise level exceeds these management levels, then all feasible and reasonable work practices should be implemented to reduce construction noise, and community consultation regarding construction noise is required to be undertaken.

5.1.1 Standard hours of construction

The ICNG recommended standard hours of construction are as follow:

- Monday to Friday, 7 am to 6 pm
- Saturday, 8 am to 1 pm
- No work on Sundays or Public Holidays

To encourage work during the Standard Hours of Construction, and to reflect the lower impact of work at these times, the ICNG prescribes less stringent Standard Hours NMLs. The construction hours described in Condition D5 of the development consent aligns with the ICNG Standard Hours.

It should be noted that the Standard Hours of Construction are only applicable to residential (or similar) land uses. At educational or commercial land uses, where evening amenity and sleeping is not a concern, the impact of construction noise is assessed based on the times that the land use operates.

5.1.2 Residential land uses

The daytime standard work hours NMLs prescribed for residential land uses by the ICNG are presented in Table 5. The ICNG out of hours NMLs would not be applicable to this assessment as Condition D6 requires construction activities to be inaudible. Inaudibility general refer toy RBL minus 10 dB. This out of hour NMLs is considered to be very stringent and would be impossible to achieve for construction activities. Resonate recommends outside standard hours NMLs to be RBL minus 10 dB as presented in Table 5 to satisfy condition D6. That said, it is understood that construction works will only be carried out during standard hours (Condition D5).

The levels apply at the most exposed property boundary of the noise sensitive receiver at a height of 1.5 metres above ground level.

5.1.3 Other sensitive land uses

The ICNG also prescribes NMLs for other sensitive land uses, including educational buildings and offices. The NMLs for other non-residential sensitive land uses are summarised in Table 6 and apply only when those land uses are in used.

For those receivers where an internal NML applies, it is common to assume an outdoor-to-indoor noise reduction of 15 dB(A). This is based on a standard educational building facade with windows partially opened.

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Table 5 Noise management levels for residential land uses

Time of day	NML, $L_{Aeq,15min}$	Application notes
Recommended Standard Hours: Monday to Friday 7am to 6pm No work on Sundays or public holidays	Noise affected: RBL + 10 dB(A)	May be some community reaction to noise. • Where the predicted or measured construction noise level exceeds the noise affected level, all feasible and reasonable work practices should be applied to meet the noise affected level. • All residents potentially impacted by the works should be informed of the nature of the works, the expected noise levels and duration, and provided with site contact details.
	Highly noise affected: 75 dB(A)	May be strong community reaction to noise. • Where construction noise is predicted or measured to be above this level, the relevant authority may require respite periods that restrict the hours that the very noisy activities can occur. • Respite activities would be determined considering times identified by the community when they are less sensitive to noise, and if the community is prepared to accept a longer period of construction to accommodate respite periods.
Outside recommended Standard Hours	Noise affected: RBL - 10 dB(A)	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the affected noise level. • Where all feasible and reasonable practices have been applied and noise is more than RBL - 10 dB(A) above the affected noise level, the proponent should negotiate with the affected community.

Table 6 ICNG noise management levels for other sensitive land uses

Land use	NML $L_{Aeq,15min}$ (applies when property in used)
Classrooms at schools and other educational institutions	Internal noise level of 45 dB
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation).	External noise level of 60 dB
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion).	External noise level of 65 dB
Offices, retail outlets	External noise level of 70 dB

5.1.4 Project specific noise management levels

Table 7 summarises the NMLs applicable to sensitive land uses around the site during the construction phase. The NMLs are based on the background noise level measured during the unattended noise monitoring conducted locations L1 and L2 during the daytime period noting that construction work will only be conducted during standard daytime construction hours. Daytime RBLs of 48 dB(A) at location L1 and 43 dB(A) at location L2 were measured. Night-time RBL of 31 dB(A) measured at locations L1 and L2 have been used to establish the outside of standard hours NML.

Table 7 Project Specific Noise Management Levels

Land use	NML $L_{Aeq,15min}$ for time period, dB(A)	
	Standard Hours	Outside of Standard Hours
Residential land uses	58 (NML for western receivers) 53 (NML for eastern receivers) 75 (Highly noise affected)	21
Education land uses	45 (Internal) when in use	N/A
Recreation land uses	65	N/A

5.2 Construction vibration

Ground vibration generated by construction can have a range of effects on buildings and building occupants. The main effects are generally classified as:

- human disturbance – disturbance to building occupants: vibration which inconveniences or interferes with the activities of the occupants or users of the building
- effects on building structures – vibration which may compromise the condition of the building structure itself.

In general, vibration criteria for human disturbance are more stringent than vibration criteria for effects on buildings. Building occupants will normally feel vibration readily at levels well below those which may cause a risk of cosmetic or structural damage to a structure. However, it may not always be practical to achieve the human comfort criteria. Furthermore, unnecessary restriction of construction activities can prolong construction works longer than necessary, potentially resulting in other undesirable effects for the local community.

Construction vibration criteria have been adopted from the following sources:

- Cosmetic and structural damage to buildings: German Standard DIN 4150-3[1]
- Human comfort: Assessing Vibration – A Technical Guideline (the Vibration Guideline)

5.2.1 Cosmetic and structural damage

Condition D19 (a) in the development consent states that potential structure damage caused by construction vibration at any residence or structure outside the site must be limited to the levels specified in the latest version of DIN 4150-3. DIN 4150-3 summarises structural and cosmetic damage assessment criteria for different types of buildings, which are presented in Table 8, which are widely used for the assessment of construction vibration effects on buildings in Australia. The criteria are specified as Peak Particle Velocity (PPV) levels measured in any direction at or adjacent to the building foundation.

[1] German Standard DIN 4150-3, 1999, *Structural Vibration – Part 3: Effects of vibration on structures*.

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Table 8 DIN 4150-3 vibration cosmetic and structural damage criteria

Structure type	Peak Particle Velocity (PPV), mm/s			
	Foundation of structure			Vibration at horizontal plane of highest floor at all frequencies
	<10 Hz	10-50 Hz	50-100 Hz	
Buildings used for commercial, industrial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwelling and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in rows 1 and 2, and are of great intrinsic value (e.g. heritage-listed buildings)	3	3 to 8	8 to 10	8

DIN 4150-3 states that exposing buildings to vibration levels higher than that recommended would not necessarily result in damage. Rather, it recommends these values as maximum levels of short-term construction vibration at which experience has shown damage reducing the serviceability of structures will not occur due to vibration effects.

DIN 4150-3 is considered to be suitable for the assessment of both structural and cosmetic damage as it considers a reduction in serviceability of the structure is deemed to have occurred if:

- cracks form in plastered surfaces of walls
- existing cracks in the building are enlarged
- partitions become detached from loadbearing walls or floors.

5.2.2 Human comfort

The ICNG recommends that vibration from construction works be assessed under *Assessing Vibration – a technical guideline* (the Vibration Guideline), consistent with Condition D19 (b) of the development consent.

The vibration assessment criteria defined in the Vibration Guideline are for human comfort and represent goals that, where predicted or measured to be exceeded, require the application of all feasible and reasonable mitigation measures. Where the maximum value cannot be feasibly and reasonably achieved, the operator would need to negotiate directly with the affected community.

The Vibration Guideline defines vibration assessment criteria for continuous, impulsive and intermittent vibration. Vibration can be classified according to the following definitions:

- Continuous vibration: continues uninterrupted for a defined period. Applies to continuous construction activity such as tunnel boring machinery.
- Impulsive vibration: rapid build-up to a vibration peak followed by a damped decay or the sudden application of several cycles of vibration at approximately the same magnitude providing that the duration is short. Applies to very occasional construction activities that create distinct events such as the occasional dropping of heavy equipment.
- Intermittent vibration: interrupted periods of continuous vibration (such as a drill) or repeated periods of impulsive vibration (such as a jack hammer).

The majority of construction activities as part of the proposed works would be expected to be continuous or intermittent in nature.

Table 9 presents the management levels for continuous and impulsive vibration at different land uses. The management levels specified are as overall unweighted RMS vibration velocity levels. The Vibration Guideline specifies the management levels as suitable for vibration sources predominantly in the frequency range 8-80 Hz as would be expected for construction vibration.

For intermittent vibration, the Vibration Dose Value (VDV) is used as the metric for assessment as it accounts for the duration of the source, which will occur intermittently over the assessment period. The VDV management levels at different land uses for intermittent vibration sources are presented in Table 10.

Table 9 RMS vibration velocity management levels for continuous and impulsive vibration

Land use	Continuous vibration – RMS vibration velocity, mm/s		Impulsive vibration – RMS vibration velocity, mm/s	
	Preferred	Maximum	Preferred	Maximum
Critical areas[1]	0.1	0.2	0.1	0.2
Residences and hospital wards – daytime[2]	0.2	0.4	6.0	12.0
Residences and hospital wards – night time[3]	0.14	0.28	2.0	4.0
Offices, schools	0.4	0.8	13.0	26.0
Workshops	0.8	1.6	13.0	26.0

(1) Critical operating areas include hospital operating theatres and precision laboratories where sensitive operations are occurring.

(2) Daytime is defined by the Vibration Guideline to be 7 am to 10 pm.

(3) Night time is defined by the Vibration Guideline to be 10 pm to 7 am.

Table 10 VDV management levels for intermittent vibration

Land use	VDV – intermittent vibration, $m/s^{1.75}$	
	Preferred	Maximum
Critical areas[1]	0.1	0.2
Residences and hospital wards – daytime[2]	0.2	0.4
Residences and hospital wards – night time[3]	0.13	0.26
Offices, schools	0.4	0.8
Workshops	0.8	1.6

(1) Critical operating areas include precision laboratories where sensitive operations are occurring.

(2) Daytime is defined by the Vibration Guideline to be 7 am to 10 pm.

(3) Night time is defined by the Vibration Guideline to be 10 pm to 7 am.

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6 Construction noise and vibration assessment

6.1 Construction activities

Typical demolition and construction associated with the Stevenson Library development have been assumed for the assessment and are broadly summarised as follow:

- Stage 1 – Mobilisation and site establishment
- Stage 2 – Access road construction
- Stage 3 – Demolition
- Stage 4 – Building construction

6.2 Construction noise assessment

6.2.1 Construction noise sources

Table 11 summarises the assumed sound power levels (L_W) for the major construction noise sources which we expect would be on site during each phase. The L_{Aeq} sound power levels have been based on data obtained from previous measurements conducted by Resonate and those within the UK Department for Environment, Food and Rural Affairs (DEFRA) *Update of noise database for prediction of noise on construction and open sites*. An overall sound power level for each stage has also been assumed based on the loudest typical source(s) operating for each works phase.

Table 11 Construction noise source sound power levels

Stage	Typical plant items	Assumed L_{Aeq} sound power level of Individual plant/equipment, dB(A)
Stage 1 – Mobilisation and site establishment	Road truck	108
	Scissor lift	98
	Franna crane	98
	Light vehicles	88
	Hand tools	95
	Overall Sound Power Level	**109**
Stage 2 – Access road construction	Excavator	107
	Bulldozer 28T	107
	Compactor	103
	Grader	107
	Vibratory roller[1]	102
	Tipper truck	108
	Bobcat	104
	Telehandler	105
	Franna Crane	98

Stage	Typical plant items	Assumed L_{Aeq} sound power level of Individual plant/equipment, dB(A)
	Delivery truck	100
	Light vehicles	88
	Hand tools	95
	Overall Sound Power Level	**115**
Stage 3 – Demolition	Crane 55T	110
	Jackhammer[1]	109
	Road truck	108
	Compressor	94
	Generator	95
	Circular saw[1]	112
	Power tools	105
	Hand tools	95
	Overall Sound Power Level	**116**
Stage 4 – Building construction	Crane 55T	110
	Delivery trucks	106
	Concrete truck	109
	Concrete pump	109
	Scissor lift	98
	Circular saw	91
	Power tools	105
	Hand tools	95
	Overall Sound Power Level	**115**

(1) Denotes "annoying" item of plant/equipment as defined in the Interim Construction Noise Guideline and as such includes a +5 dB penalty adjustment.

6.2.2 Predicted construction noise levels

Typical worst-case predicted noise levels are shown in Table 12 for each receiver location and each stage of works. Predicted noise levels were calculated using distance attenuation.

Based on the predictions, it can be seen that construction noise from the site is likely to exceed the project specific NMLs at all locations. The surrounding residences are not assessed to be highly noise affected as the predicted construction noise levels at residential premises are below the 75 dB(A) limit.

It is important to note that these predictions are typical worst-case predictions as they assume that:

- The receiver is located at the boundary of each receiver property.
- All plant/equipment within each stage are operating concurrently.

- The noisiest construction sources are operating continuously for the entire 15-minute period. This will not occur at all times as equipment will regularly be stood down or idled while other activities are undertaken.

Table 12 Predicted typical worst-case external construction noise levels for each phase during standard working hours

Receiver (Approximate distance from middle of project site)	Predicted typical worst-case external construction noise level for each stage, L_{Aeq} dB(A)			
	Stage 1 – Mobilisation and site establishment	Stage 2 – Access road construction	Stage 3 – Demolition	Stage 4 – Building construction
Receiver 1 External (60 metres)	65	71	72	71
Receiver 2 External (125 metres)	59	73	66	73
Receiver 3 External (150 metres)	58	64	65	64
Receiver 4 External (150 metres)	58	64	65	64
Receiver 5 Internal (5 metres)	72[1]	78[1]	79[1]	78[1]
Receiver 6 Internal (90 metres)	47[1]	53[1]	54[1]	53[1]
Receiver 7 External (55 metres)	66	72	73	72

(1) A -15 dB correction has been applied to the predicted level to account for attention through a partially opened window.

6.3 Construction vibration

The Roads and Maritime Services' *Construction Noise and Vibration Guideline* provides guidance for safe working distances for vibration-intensive activities. Vibration levels for typical construction activities have been published along with the safe working distances for cosmetic damage and human comfort.

Table 13 presents the recommended safe working distances for vibratory roller and jackhammer that may be used for the construction of the project.

Table 13 – Recommended safe working distances for vibration intensive plant

Plant Item	Rating/Description	Safe Working Distance – Cosmetic Damage[1]	Safe Working Distance – Human Comfort
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

(1) Based on residential structures.

The minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. Vibration monitoring is recommended to confirm the minimum working distances at specific sites and once plant selection has been confirmed.

Vibration intensive equipment/plant, i.e. vibratory roller and jackhammer, are anticipated to be used in Stage 2 and Stage 3 works. Where feasible and reasonable, all vibration intensive works would be undertaken outside the cosmetic damage safe working distances to avoid structural vibration impact.

The nearest receivers that would potentially be impacted by the vibration of the project's construction activities are the adjoining school buildings (receiver R5) to the west and south of the site. The school building to the west is right on the western boundary of the site and the school building to the south is approximately 20 metres from the southern boundary of the site.

As the nearest residential receivers are 60 metres or more from the site, vibration impacts have been assessed to be:

- negligible and deemed to comply with the cosmetic damage vibration management levels when vibratory roller or jackhammer is used
- negligible and deemed to comply with the human comfort vibration management levels when vibratory roller less than 7 tonnes or jackhammer is used
- in exceedance of the human comfort vibration management levels when vibratory roller 7 tonnes or more is used

7 Construction hours

7.1 Standard construction hours

The approved project standard construction hours, as outlined in Condition D5, are as follows.

Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:

(a) between 7 am and 6 pm, Mondays to Fridays inclusive; and
(b) between 8 am and 1 pm, Saturdays
(c) No work may be carried out on Sundays or public holidays

7.2 Out of hours work

The approved out of hours work, as outlined in Conditions D6 and D7, are as follows.

Activities may be undertaken outside of the hours in condition D5 if required:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or
(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or
(c) where the works are inaudible at the nearest sensitive receivers; or
(d) where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works.

Notification of such activities must be given to affected residents before undertaking the activities or as soon as practical afterwards.

7.3 High impact work hours

The approved work hours for high impact activities, as outlined in Condition D8, are as follows.

Rockbreaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

(a) 9 am to 12 pm, Monday to Friday
(b) 2 pm to 5 pm, Monday to Friday; and
(c) 9 am to 12 pm, Saturday

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8 Noise and vibration management measures

This section outlines noise management measures that will be implemented as part of the construction works, including consultation and complaint handling procedures.

It may not be feasible to adopt all management measures at all times during construction, and identification of all reasonable and feasible mitigation methods will be conducted by the site supervisor and/or environmental representative on a regular basis during noisy works near sensitive land uses.

In relation to the implementation of mitigation measures, feasibility addresses engineering consideration regarding what is practical to build. Reasonableness relates to the application of judgment in arriving at a decision, taking into account the following factors:

- work hours
- noise reduction achieved
- number of people or other uses benefited
- cost of the measure
- delay to schedule and whether the measure will prolong exposure to noise
- community views
- pre-construction noise levels at receivers

While the management measures presented will not necessarily result in mitigating all noise impacts at all times, they are expected to reduce impacts to levels most stakeholders should find acceptable considering the anticipated benefits of the completed project as a whole.

8.1 Noise and vibration management measures

The following noise management measures will be implemented throughout the construction of the project where reasonable and feasible:

Table 14 Noise and vibration management measures

Reference	Details of management measures	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
NVMM01	Works to be undertaken during Standard Construction Hours where possible.	✓	✓	Construction Manager
NVMM02	The induction of site staff will include a reference to potential noise impacts and the identification of noise-sensitive land uses.	✓		Construction Manager
NVMM03	'Toolbox talks' will include a reference to any noise management measures being implemented on site at the time.		✓	Site Supervisor
NVMM04	Where possible, schedule work breaks at same time as sensitive times for receivers. For example, break for lunch between 12 and 2 pm when catering usage is busy.		✓	Site Supervisor
NVMM05	Implement complaint response procedures as detailed in Section 8.2.	✓	✓	Community Relations Manager

Reference	Details of management measures	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
NVMM06	Construction vehicles (including concrete trucks) must not arrive at the site or surrounding residential precincts outside of the standard construction hours as outlined in Section 5.1.1 (Condition D5)		✓	Site Supervisor Operators
NVMM07	Vehicle warning devices, such as horns, are not to be used as signalling devices.		✓	Site Supervisor Operators
NVMM08	No swearing or unnecessary shouting or loud stereos/radios on site.		✓	Site Supervisor
NVMM09	No unnecessary dropping of materials from height, throwing of metal items and slamming of doors.		✓	Site Supervisor
NVMM10	Site access and delivery points will be located as far away from the sensitive receivers as possible.	✓	✓	Construction Manager
NVMM11	Truck movements will use arterial roads and be diverted away from residential streets where feasible.	✓	✓	Construction Manager
NVMM12	Traffic flow, parking and loading/unloading areas will be planned to avoid the need for reversing near sensitive receivers.	✓	✓	Construction Manager Site Supervisor
NVMM13	Two way radios will be used at the minimum effective volume.		✓	Site Supervisor Operators
NVMM14	Quieter construction methods will be used where feasible and reasonable.	✓	✓	Construction Manager
NVMM15	Noise levels of plant and equipment will be considered in rental decisions and all plant and equipment will be selected and operated to be compliant with the sound power levels in Table 11.	✓	✓	Construction Manager
NVMM16	Simultaneous operation of noisy plant close together and near the sensitive receivers will be avoided.		✓	Site Supervisor
NVMM17	The offset distance between plant and sensitive uses will be maximised.		✓	Site Supervisor
NVMM18	Plant used intermittently will be shut down or throttled down to a minimum in between use.		✓	Site Supervisor
NVMM19	Plant emitting noise in a particular direction will be directed away from sensitive receivers.		✓	Site Supervisor
NVMM20	Delivery vehicles will be fitted with straps rather than chains for unloading near sensitive areas, wherever possible.		✓	Site Supervisor Operators
NVMM21	Ensure that truck tailgates are cleared and locked at the point of unloading.		✓	Site Supervisor Operators
NVMM22	Locate plant and equipment to take advantage of barriers provided by existing site features and structures.		✓	Site Supervisor Operators

Reference	Details of management measures	Implementation		Responsibility
Implemented throughout external works		**PC[1]**	**C[2]**	
NVMM23	Implement mufflers/silencers on plant and equipment. Undertake regular maintenance of plant and equipment, including silencers, to ensure that noise emissions do not increase over time. Servicing, refuelling and warm-up to be undertaken during standard construction hours.		✓	Site Supervisor Operators
NVMM24	Noise associated with packing up plant and equipment at the end of works will be minimised.		✓	Site Supervisor Operators
NVMM25	Vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in Section 5.2 (as per Condition D19)		✓	Site Supervisor Operators
NVMM26	Vibratory rollers which are 7 tonnes or more should not be used.	✓	✓	Construction Manager Site Supervisor
NVMM27	Jackhammers must not be used closer than 1 metres from any surrounding building structures.		✓	Site Supervisor Operators

(1) Pre-construction – note that this may refer to prior to commencement of specific activities rather than prior to the commencement of all construction works.

(2) Construction

8.2 Complaint handling

The person receiving complaints will have the ability to implement reasonable and feasible measures to action the complaint. These measures may include modification of the work site or work practices, or a review of night activities. The following complaint management procedure will be implemented during all works:

1) Assess whether the issue can be resolved easily and take immediate action if possible.
2) If not, assess the construction site and activities and determine whether there is any reason to believe noise levels are higher than anticipated.
3) Undertake monitoring of noise (where this is an appropriate response).
4) Ensure all planned management measures have been appropriately implemented.
5) If steps 3 and 4 are correct, no further site actions are required (proceed to step 8).
6) If steps 3 and 4 are incorrect, implement all reasonable and practicable mitigation measures where possible and implement correct engagement procedures.
7) Ensure person receiving complaints is well briefed on the existing mitigation measures in place during the activity and the justification for the activity, and understands the details of any night works approvals (if applicable).
8) Advise complainant of actions undertaken.

Records of any noise and vibration complaint received during the works, and the action taken in response to the complaint, will be maintained throughout the works.

9 Compliance management

9.1 Roles and responsibilities

The Project Team's organisational structure and overall roles and responsibilities are outlined in the Environmental Site Management Plan. Specific responsibilities for the implementation of noise and vibration management measures are detailed in Section 8.1.

9.2 Training

All employees, sub-contractors and utility staff working on site will undergo site induction training relating to noise and vibration management issues, including:

- Existence and requirements of this CNVMSP.
- Standard Working Hours.
- Location of noise sensitive areas and receivers.
- General noise and vibration management measures, including monitoring procedures.
- Complaints reporting.

The project's site induction documentation should be updated to adopt all noise and vibration related requirements.

9.3 Monitoring and inspections

Weekly inspections by the Site Manager or a suitably qualified representative will occur throughout construction.

Noise and vibration monitoring will also occur routinely during the works as detailed in Table 15.

Table 15 Noise and vibration monitoring plan

Situation	Monitoring requirements	Frequency, reporting and responsibility
Noise monitoring		
Attended monitoring to assess typical construction noise levels at noise sensitive receivers.	If monitoring cannot be undertaken at the nearest relevant sensitive receiver, a suitable representative location will be selected. The testing method includes: • Sound level meter configured for "Fast" time weighting and "A" frequency weighting. • Test environment free from reflecting objects where possible. Where noise monitoring is conducted within 3.5 metres of large walls or a building facade, then a reflection correction of up to -2.5 dB(A) will be applied to remove of increased noise due to sound reflections. • Tests will not be carried out during rain or when wind speed exceeds 5m/s. • Conditions such as wind velocity and direction, temperature, relative humidity and cloud cover will be recorded from the nearest Bureau of Meteorology station or on-site weather station/observations. • The monitoring period should be sufficient such that measured noise levels are representative of noise over a 15-minute period. • At a minimum L_{Aeq}, $L_{AF,max}$, L_{A10} and L_{A90} levels will be measured and reported. The observations of the person undertaking the measurements will be reported including audibility of construction noise, other noise in the environment and any discernible construction activities contributing to the noise at the receiver.	Frequency On a minimum three (3) monthly basis for attended monitoring. As required for complaints. Reporting Written reports of all noise monitoring will be maintained by the contractor and submitted to key stakeholders on request. Responsibility Monitoring to be undertaken by contractor staff suitably experienced in carrying out noise monitoring. If deemed necessary, a suitably qualified acoustic consultant[1] will undertake monitoring to resolve complaints.
Where complaint is received and monitoring is considered an appropriate response to determine if noise levels exceed predicted construction noise levels documented in this CNVSMP.		

Situation	Monitoring requirements	Frequency, reporting and responsibility
Spot checks of noisy plant to determine noise emission levels for: • assessing compliance against manufacturer specifications • assisting to assess accuracy of predictions • assessing quieter construction techniques where required.	Stationary test procedures according to AS 2012.1:1990 *Acoustics – Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors – Stationary test condition*. The testing method includes: • Sound level meter configured for "Fast" time weighting and "A" frequency weighting. • The test environment will be free from reflecting objects. • Tests will not be carried out during rain or when wind speed exceeds 5 m/s. • In accordance with *AS 2012.1*, a minimum of three measurement points will be defined at locations on the hemispherical surface around the plant with the radius determined by the basic length of the machine. • The L_{A90} background noise level at the measurement locations will be at least 6 dB and preferably 10 dB below the level with plant operating. • L_{Aeq} and L_{A10} levels will be measured and reported.	<u>Frequency</u> On an as required basis during main works. <u>Reporting</u> Records of spot checks of noisy plant will be maintained by the contractor. <u>Responsibility</u> Monitoring to be undertaken by the contractor staff suitably experienced in carrying out noise monitoring.
Vibration monitoring		
Vibration monitoring to be conducted at 2 locations of the existing sandstone retaining walls to the north of the project site.	Continuous vibration monitoring conducted throughout access road construction as follows: • Geophone installed at ground adjacent to the foundation of the retaining walls. • Monitor to continuously record PPV vibration level in 15-minute (or shorter) intervals. • If PPV level exceeds 3 mm/sec, an alert will be sent to nominated site staff via email/SMS. This will include a Site Supervisor with suitable authority to stop work. • Upon receipt of an alert, work will STOP. • Necessary modifications will be made to work practices to reduce the vibration level and the works will continue as long as further alerts are not received. If necessary following the vibration measurements: • Appropriate vibration management measures will be implemented.	<u>Frequency</u> Throughout the access road construction. <u>Reporting</u> Report detailing measurement results and any vibration management measures to be provided to the contractor. <u>Responsibility</u> A suitably qualified acoustic consultant[1] will undertake monitoring to resolve complaints.

Situation	Monitoring requirements	Frequency, reporting and responsibility
If any works occur within safe working distances for damage to buildings, detailed in Section 6.3.	Continuous vibration monitoring conducted throughout works as follows: • Geophone installed at ground adjacent to building foundations or equivalent (or nearer) location if access not provided to the outside of the building. • Monitor to continuously record PPV vibration level in 15-minute (or shorter) intervals. • If PPV level exceeds 75% of the minimum DIN 4150-3 building damage limit, an alert will be sent to nominated site staff via email/SMS. This will include a Site Supervisor with suitable authority to stop work. • Upon receipt of an alert, work will STOP. • Necessary modifications will be made to work practices to reduce the vibration level and the works will continue as long as further alerts are not received. • Note that if the frequency of the vibration event is such that 75% of the DIN 4150-3 limit was not exceeded, then works will proceed with caution, and the alert level adjusted as appropriate.	<u>Frequency</u> If required if works change such that works may occur in safe working distances for buildings. <u>Reporting</u> Records of logged vibration levels will be maintained by the contractor. <u>Responsibility</u> Monitoring to be undertaken by a suitably qualified acoustic consultant[1].
Vibration monitoring in response to a complaint, where this is considered an appropriate response.	Attended vibration monitoring will be conducted of the relevant activities as follows: • Geophone installed at ground adjacent to building foundations or equivalent (or nearer) location if access not provided to the outside of the building. • Monitor to continuously record PPV and/or VDV vibration levels generated by the activity. • Measured levels to be compared to human disturbance vibration goals and/or building damage limits as appropriate. If necessary following the vibration measurements: • Appropriate vibration management measures will be implemented. Continuous vibration monitoring will be considered if this is considered of benefit to address the complaint.	<u>Frequency</u> As required for complaints. <u>Reporting</u> Report detailing measurement results and any corrective actions to be provided to the complainant and relevant stakeholders. <u>Responsibility</u> A suitably qualified acoustic consultant[1] will undertake monitoring to resolve complaints.

(1) A suitably qualified acoustic consultant would be a person who is a member of the Australian Acoustical Society and with appropriate professional qualifications.

9.4 Reporting

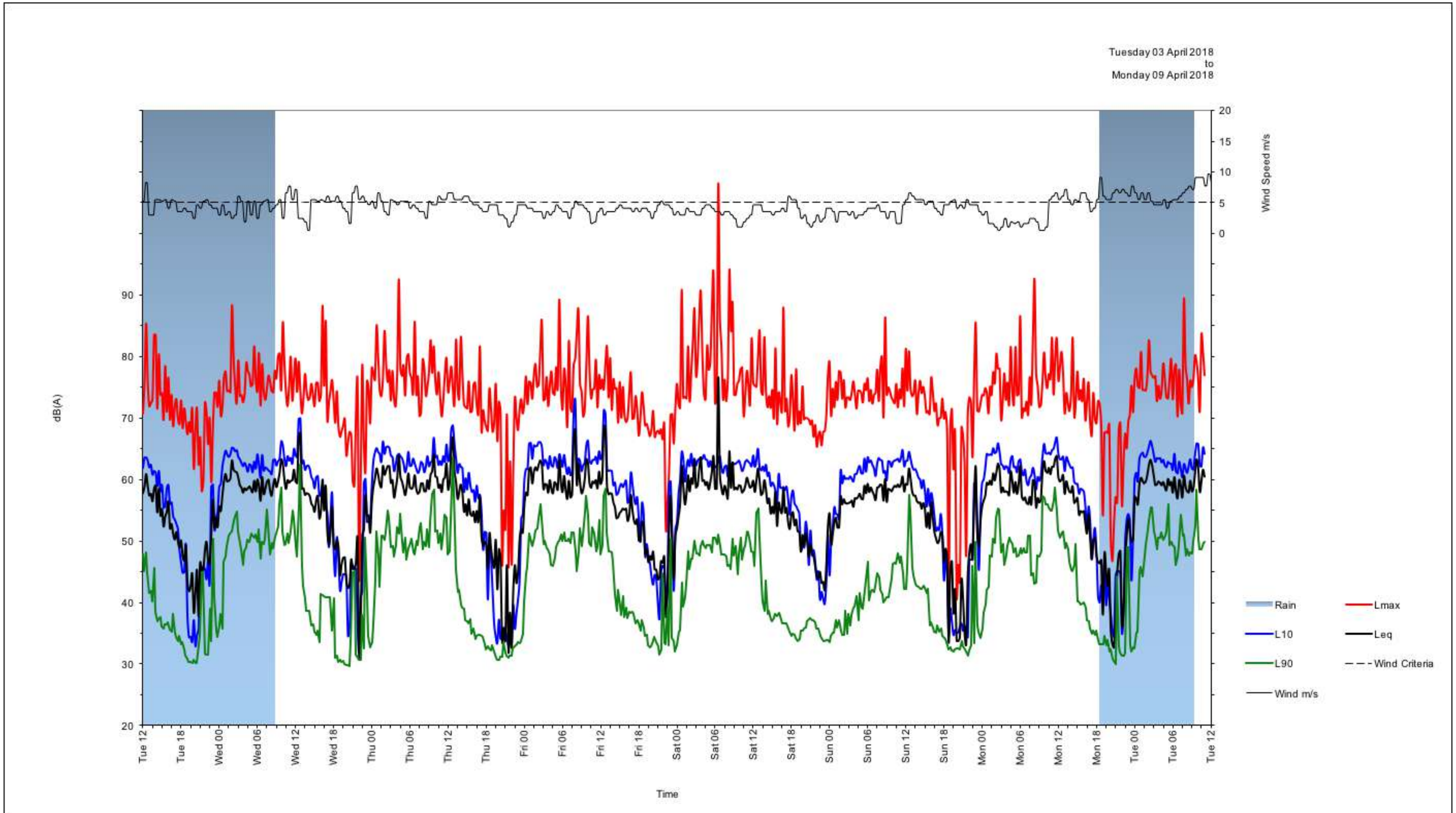
All noise and vibration monitoring results will be assessed against the nominated management levels. Noise and vibration monitoring data, and any other relevant information, will be provided in a noise/vibration report to the contractor to assist in producing the Compliance Reporting as required under Conditions C28 to C31 of the Development Consent.

The following should be included as a minimum (where relevant) in the noise/vibration monitoring reports:

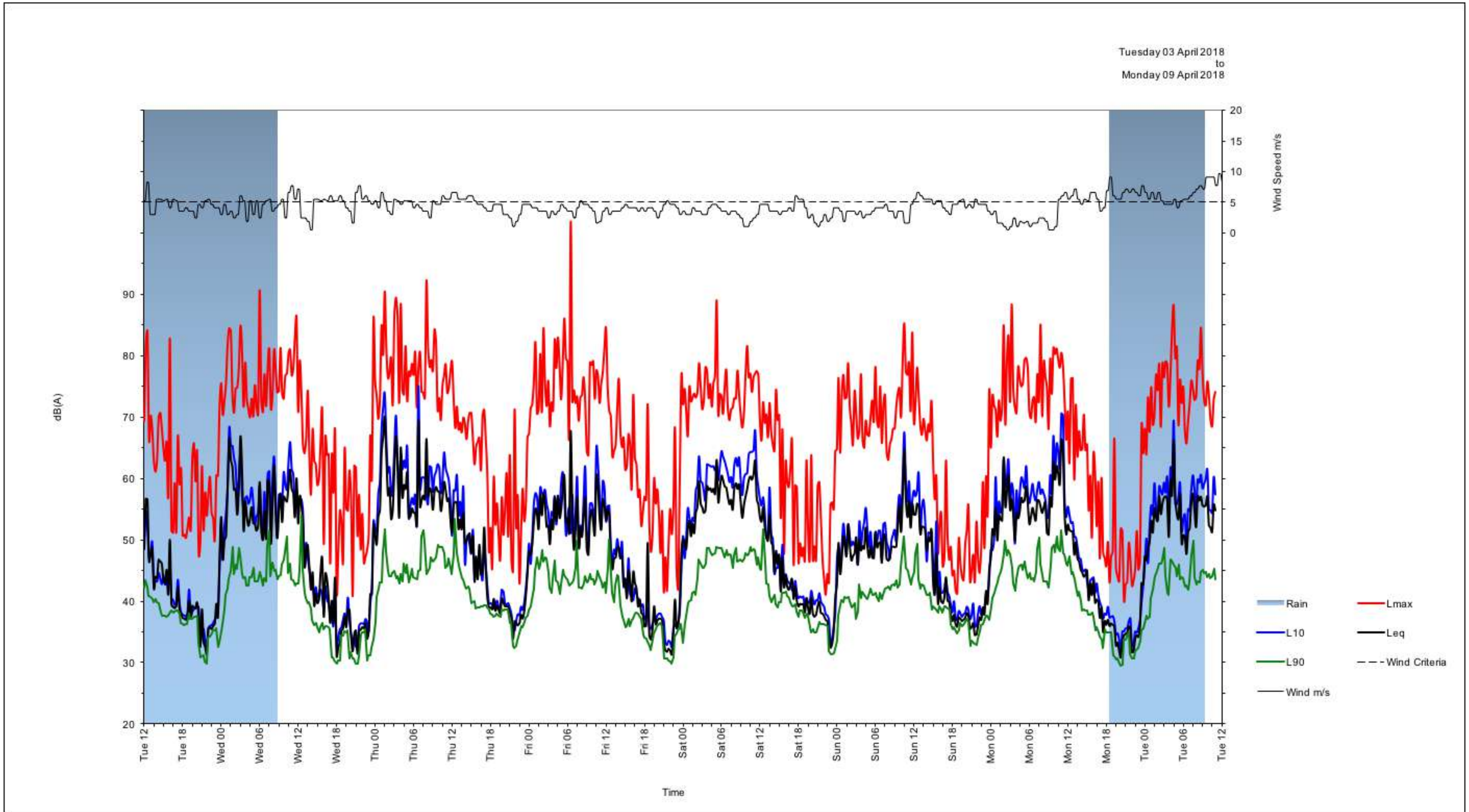
- The type of monitoring conducted (for example, at a particular project stage or following complaints) and a brief statement of the measurement method;
- The noise/vibration conditions in the Development Consent, or the relevant noise management levels;
- Descriptions of the nearest affected residences and other sensitive land uses or, in the case of complaints, description of the complainant location and complaint;
- Description of the instrumentation used;
- The results of monitoring at each monitoring location, including a comparison with the consent conditions or relevant noise/vibration management levels;
- Vibration monitoring results summary together with notes describing any vibration intensive activities (if applicable);
- Summary of measurements exceeding the vibration management levels and descriptions of the plant or operations causing these exceedances (if available);
- Details of corrective action applicable to vibration management levels exceedances and confirmation of its successful implementation. Where corrective action has not yet been implemented, it may be shown as pending and the status of its implementation will be carried forward to following reports;
- The location of the construction works in relation to the monitoring position (sketch plan & sections, photos);
- Details of the various construction equipment in use during the measurement period;
- Details as to the likely dominant noise sources;
- Meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- A clear statement outlining the Project’s compliance or non-compliance with the conditions or management levels where the monitored level is higher than the conditions or management levels; and
- The reasons for non-compliance should be stated, strategies for minimising noise/vibration identified and stated, and the appropriate actions to implement the mitigation and or management strategies.

Appendix A – Unattended Noise Monitoring

Resonate



Unattended noise monitoring at Location 01 – 40 Victoria Road



Unattended noise monitoring at Location 02 – 55 Cranbrook Road

29-53 Victoria Road, Bellevue Hill

Scots College Stevenson Library (SSD 8922)

Preparation of Waste & Recycling Management Plan

Report Number 610.17857-R01

18 April 2018

Impact Group
PO Box 1002
North Sydney NSW 2059

Version: -v0.2

29-53 Victoria Road, Bellevue Hill

Scots College Stevenson Library (SSD 8922)

Preparation of Waste & Recycling Management Plan

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.17857-R01-v0.2	18 April 2018	Dale Beckham	I-hui Waung	I-hui Waung
610.17857-R01-v0.1	16 March 2018	Dale Beckham	I-hui Waung	DRAFT

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APPENDICES

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) was engaged by Impact Group (Client) on behalf of the Presbyterian Church (New South Wales) Property Trust, to prepare a Site Waste and Recycling Minimisation and Management Plan (SWMMP) in support of a State Significant Development application (SSD 8922) to the NSW Department of Planning. The SSD 8922 pertains to building alteration and addition works on the "Stevenson Library Building" of The Scots College, 29-53 Victoria Road, Bellevue Hill NSW 2023.

Redevelopment of the Stevenson Library Building (the Project) is understood to comprise partial demolition of the five existing library levels, then alteration and addition works to construct a total of six floors within the building. Further details of the Project are provided in **Section 4**.

This SWMMP applies to waste anticipated to be generated from demolition and construction works on the existing building and from operation of the redeveloped Stevenson Library Building.

This SWMMP has been prepared using architectural drawings provided by the Client. A demolition quantity survey has not been provided for preparation of this SWMMP. SLR has therefore made a number of assumptions regarding the quantities and waste types provided herein associated with demolition works.

Waste management for the demolition and construction stages is described in **Section 5**. Waste management for the operational stage is described in **Section 6**.

1.1 Site Identification

The Stevenson Library Building (SLB) is located within Victoria Road East Precinct of The Scots College (the College) (**Figure 1**). The College is within the local government area of Woollahra Municipal Council (Council).

Aerial image and property boundaries as per Appendix 6 Preliminary P-1 *Proposed Renovation of the Stevenson Library* (JCA Architects, Nov 2017)

Figure 1 Location of Stevenson Library Building within the College

1.2 Objectives

The Client requires a SWMMP for the Project that satisfies the SEARs and is suitable for inclusion into the Environmental Impact Statement (EIS). As such, the objectives of this SWMMP are:

- To address the SEARs Key Issues pertaining to waste for the Project (refer to **Appendix A**), which are to:
    - *Identify, quantify and classify the likely waste streams to be generated during construction and operation and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste; and*
    - *Identify appropriate servicing arrangements (including but not limited to, waste management, loading zones, mechanical plant) for the Project.*
- To provide advice on how classified wastes should be handled, processed and disposed of (or re-used / recycled) in accordance with the above SEARs, Council requirements and better practice waste minimisation principles;
- To assist the site manager (during demolition and construction works) and the facility manager (during operation of the redeveloped Stevenson Library) in achieving Federal and State Government waste minimisation targets; and
- To facilitate safe and practical waste servicing options for Council waste collection staff and / or private contractors.

2 BETTER PRACTICE FOR WASTE MANAGEMENT AND RECYCLING

The Better Practice principles and recommendations presented in this section apply to all stages of the proposed redevelopment of the SLB. Designers, site managers and facility managers are therefore encouraged to communicate these Better Practice principles to staff and to prioritise the implementation of Better Practice approaches in designing waste management provisions for the SLB and in managing waste from demolition, construction and operational works.

2.1 Waste Management Hierarchy

This SWMMP has been prepared in line with the waste management hierarchy (**Figure 2**), which summarises the objectives of the *Waste Avoidance and Resource Recovery Act 2001*.

The waste management hierarchy comprises the following principles, from most to least preferable (with respect to waste minimisation):

1. Waste **avoidance**, through prevention or reduction of waste generation. Waste avoidance is best achieved through better design and purchasing choices;
2. Waste **reuse**, without substantially changing the form of the waste;
3. Waste **recycling**, through treatment of waste to produce new products;
4. Energy **recovery**, through processing of residual waste materials;
5. Waste **treatment**; and
6. Waste **disposal**, in a manner that causes the least harm to the natural environment.

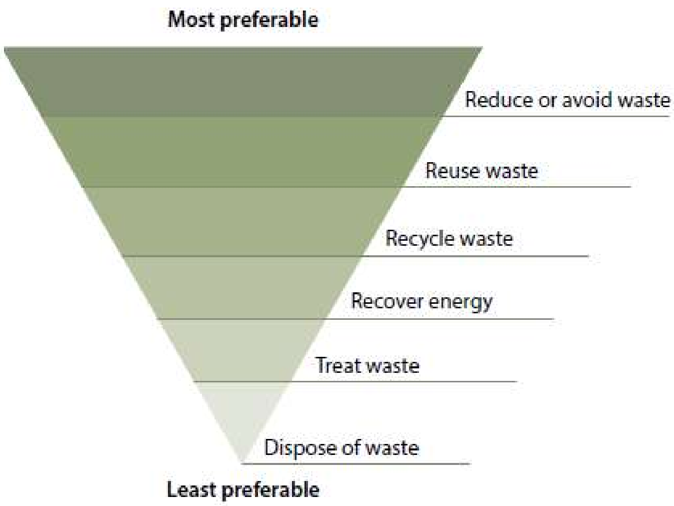


Image from NSW EPA (2014) *NSW Waste Avoidance and Resource Recovery Strategy 2014-21*.

Figure 2 Waste management hierarchy

2.2 Benefits of Adopting Better Practice

Adopting better practice principles in waste minimisation offers significant benefits for organisations, stakeholders and the wider community. Benefits from better practice waste minimisation include:

- Enhances social and environmental reputation of an organisation;
- Reduces consumption of non-renewable resources;
- Reduces pollution generated from materials manufacturing and waste treatment;
- Reduces financial burden associated with waste disposal; and
- Provides opportunities for additional revenue streams through beneficial reuse.

2.3 Waste Avoidance, Re-use and Recycling

2.3.1 Waste Avoidance

Waste avoidance measures may include:

- Provision of take-back services to clients to reduce waste further along the supply chain;
- Re-work / re-packaging of products prior to local distribution to reduce waste arising;
- Review of packaging design to reduce waste but maintain 'fit for purpose';
- Providing ceramic cups, mugs, crockery and cutlery rather than disposable items;
- Presenting all waste reduction initiatives to staff as part of their induction program; and
- Investigating leased office equipment and machinery rather than purchase and disposal.

2.3.2 Re-use

Establish systems with in-house and supply chain stakeholders to transport products in re-useable packaging where possible.

2.3.3 Recycling

Recycling opportunities include:

- Plastic film (usually in the form of shrink pallet wrap) is light weight and compactable. If kept clean and separated from other plastics it is potentially recyclable and can be used to make items such as outdoor furniture;
- Flatten or bale cardboard to minimise storage space requirements;
- Paper recycling trays provided in office areas for scrap paper collection and recycling;
- Printer toners / ink cartridges are collected in allocated bins for appropriate contractor disposal;
- Development of 'buy recycled' high quality purchasing policy; and
- Providing recycling collections within each of the offices (e.g plastics, cans and glass).

3 WASTE LEGISLATION AND GUIDANCE

Legislation and guidance documents outlined in **Table 1** should be referred to during all stages of the Project.

Table 1 Waste legislation and guidance

Legislation / Guidance	Objectives
SSD 8922, Secretary's Environmental Assessment Requirements	Section 78A(8) of the Environmental Planning and Assessment Act, Schedule 2 of the Environmental Planning and Assessment Regulation 2000, SEARs pertaining to the Proposed Major alterations and additions to the Stevenson Library Building at The Scots College, SSD 8922 (issued 12 December 2017). This SWMMP specifically addresses the Key Issues pertaining to Waste.
Woollahra Municipal Council's Development Control Plan 2015	The Woollahra Municipal Council's Development Control Plan (WDCP) 2015 commenced on 23 May 2015 and supports the provisions of the WLEP planning controls by providing detailed planning and design guidelines. Council's WDCP has been prepared in accordance with Part 3, Division 6 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (Regulation). This SWMMP specifically addresses the General Introduction and Part E5 of the DCP and sets out the waste management for the Scots College Stevenson Library Building proposed to be developed within Council's Local Government Area. The waste management requirements focus on six key objectives are to: • Give effect to the aims of Woollahra LEP 2014; • Facilitate development that is permissible under Woollahra LEP 2014 with reference to the unique characteristics of the area where the Project is proposed; • Achieve the objectives contained in Woollahra LEP 2014; • Establish controls that provide a balance between flexibility and certainty in the Project assessment process; • Establish the advertising / notification requirements for development requiring consent; and • Establish a consistent set of definitions for terms used in the DCP.
Woollahra Local Environmental Plan 2014	The Woollahra Local Environmental Plan (WLEP) 2014 commenced on 23 May 2015, detailing Council's core legal document for development control and planning. The WLEP ensures growth and development are planned and coordinated in consistency with Council and community expectations and requirements.
Woollahra DA Guide – Attachment 1 Site Waste Minimisation and Management	The Woollahra DA Guide – Attachment 1 Site Waste Minimisation and Management further establishes the guidelines for the preparation of site waste minimization and management and should be considered in the preparation of a SWMMP.
National Waste Policy: Less Waste, More Resources 2009	The National Waste Policy is the current document that provides a guidance framework to all jurisdictions for managing waste through to 2020 and has the following aims; • Avoid waste generation, reduce wastes for disposal (including hazardous waste); • Manage waste as a resource; • Ensure that waste treatment, disposal, recovery and re-use is undertaken in a safe, scientific and environmentally sound manner; and • Contribute to the reduction in greenhouse gas emissions, energy conservation and production, water efficiency and the productivity of the land. The National Waste Policy establishes six key areas and identifies 16 strategies across these areas for all government jurisdictions to work towards waste minimisation and resource recovery.
Waste Avoidance and Resource Recovery Act 2001	To promote extended producer responsibility in place of industry waste reduction plans. Specific objectives include: • To encourage efficient use of resources; • To minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste; • Ensuring industry and the community share responsibility in reducing / dealing with waste; and • Efficient funding of waste / resource management planning, programs and service delivery. As of 2016, the addition of Part 5 defines the legislative framework for the Return and Earn "Container Deposit Scheme" where by select containers can now be returned in NSW for a 10c refund. This scheme can be used as a fundraising tool within schools and organisations alike.

Legislation / Guidance	Objectives
Protection of the Environment Operations Act (POEO) 1997 & Amendment Act 2011	Administered by the Environmental Protection Authority (EPA) to enable the Government to establish instruments for setting environmental standards, goals, protocols and guidelines. The owner of a premise, the employer or any person carrying on the activity which causes a pollution incident is to *immediately* notify the relevant authorities when material harm to the environment is caused or threatened. A list of each relevant authority is provided in the POEO Amendment Act and will be noted in the Site's incident register.
POEO (Waste) Regulation 2014 (previously POEO (Waste) Regulation 2005)	Contains provisions relating to the waste levy, waste tracking and management requirements for certain waste types, payment schemes for local councils, consumer packaging recycling and other miscellaneous provisions.
NSW EPA's Waste Classification Guidelines (Part 1) 2014	To assist waste generators to effectively manage, treat and dispose of waste to ensure the environmental and human health risks associated with waste are managed appropriately and in accordance with the POEO Act and is associated regulations.
Council of Australian Governments National Construction Code 2016	The National Construction Code 2016 sets the minimum requirements for the design, construction and performance of buildings throughout Australia.
EPA's Better Practice Guidelines for Waste Management and Recycling in Commercial and Industrial Facilities 2012	The EPA's Better Practice Guidelines (2012) encourage efficient waste minimisation and resource recovery for commercial and industrial facilities and is used as a benchmark document when assessing waste production rates within Australia and details a range of waste management provisions.
NSW EPA (2014) NSW Waste Avoidance and Resource Recovery Strategy 2014-21	A key component of the State Government's vision for the environmental and economic future of the state that will be supported financially by the *Waste Less, Recycle More* funding initiative providing long-term targets for six key result areas including reduced illegal dumping.
NSW EPA Resource Recovery Orders and Resource Recovery Exemptions	The NSW EPA has issued a number of resource recovery orders and resource recovery exemptions which are currently in force in NSW for commonly recovered and reused wastes. • Resource recovery orders present conditions which generators and processors of waste must meet to supply the waste material for beneficial re-use; and • Resource recovery exemptions contain the conditions which consumers must meet to use waste for beneficial re-use.
Australian Packaging Covenant 2017	The Australian Packaging Covenant highlights two goals in an effort to support a reduction in the environmental impacts associated with Consumer Packaging: • Design: Optimise packaging using less resources and enabling efficient end-of-use recycling. • Recycling / reuse: Supporting innovative packaging collection before it enters the environment. Product Stewardship: Demonstrate commitment of all signatories.
Product Stewardship Act 2011	The Product Stewardship Act aims to reduce waste and prevent the landfilling of harmful materials by increasing recycling and the recovery of valuable materials from products. The Act highlights that government, industry and the community alike all hold a shared responsibility to the impact of manufactured, consumed and disposed products.

4 PROJECT DESCRIPTION

The existing SLB is predominantly of brick and concrete construct, comprising five levels and a metal deck roof. The proposed remodelling of the SLB will involve:

- Partial demolition of the ground, first, second, third, fourth and roof levels;
- Extensions to existing floor slabs;
- Construction of a sixth level and new roof;
- Complete interior refitting;
- Complete recladding of the exterior in a Scottish Baronial architectural style;
- Construction of a new main entrance from the College Quadrangle; and
- Construction of new, secondary entrances from the College oval.

The refurbished SLB will provide:

- Ground Floor: Canteen / Café;
- First Floor: Reception desk, student meeting area, student services and teaching / learning areas;
- Second Floor: Student counselling, teaching and learning areas;
- Third Floor: Seminar rooms and learning spaces;
- Fourth Floor: Library, teaching / learning areas, student services and counselling staff;
- Fifth Floor: Teaching / learning areas, multi-use space and outdoor terrace.

A copy of the architectural drawings for the Project is provided in **Appendix B**.

5 DEMOLITION AND CONSTRUCTION WASTE AND RECYCLING MANAGEMENT

5.1 Targets for Recycling

The performance of each development in NSW should contribute to the 80% construction and demolition waste diversion target in accordance with Council's DCP and the NSW EPA (2014) *NSW Waste Avoidance and Resource Recovery Strategy 2014-21.* SLR understands, however, that the Project is being aimed at achieving a Green Building Council of Australia 'Green Star' with respect to demolition and construction waste and the following target has been established for the Project:

- 90% of total construction and demolition waste diverted for reuse and recycled (with receipts sufficient in demonstrating the achieved target).

It is anticipated that the waste minimisation measures in the following sections will assist the Project to meet this target. Waste reporting and audits are required to determine the actual percentage of wastes that are being / have been recycled during the demolition and construction stages of the Project.

5.2 Key Activities

Key demolition and construction activities are understood to comprise:

- Partial demolition of the ground, first, second, third, fourth and roof levels;
- Extensions to existing floor slabs;
- Construction of a sixth level and new roof;
- Construction of a new main entrance from the College Quadrangle; and
- Construction of new entrance ways directly off the College oval.

5.3 Waste Streams and Classifications

The demolition and construction activities are anticipated to generate the following broad waste streams:

- Demolition wastes, including hazardous waste (presented in more detail in **Section 5.5**);
- Construction waste (presented in more detail in **Section 5.6**);
- Plant maintenance waste;
- Packaging waste;
- Work compound (on-site employees) waste; and
- Wastewater (from dewatering of excavations, plant maintenance and construction activities).

A summary of likely waste types arising from demolition and construction activities, along with their waste classifications and proposed management methods, is provided in **Table 2.**

For further information on how to determine a waste's classification refer to the NSW EPA (2014) *Waste Classification Guidelines*[1]. Further information on managing demolition and construction wastes is also available from the NSW EPA website[2].

[1] Available online from http://www.epa.nsw.gov.au/wasteregulation/classify-guidelines.htm
[2] http://www.epa.nsw.gov.au/your-environment/waste/industrial-waste/construction-demolition

Table 2 Potential waste types, classifications and management methods

Waste Types	NSW EPA Waste Classification	Proposed Reuse / Recycling / Disposal Method
Demolition and Construction		
Green waste	General solid waste (non-putrescible) (garden waste)	Off-site recycling
Clean fill/soil	General solid waste (non-putrescible)	On-site re-use
Contaminated fill	To be classified	Off-site treatment or disposal to landfill
ENM or VENM	General solid waste (non-putrescible)	On-site re-use or off-site beneficial re-use
Sediment fencing, geotextile materials (if applicable)	General solid waste (non-putrescible)	Reuse at other sites where possible or disposal to landfill
Concrete	General solid waste (non-putrescible)	Off-site recycling (for filling, levelling or road base)
Bricks and pavers	General solid waste (non-putrescible)	Off-site recycling (cleaned for reuse, rendered over or crushed for landscaping / driveway use)
Gyprock / plasterboard	General solid waste (non-putrescible)	Off-site recycling or returned to supplier
Sand / soil	General solid waste (non-putrescible)	Off-site recycling
Metals (fittings, appliances etc) and bulk electrical cabling	General solid waste (non-putrescible)	Off-site recycling
Timber	General solid waste (non-putrescible)	Off-site recycling (*Treated*: reused for formwork, bridging, blocking, propping or second hand supplier. *Untreated*: reused for floorboards, fencing, furniture, mulched second hand supplier)
Doors, Windows, Fittings	General solid waste (non-putrescible)	Off-site recycling (second hand supplier)
Insulation material	General solid waste (non-putrescible)	Off-site disposal
Glass	General solid waste (non-putrescible)	Off-site recycling (glazing or aggregate for concrete production)
Asbestos	Hazardous waste	Off-site disposal
Fluorescent light fittings / bulbs	Hazardous waste	Off-site recycling or disposal (contact *FluoroCycle* for more information[3])
Lead paint	Hazardous waste	Off-site disposal
Synthetic Rubber (carpet underlay)	General solid waste (non-putrescible)	Off-site recycling (reprocessed and used in safety devices and speed humps)
Carpet	General solid waste (non-putrescible)	Off-site recycling or disposal (reused for landscaping or equestrian uses)
Plant Maintenance		
Empty oil and other drums / tins (e.g fuel, chemicals, paints, spill clean ups)	Hazardous waste: Containers were previously used to store Dangerous Goods (Class 1, 3, 4, 5 or 8) and residues have not been removed by washing or vacuuming. General solid waste (non-putrescible): Containers have been cleaned by washing or vacuuming.	Transport to comply with the transport of Dangerous Goods Code applies in preparation for off-site recycling or disposal at licensed facility (Note: Discharge to sewer subject to Trade Waste Agreement with local Council.)
Air filters and rags	General solid waste (non-putrescible)	Disposal at landfill
Oil filters	Hazardous waste	Off-site recycling
Batteries	Hazardous waste	Off-site recycling Contact the *Australian Battery Recycling Initiative* for more information[4]
Packaging		

[3] http://www.fluorocycle.org.au/ or http://www.environment.gov.au/settlements/waste/lamp-mercury.html
[4] http://www.batteryrecycling.org.au/home

Waste Types	NSW EPA Waste Classification	Proposed Reuse / Recycling / Disposal Method
Packaging materials, including wood, plastic (including stretch wrap or LLPE), cardboard and metals	General solid waste (non-putrescible)	Off-site recycling
Wooden or plastic crates / pallets	General solid waste (non-putrescible)	Reused for similar projects, returned to suppliers, or off-site recycling. Contact *Business Recycling* for more information[5]
Work Compound and Associated Offices		
Food Waste	General solid (putrescible) waste	Donate (if suitable)[6] or compost on site. Alternatively dispose to landfill with general garbage
Recyclable beverage containers (glass and plastic bottles, aluminium cans), tin cans	General solid waste (non-putrescible)	Co-mingled recycling at off-site licensed facility or at a local NSW container deposit scheme "Return and Earn" off-site licensed facility[7]
Clean paper and cardboard	General solid waste (non-putrescible)	Paper and cardboard recycling at off-site licensed facility
General domestic waste generated by workers (soiled paper and cardboard, food stuffs, polystyrene)	General solid waste (non-putrescible) mixed with putrescible waste	Disposal at landfill
Wastewater, pump-out waste and septage (sewage)	Liquid (trade) waste	Off-site disposal at licensed facility or disposal direct to sewer where arranged with Council

5.4 Site Preparation Waste Types and Quantities

Site preparation waste for the "floor plate" area extension would be primarily green waste, excavated fill, soil and / or rock. In the absence of Council published sources, the estimated quantities of site preparation waste (**Table 3**) are based on an average depth of excavation of 500 mm across the extension area of 214 m^2 and:

- Area estimation obtained from Section 4.3 of the Request for Secretary's Environmental Assessment Requirements (date November 2017);
- An assumed, average depth of topsoil (including grass and roots) of 50 mm across the extension area; and
- Fill material, Excavated Natural Material (ENM) or Virgin Excavated Natural Material (VENM) below the topsoil and comprising the remainder of the excavation spoil.

Care should be taken to minimise site disturbance and limit unnecessary excavation.

[5] http://businessrecycling.com.au/search/
[6] http://www.ozharvest.org/, https://www.foodbank.org.au/, https://www.secondbite.org/ or https://www.exodusfoundation.org.au/
[7] http://returnandearn.org.au/

Table 3 Estimated quantities of site preparation waste

Spoil Type	Area (m^2)	Depth (m)	Density (tonnes / m^3)	Quantity (tonnes)
Green Waste	214	0.05	0.23[a]	5
Fill, ENM or VENM	214	0.45	1.9[b]	185
Total	**214**	**0.5**	**n/a**	**190**

Estimated quantities rounded to the nearest 5 tonnes.
Medium density of 0.23 tonnes / m3 for "Vegetation – Garden" (converted from EPA Victoria *Waste Materials – Density Data:* http://www.epa.vic.gov.au/business-and-industry/lower-your-impact/~/media/Files/bus/EREP/docs/wastematerial-densities-data.pdf).
Low range bulk density of 1.9 tonnes / m3 for "medium-dense sands and gravels" (Table 6-1-1 from Tomlinson (1986)[8]).

5.5 Demolition Waste Types and Quantities

The absence of detailed floor plans for the existing SLB precludes the provision of information on the types and quantities of demolition waste beyond the general information presented below.

Based on aerial imagery of the existing SLB, preliminary information on elevations[9] and floor plans[10] and "Office" demolition waste generation rates as per Appendix A of *The Hills Development Control Plan 2012* (Hills DCP), SLR anticipates that demolition works on the SLB will generate the following waste types:

- Brick (generation rate of 1,485 tonnes per 1000 m^2);
- Timber / Gyprock (generation rate of 124 tonnes per 1000 m^2);
- Steel (generation rate of 29 tonnes per 1000 m^2); and
- Other (generation rate of 155 tonnes per 1000 m^2).

Although Appendix A of *The Hills Development Control Plan 2012* (Hills DCP) lists the anticipated generation rate of 7,410 tonnes of concrete per 100 m^2 for the demolition of an office, SLR understands the Project is vested in minimising the deconstruction / demolition of the existing concrete structures and is aiming to achieve a waste concrete generation rate of 741 tonnes per 1000 m^2.

Based on the types and generation rates above, the anticipated quantities of demolition waste from partial demolition of the existing SLB are shown in **Table 4**. SLR has also adopted a precautionary approach to estimating quantities of demolition waste by basing the quantities in **Table 4** on the demolition areas indicated on each floor's architectural drawing detailing the demolition plan of the existing SLB.

[8] Tomlinson M.J. (1986) *Foundation design and construction.* John Wiley & Sons.
[9] SSD1.02/17-005; SSD1.02/17-006; and SSD1.02/17-007 (All dated November 2017)
[10] SSD1.02_17-150 RevP2 GF + FF; SSD1.02_17-151 RevP1 2F + 3F; and SSD1.02_17-152 RevP1 Fourth Floor + Roof (All dated November 2017)

Table 4 Anticipated types and estimated quantities of demolition waste

		Estimated Waste Material (tonnes)				
Building Level	**Floor Area (m^2)**	**Concrete**	**Bricks**	**Timber / Gyprock**	**Steel**	**Other**
Ground Floor	475	360	710	60	20	80
1st Floor	580	430	870	80	20	90
2nd Floor	430	320	640	60	20	70
3rd Floor	565	420	840	80	20	90
4th Floor	365	280	550	50	20	60
Roof	510	380	760	70	20	80
	Total	**2,190**	**4,370**	**400**	**120**	**470**

Waste estimates have been rounded up to the nearest 10 tonnes.
Tonnes per 1,000 m^2 from Appendix A of the Hills DCP, using the "Office" demolition rates.
Concrete rate adapted from the Hills DCP (refer to prior text for deductive explanation).
Floor areas for demolition were estimated by SLR from architectural drawings SSD1.02/17-150, SSD1.02/17-151 and SSD1.02/17-152 dated November 2017.

Although the existing SLB appears to be of brick, concrete and steel construction, there is a potential for asbestos[11] and / or asbestos containing materials to be present among the waste generated from partial demolition of the building. As such, it is recommended that a pre-demolition hazardous materials survey be conducted by a qualified professional on the existing SLB to identify potential hazardous wastes likely to arise from the proposed demolition works.

To provide further information on types and quantities of demolition waste, SLR recommends that a professional demolition quantities survey be conducted on the existing SLB with respect to the proposed demolition works.

5.6 Construction Waste Types and Quantities

In the absence of readily available construction waste generation rates from Council, SLR have adopted the "Office" waste generation rates from Appendix A of The Hills DCP for estimating the type and quantities of waste generated from construction works on the SLB (**Table 5**). SLR has also adopted a conservative approach to estimating quantities of construction waste by basing the quantities in **Table 5** on the full floor areas shown on the architectural drawings for the refurbished SLB.

The "Office" waste generation rates comprise predominantly of:

- Timber (generation rate of 5.1 tonnes per 1000 m^2);
- Concrete (generation rate of 18.8 tonnes per 1000 m^2);
- Brick (generation rate of 8.5 tonnes per 1000 m^2);
- Gyprock (generation rate of 8.6 tonnes per 1000 m^2);
- Sand / Soil (generation rate of 8.8 tonnes per 1000 m^2);
- Metal (generation rate of 2.75 tonnes per 1000 m^2); and
- Other (generation rate of 5 tonnes per 1000 m^2).

[11] Please also refer to the EPA NSW asbestos information below http://www.epa.nsw.gov.au/your-environment/household-building-and-renovation/dealing-with-household-asbestos, http://www.epa.nsw.gov.au/your-environment/waste/tracking-transporting-hazardous-waste/transporting-asbestos-waste-tyres/tracking-asbestos-waste-locate and http://www.epa.nsw.gov.au/your-environment/waste/industrial-waste/asbestos-waste

Table 5 Anticipated types and estimated quantities of construction waste

		Waste Material (tonnes)						
Building Level	**Floor Area (m^2)**	**Timber**	**Concrete**	**Bricks**	**Gyprock**	**Sand / Soil**	**Metal**	**Other**
Ground Floor	990	10	20	10	10	10	5	5
1st Floor	745	5	15	10	10	10	5	5
2nd Floor	745	5	15	10	10	10	5	5
3rd Floor	735	5	15	10	10	10	5	5
4th Floor	670	5	15	10	10	10	5	5
5th Floor	690	5	15	10	10	10	5	5
Roof	730	5	15	10	10	10	5	5
	Total	**40**	**110**	**70**	**70**	**70**	**35**	**35**

Floor areas from architectural drawings SSD1.02/17-201, SSD1.02/17-202, SSD1.02/17-203, SSD1.02/17-204, SSD1.02/17-205, SSD1.02/17-206 and SSD1.02/17-207 dated November 2017.
Waste estimates have been rounded up to the nearest 5 tonnes

5.7 Waste Avoidance

The Building Designer should:

- Use prefabricated components and recycled materials (e.g recycled steel);
- Reduce the use of PVC;
- Preferentially use paints, floor coverings and adhesives with low VOC (volatile organic compound) content;
- Exercise a preference for long lifespan and / or high potential for re-use in selecting construction materials;
- Use low formaldehyde wood products, post-consumer reused timber, Forest Stewardship Council (FSC) certified timber, wood plastic composite or recycled plastic timber substitute;
- Use fittings and furnishings that have been recycled, are made from or incorporate recycled materials and have been certified as sustainable or environmentally friendly by a recognised third party certification scheme; and
- Preferentially use building materials, fittings and furnishings (including structural framing, roofing and façade cladding) that have longer life and better re-use and / or recycling potential.

The Building Contractor should:

- Estimate required volumes of materials to reduce over-purchasing (and excess materials);
- Arrange delivery of materials on an “as needed” basis to mitigate material degradation by weathering or moisture damage;
- Reduce packaging waste by:
  - Returning packaging to suppliers where possible and practicable;
  - Purchasing in bulk;
  - Requesting cardboard or metal drums rather than plastics;
  - Requesting metal straps rather than shrink wrap;
  - Using returnable packaging such as pallets and reels; and
- Ensure subcontractors are informed of and implement site waste management procedures.

5.8 Re-use, Recycling and Disposal

The Building Contractor should:

- Sort and segregate demolition and construction wastes to ensure efficient recycling of wastes (see also **Section 5.9.1**);
- Temporarily store wastes on site (to be removed daily) appropriately to prevent cross-contamination and / or mixing of different waste types (see also **Sections 5.9.1** and **5.9.2**);
- Recycle / dispose of waste oil in an appropriate manner;
- Retain roofing material cut-offs for re-use;
- Retain used crates for storage purposes unless damaged;
- Recycle cardboard, glass and metal wastes;
- Return packaging to suppliers where possible / practicable;
- Recycle / dispose of solid waste timber, brick, concrete, tiles, asphalt and rock (where such waste cannot be re-used on site) to an appropriately licenced construction and demolition (C&D) waste recycling facility or an appropriately licenced landfill;
- Dispose of all asbestos, hazardous and / or intractable wastes in accordance with WorkCover NSW and NSW EPA requirements; and
- Deliver batteries to drop off-site recycling facility / centre.

5.9 Waste Segregation, Storage and Servicing

5.9.1 Waste Segregation and Storage

Waste materials produced from demolition and construction activities are to be segregated and temporarily stored separately on site. Due to the confined availability of storage areas and as a safety precaution, demolition and construction waste will be removed from the site daily and not stored overnight. It is anticipated that the site will provide allowances for separate storage (e.g separate skip bins and / or appropriately managed stockpiles) of the following waste types:

- Bricks, roof tiles, concrete and scrap metal;
- Metal / steel (if any, in a condition suitable for recycling at metal recycling facilities);
- Timber;
- Glass;
- Hardstand rubble;
- Excavation spoil (uncontaminated, if present);
- Contaminated excavation spoil (if present);
- Hazardous waste (if present);
- Paper / cardboard;
- Recyclable general waste; and
- Non-recyclable general waste.

If there is insufficient space onsite for full segregation of waste types, the Building Contractor should consult with waste / recycling collection facilities to confirm which waste types may be co-mingled prior to removal from the site.

5.9.2 Waste Storage Areas

Areas designated for waste storage should:

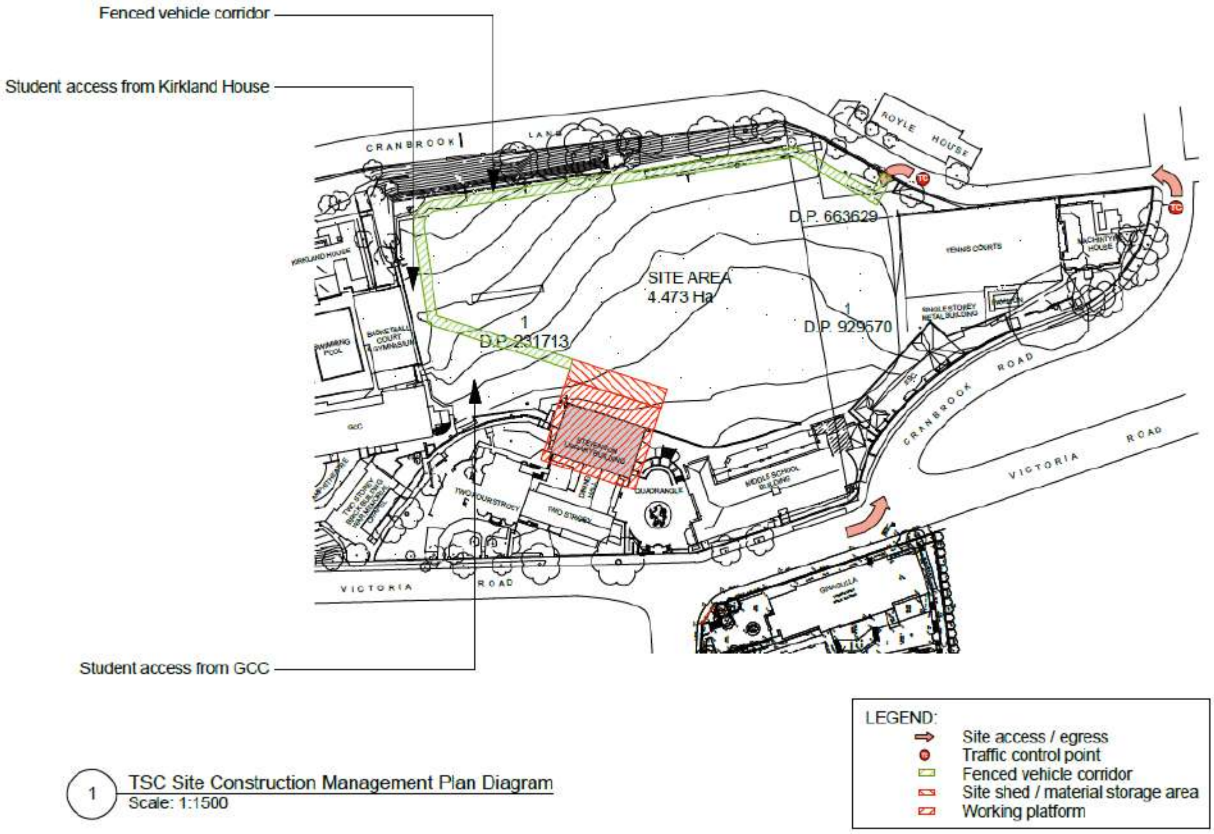
- Allow unimpeded access by site personnel and waste disposal contractors;
- Employ adequate environmental management controls (e.g consideration of slope, drainage and proximity relative to waterways / stormwater outlets / vegetation) to prevent off-site migration of waste materials and / or contamination from the waste; and
- Not present hazards to human health or the environment.

5.9.3 Waste Servicing and Transport Off-site

The Building Contractor is to:

- Arrange for suitable waste collection contractors to remove the demolition and construction waste from site (**Figure 3**);
- Ensure waste bins are not filled beyond recommended filling levels;
- Ensure that all bins and loads of waste materials leaving site are covered;
- Maintain waste disposal documentation detailing, at a minimum:
    - Descriptions and estimated amounts of all waste materials removed from site;
    - Details of the waste / recycling collection contractor(s) and facilities receiving the waste / recyclables;
    - Records of waste / recycling collection vehicle movements (e.g date and time of loads removed, licence plate of collection vehicles, tip dockets from receiving facility); and
    - Waste classification documentation for materials disposed to off-site recycling or landfill facilities.
- Ensure lawful waste disposal records are readily accessible for inspection by regulatory authorities such as Council, WorkCover NSW or NSW EPA;
- Remove waste during hours approved by Council.

JCA Architects completed a preliminary construction management plan detailing the anticipated site access / egress, traffic control points, fenced vehicle corridor, material storage area and working platform for the Project (**Figure 3**).



Source: Preliminary Construction Management Plan, Architectural drawing SSD1.02/17-014 (dated November 2017)

Figure 3 Proposed access for waste collection vehicle (green hatched area)

5.10 Contaminated / Hazardous Waste

Contaminated and / or hazardous materials, where identified, are to be removed by appropriately licenced contractors and transported to facilities licenced to accept such materials for treatment and / or disposal in accordance with NSW EPA regulations.

Where unexpected materials are encountered which are, or are suspected of being, contaminated or hazardous, the following shall be undertaken as a minimum:

- Work in the vicinity of the suspect material is to stop immediately and access to the area restricted;
- The Building Contractor's unexpected finds protocol, if available, shall be implemented; and
- The Site Manager is to contact a qualified hazardous materials assessor and / or environmental consultant (as necessary) to arrange an assessment of the suspect material and advise on subsequent management procedures.

It is anticipated that management of contaminated / hazardous waste will also be subject to relevant requirements as set out in the *Construction Environmental Management Plan* (to be prepared by the Building Contractor).

5.11 Liquid Waste Management

Wastewater or liquid waste generated from demolition or construction activities is not permitted to enter the stormwater system or migrate off-site.

Areas, if any, designated on site for wash-down of equipment plant or machinery are to be appropriately bunded and isolated from the local stormwater system and groundwater.

Liquid waste / wastewater are to be removed by a suitably qualified liquid waste contractor and transported to an appropriately licenced facility for treatment and / or disposal in accordance with NSW EPA regulations.

Refer also to the Building Contractor's Soil and Erosion Management Plan and the *Construction Environmental Management Plan* for further site-specific details on wastewater and liquid waste management, treatment and / or disposal.

5.12 Spills Management

Spillages are to be contained immediately (if safe to do so) and the Site Manager notified as soon as possible.

Spill containment kits and spill control equipment are to be provided and maintained in sufficient numbers and at appropriate locations to allow ready and rapid access by site personnel. Safety Data Sheets (SDSs) should also be available to provide advice on spill clean-up and disposal.

Refer also to the Building Contractor's *Construction Environmental Management Plan* for further site-specific details on spills management.

5.13 Construction Environmental Management Plan

In addition to this SWMMP, it is expected that the Building Contractor shall prepare a *Construction Environmental Management Plan* (CEMP) detailing control measures and procedures to be followed during site preparation and construction work to mitigate the environmental impact of these works. The CEMP and this SWMMP are anticipated to be implemented in tandem during site preparation and construction works.

5.14 Signage

Standard signage is to be posted in all waste storage / collection areas.

All waste containers are required to be labelled correctly and clearly to identify stored materials.

Signs approved by the NSW EPA for labelling of waste materials are available online (http://www.epa.nsw.gov.au/wastetools/signs-posters-symbols.htm) and should be used where applicable. A selection of signs prepared by NSW EPA is provided in **Figure 4**.

Figure 4 Examples of NSW EPA labels for waste skips / bins

5.15 Site Inductions

Waste management measures and procedures are to be included in the site induction for all personnel working at the site. With respect to waste management, the site induction is to include, at a minimum:

- An outline of this SWMMP;
- Legal obligations;
- Emergency response procedures on site;
- Waste storage locations and separation of waste;
- Litter management in transit and on site;
- Implications of poor waste management practices;
- Correct use of spill kits; and
- Responsibility and reporting (including identification of personnel responsible for onsite waste management and individual responsibilities).

5.16 Monitoring and Reporting

Records of volumes or tonnages of waste re-used, recycled or disposed to landfill are to be maintained by the Building Contractor. Additionally, dockets / receipts verifying recycling and / or disposal in accordance with the SWMMP must be retained and presented to the regulatory authorities such as Council, WorkCover NSW or NSW EPA if requested.

Daily visual inspections of waste storage areas will be undertaken by site personnel to identify and rectify any issues concerning waste management at the site, as well as identifying opportunities to improve waste management at the site. A written record of these inspections, which will include observations made and the results of any remedial actions taken, is to be undertaken and retained by the Building Contractor as part of the construction environmental management documentation.

Refer also to the Building Contractor's *Construction Environmental Management Plan* for further site-specific details on waste monitoring and reporting requirements.

5.17 Roles and Responsibilities

Suggested roles and responsibilities for waste management at the site are provided in **Table 6**.

Table 6 Suggested roles and responsibilities for site preparation and construction waste management

Role	Responsibilities
Site Manager for Building Contractor / Principal Contractor	• Ensuring plant and equipment are well maintained; • Ordering only the required amount of materials; • Developing or identifying, and using, local commercial opportunities for re-use of materials where re-use on-site is impractical; • Keeping materials segregated to maximise reuse and recycling; • Ensuring that waste sorting and storage areas are sign posted correctly, maintained in a tidy and functional state and do no present hazards to human health or the environment; • Facilitate waste collection / manage waste collection and waste disposal contractors; • Ensure hazardous / contaminated materials are appropriately managed and disposed; • Ensure site records and documentation is kept and is complete; • Ensuring staff and contractors are aware of site requirements for waste management; • Maintain site environmental controls; • Ensure the CEMP and this SWMMP are implemented; • Liaise with the Principal as required; • Approval of off-site waste disposal locations and checking licensing requirements; • Arranging for the assessment of potentially hazardous and / or contaminated materials and liquid wastes; • Monitor site environmental controls; and • Other required monitoring, inspection and reporting requirements.

6 OPERATIONAL WASTE AND RECYCLING MANAGEMENT

6.1 Targets for Resource Recovery

The waste management performance of each development should contribute to the overall NSW State target for recycling, which is expected to increase from 52% (2010 to 2011) for municipal solid waste and 57% for commercial / industrial waste to 70% (by 2021 to 2022) of the total waste generation per capita (NSW EPA (2014) *NSW Waste Avoidance and Resource Recovery Strategy 2014-21*).

It is anticipated that the waste segregation and minimisation measures in the following sections will assist the Project to meet this target.

6.2 Waste Streams and Classifications

Operation of the refurbished SLB is anticipated to generate the following broad waste streams:

- General waste and commingled recycling;
- Bulk packaging wastes, including polystyrene and cardboard boxes;
- Bulky waste items, such as furniture and e-waste; and
- Stores, plant and general maintenance wastes.

Potential waste types, their associated waste classifications, and management methods are provided in **Table 7**.

For further information on how to determine a waste's classification, refer to the NSW EPA (2014) *Waste Classification Guidelines.*[12]

Council provides further waste and recycling information and options for Schools[13], responsible waste management[14], recycling and re-use[15] for the Woollahra municipality.

Table 7 Potential waste types, classifications and management methods – operational waste

Waste Types	NSW EPA Classification	Proposed Reuse / Recycling / Disposal Method
General		
Paper	General solid (non-putrescible) waste	Paper recycling at off-site licensed facility
Cardboard and bulky cardboard boxes	General solid (non-putrescible) waste	Cardboard recycling at off-site licensed facility
Stationery	General solid (non-putrescible) waste	Off-site recycling or disposal to landfill
General garbage (including non-recyclable plastics)	General solid (putrescible and non-putrescible) waste	Disposal at landfill
Recyclable beverage containers (glass and plastic bottles, aluminium cans), tin cans	General solid (non-putrescible) waste	NSW container deposit scheme "Return and Earn"; comingled recycling at off-site licensed facility
Food waste	General solid (putrescible) waste	Donate (if suitable)[16] or compost on site. Alternatively dispose to landfill with general garbage
Bulky polystyrene	General solid (non-putrescible) waste	Disposal at landfill

[12] Available online from http://www.epa.nsw.gov.au/wasteregulation/classify-guidelines.htm
[13] https://www.woollahra.nsw.gov.au/services/rubbish_and_recycling/schools
[14] https://www.woollahra.nsw.gov.au/__data/assets/pdf_file/0007/52279/REUSE_RECYCLE_A5_final_draft.pdf
[15] https://www.woollahra.nsw.gov.au/services/rubbish_and_recycling/more_recycling_and_disposal_options
[16] http://www.ozharvest.org/, https://www.foodbank.org.au/, https://www.secondbite.org/ or https://www.exodusfoundation.org.au/

Waste Types	NSW EPA Classification	Proposed Reuse / Recycling / Disposal Method
Furniture	General solid (non-putrescible) waste	Off-site reuse or disposal to landfill
E-waste, printer toners and ink cartridges	Hazardous waste	Off-site recycling (free disposal box / bags and pickup service exists for printer toners and ink cartridges)
Batteries	Hazardous waste	Off-site recycling (Contact the *Australian Battery Recycling Initiative* for more information[17])
Mobile Phones	Hazardous waste	Off-site recycling (Contact *MobileMuster* for more information)[18]
Maintenance		
Spent smoke detectors[19]	General solid (non-putrescible) waste OR Hazardous waste (some commercial varieties)	Disposal to landfill, or off-site disposal at licensed facility
Glass (other than containers)	General solid (non-putrescible) waste	Off-site recycling
Light bulbs / fluorescent tubes	Hazardous waste	Off-site recycling or disposal (contact *FluoroCycle* for more information[20])
Cleaning chemicals, solvents, area wash downs, empty oil / paint drums / chemical containers	Hazardous waste if containers used to store Dangerous Goods (Class 1, 3, 4, 5 or 8) and residues have not been removed by washing or vacuuming. General solid (non-putrescible) waste if containers cleaned by washing or vacuuming.	Transport to comply with the transport of Dangerous Goods Code applies in preparation for off-site recycling or disposal at licensed facility. Discharge to sewer likely to be subject to Trade Waste Agreement with Sydney Water.

Source: http://www.epa.nsw.gov.au/wasteregulation/classify-waste.htm

6.3 Waste Management Overview

Operational waste management is proposed to align with current operational waste management practises at the SLB:

- General waste located on the ground floor of the refurbished SLB is collected within lined 240 L capacity mobile garbage bins (MGBs). Cleaning staff remove full bin liners, then transport (by golf cart) and dispose of bin liners and waste in 4,500 L waste MGBs located in the Ginahgulla Carpark (**Figure 5**) for collection by a private waste contractor;
- Recycling located on the ground floor of the refurbished SLB to be collected within lined 240 L capacity mobile garbage bins (MGBs). Cleaning staff remove full bin liners, then transport (by golf cart) and dispose of the bin liner content in 1,100 L recycling MGBs located in the Ginahgulla Carpark (**Figure 5**) for collection by a private waste contractor. Empty, used bin liners are placed in the 4,500 L waste MGBs;
- General waste and recycling generated on the first, second, third, fourth and fifth floors of the refurbished SLB:
    - To be collected within 55 L capacity MGBs within on-level waste storage areas;
    - On a daily basis, cleaning staff transfer general waste from the 55 L MGBs into 4,500 L waste MGBs located in the Ginahgulla Carpark (**Figure 5**) for collection by a private waste contractor; and

[17] http://www.batteryrecycling.org.au/home
[18] https://www.mobilemuster.com.au/
[19] The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) require that when more than 10 smoke alarms (particularly americium-241 sources) are collected for bulk disposal they must be treated as radioactive waste and the requirements of the National Health and Medical Research Council's *Code of practice for the near-surface disposal of radioactive waste in Australia (1992)* must be met. Contact ARPANSA for more information. http://www.arpansa.gov.au/radiationprotection/factsheets/is_smokedetector.cfm
[20] http://www.fluorocycle.org.au/ or http://www.environment.gov.au/settlements/waste/lamp-mercury.html

- On a daily basis, cleaning staff will transfer recycling from the 55 L MGBs into 1,100 L recycling MGBs located in the Ginahgulla Carpark (**Figure 5**) for collection by a private waste contractor.

Figure 5 Location of 4,500 L MBGs in the Ginahgulla Carpark

6.4 Estimated Quantities of Operational Waste

For the purposes of this assessment, SLR has adopted the general waste and recycling rates for "Restaurant / café" and "Offices", as presented in Part E, Chapter E5 of Council's *Waste Management General Controls for all Developments* (2015):

- Restaurant / Café Operational Waste Rate: 10 L / 1.5 m² of floor area / day;
- Restaurant / Café Operational Recycling Rate: 2 L / 1.5 m² of floor area / day;
- Office Operational Waste Rate: 10 L / 100 m² of floor area / day; and
- Office Operational Recycling Rate: 10 L / 100 m² of floor area / day.

Although Council's operational rates omit separation of recycling materials (i.e there is only a single recycling rate), it is anticipated that the recycling component of the refurbished SLB will be further separated into at least two recycling streams:

- Paper / cardboard; and
- Mixed container recycling.

The estimated quantities of operational waste and recycling generated by the refurbished SLB (**Table 8**) are based on:

- The floor areas as presented on the architectural drawings;
- Council's "Restaurant / café" and "Offices" waste and recyclable generation rates (listed above);

- Collective recycling estimates; and
- A week comprising 5 days of operation.

Table 8 Estimated quantity of daily and weekly operational waste and recycling

Floor	Area (m²)	Waste (L / day)	Recycling (L / day)	Waste (L / week)	Recycling (L / week)
Ground Floor (Café)	613	4,090	820	20,440	4,090
Ground Floor (Non-Café)	22	10	10	20	20
1st Floor	668	70	70	340	340
2nd Floor	575	60	60	290	290
3rd Floor	654	70	70	330	330
4th Floor	655	70	70	330	330
5th Floor	312	40	40	160	160
Total	**3,499**	**4,410**	**1,140**	**21,910**	**5,560**

Waste estimates have been rounded up to the nearest 10 tonnes.

6.5 Waste Storage Areas

6.5.1 Waste Storage Area Size

In accordance with Council's DCP Chapter E5 *Waste Management* and Council's *DA Guide - Attachment 1 Site Waste Minimisation and Management*, the waste and recycling storage area must encompass the capacity to store the volume of operational waste and recycling between collections.

The estimated number of MGBs required for weekly storage of operational waste and recycling generated by the refurbished SLB (**Table 10**) are based on:

- The estimated quantities of operational waste and recycling to be generated from each floor of the refurbished SLB (**Table 8**);
- Waste and recycling being ultimately stored in 4,500 L MGBs and 1,100 L MGBs (respectively) for servicing by waste collection contractor(s);
- 55 L and 240 L MGB dimensions as per Council's *DA Guide – Attachment 1 – Site Waste Minimisation and Management*[21];
- 4,500L and 1,100 L MGB dimensions as per *Better Practice Guidelines for Waste Management and Recycling in commercial and Industrial Facilities (2012)*[22]; and
- Once-a-week frequency of garbage and recycling collection.

The dimensions and GFA of the MGBs are presented in **Table 9**.

Table 9 Dimensions and GFA of a 55 L, 240 L, 1,100 L and 4,500 L MGBs

Dimension	55 L MGB	240 L MGB	1,100 L MGB	4,500 L MGB
Height	330	1,080	1,470	3,750
Depth	510	735	1,245	1,605
Width	420	580	1,370	1,805
GFA (rounded)	**0.3**	**0.5**	**2**	**3**

[21] https://www.woollahra.nsw.gov.au/__data/assets/pdf_file/0019/152407/DA_Guide_-_Attachment_1_-_Site_Waste_Minimisation_and_Management_Plan.pdf
[22] https://www.epa.nsw.gov.au/-/media/A5EB094C4C744A62A0499EC335A088D9.ashx

To allow for ready movement of bins into and out of the bin room(s), a bin / garbage room should provide a floor area of at least 150 % of the total minimum bin GFA. This also allows for provisional contingency in the event of a surplus of waste occurrence.

6.5.1.1 Ground Floor

The ground floor of the refurbished SLB is proposed to be largely occupied by a café and, as a consequence, the ground floor is expected to produce the greatest quantities of waste and recycling among the floors in the refurbished SLB (**Table 8**). It is anticipated that 19 waste 240 L MGBs and five recycling 240 L MGBs will be required for daily storage of waste and recycling generated from the ground floor of the refurbished SLB (**Table 10**).

As the refurbished SLB is intended to resume the existing waste management practises, each 240 L MGB will be conveniently located within and surrounding the SLB ground floor. As such an area of **approximately 0.75 m^2 is recommended per** 240 L **MGB**. If however, all 24 x 240 L MGBs were stored together, a **dedicated bin storage area of approximately 19 m^2 would be required for the ground floor** of the refurbished SLB.

Table 10 Minimum number 240 L MGBs required for the Ground Floor daily operational waste and recycling storage and associated GFA for MGBs

Waste Type	Total Number of 240 L MGBs	Min. MGBs GFA (m^2)	Recommended Waste Storage GFA (m^2)
Waste	19	9.5	15
Recycling	5	2.5	4
Total	**24**	**12**	**19**

The number of waste and recycling 240 L MGBs required to service the ground floor of the refurbished SLB could potentially be reduced by implementing one or more of the following:

- Emptying all waste and recycling 240 L MGBs multiple times a day;
- Reducing the quantity of waste by separation of food wastes for onsite composting;
- Reducing the quantity of waste by ensuring café packaging is recyclable / compostable;
- Reducing the quantity of waste by promoting student recycling / composting;
- Reducing the quantity of recycling by separate drink container[23] collection (and return for a refund as a school fundraiser program); and / or
- Bale or store paper / cardboard separately to other recycling.

6.5.1.2 First to Fifth Floors

For daily waste and recycling storage, it is recommended that a minimum of two waste and four recycling 55 L MGBs (two for paper / cardboard collection and the two for mixed recyclables) are placed on the first, second, third and fourth floor of the refurbished SLB. For ease of use and to encourage at-source separation of recycling from waste, waste bins and recycling bins should be located side-by-side; therefore, a minimum of **three adjacent storage areas of approximately 1.5 m^2 each are recommended per floor (a total of 3m^2 per floor)**.

Three 55 L MGBs (one bin for waste, one bin for paper / cardboard and one bin for mixed recyclables) are recommended for storage of daily waste and recycling on the fifth floor. A **minimum storage area of 1.5 m^2 is recommended for the fifth floor**.

[23] For a list of NSW eligible containers and return locations refer to the *Return and Earn, Container Deposit Scheme* http://returnandearn.org.au/

6.5.1.3 Ginahgulla Carpark MGB Storage Area

Based on the estimated waste and recycling quantities for the refurbished SLB (**Table 8**), the present use of 4,500 L and 1,100 L MGBs for pre-collection storage of waste and recycling, and a collection frequency of once per week, five 4,500 L MGBs will be required for the weekly storage of waste and six 1,100 L MGBs will be required for the weekly storage of recycling, with a combined recommended storage area of at least 41 m^2 (**Table 11**). The 4,500 L and 1,100 L MGBs are currently located within the Ginahgulla carpark of The Scots College.

It is understood that approximately 100 m^2 of the Ginahgulla carpark will be allocated for storage of the 4,500 L and 1,100 L MGBs. The size of this portion of the carpark is consistent with the storage area requirements in **Table 11**.

It is strongly recommended that a waste audit be conducted to ensure the operational waste management for the refurbished SLB satisfies the amenity of The Scots College.

Table 11 Minimum number MGBs required for the weekly operational waste and recycling storage for the refurbished SLB and associated GFA

Waste Type	Total Number of 1,100 L MGBs	Total Number of 4,500 L MGBs	Min. MGBs GFA (m^2)	Recommended Waste Storage GFA (m^2)
Waste	0	5	15	23
Recycling	6	0	12	18
Total	**6**	**5**	**27**	**41**

6.5.2 Waste Storage Location

Waste storage areas are to be integrated into the design of the refurbished SLB so that:

- The waste storage area(s) centralise the collection / storage of wastes and recyclable materials;
- Visual amenity is maintained;
- Potential noise impacts associated with collection and servicing is minimised;
- The area is located away from operable windows of habitable rooms and positioned to minimise amenity impacts adjacent sensitive land uses, with respect to streetscape aesthetics, litter odour, noise and dust pollution;
- The area is (preferably) behind the front building line and integrated within the building design;
- The area is located in close proximity to laneways for servicing accessibility;
- The area is (preferably) perpendicular to the laneway frontage;
- There are no steps, kerbs nor gradients exceeding 1V:8H between the 240 L daily storage MGBs and the Ginahgulla carpark bin collection point;
- Litter and contamination of the stormwater drainage system is avoided;
- The area has convenient access by users (within five meters of the collection point), well ventilated and well lit;
- The area must be inaccessible to the public and vermin proof;
- Use of the waste storage area does not interfere with the use of access driveways, loading / parking bays; and
- Waste collection vehicles are permitted to enter / leave the premises in a forward direction, preferably with a roadway ingress / egress (or adequate turning circle / hammerhead provisions).

6.5.3 Waste Storage Design Considerations

In accordance with Council's *DA Guide – Attachment 1 – Site Waste Minimisation and Management Plan* and Best Practices, driveway and access routes must be at least 3.6 m wide and vehicle standing areas must be at least 10 m long and 3.6 m wide. Waste and recycling storage areas must be constructed in accordance with the National Construction Code requirements (formally the Building Code of Australia, BCA) and should have the following features:

- Allow sufficient on-site space to store and manoeuvre MGBs;
- Graded in accordance with WorkCover NSW Work Health and Safety requirements allowing ease of MGB movement for emptying / servicing;
- Smooth / durable even surfaced finished floors constructed of concrete at least 75 mm thick or other approved material graded and drained to a Sydney Water Corporation approved drainage fitting. The drainage fitting is to be located within the storage area and have a fine grade drain cover sufficient to prevent coarse pollutants from entering the sewer;
- Hot and cold tap-based water supply with centralised missing values and at least one hose cock for MGB cleaning;
- Finished / impervious ceilings with rigid smooth faced, non-absorbent, easy to clean material (if applicable);
- Finished walls, impervious floors and ceilings with light colour (if applicable);
- Be designed to minimise negative impacts on amenity of other buildings in the College and neighbouring properties, with respect to noise and odours;
- Constructed to prevent vermin;
- Well ventilated by permanent, unobstructed natural direct ventilation (not less than 5% of the floor area) or a mechanical exhaust at a rate of at least 5 L / s per every square metre floor area (if applicable);
- Furnished with lighting and switches inside and outside of the room (if applicable);
- Close-fitting, self-closing door (openable from within the room);
- Smoke detectors be installed in accordance with Australian Standards and connected to the fire prevention system of the building; and
- The bin storage area is to have adequate signage as appropriate.

6.6 Signage

Operational waste from the refurbished SLB should be separated into at least three streams:

- Paper and cardboard;
- Other recyclables; and
- General waste.

Separate, dedicated MGBs should be provided for collection of each of the above three waste streams. MGBs should be appropriately colour-coded and labelled to enable users to easily identify which waste is to be placed into which bins.

The Standards Australia *AS 4123.7-2006 (R2017) Mobile waste containers Part 7: Colours, markings, and designation requirements* provides recommendations for designated colours for waste bins depending on the type of waste the bins are to receive. The colours anticipated to apply to operational waste generated by the refurbished SLB are:

- Blue: Paper and cardboard;
- Yellow: Recyclables (other than paper and cardboard); and

- Red: General Waste.

Each MGB should also be labelled according to the waste they are to receive. Labels approved by the NSW EPA for labelling of waste materials are available online[24] and should be used where applicable. A selection of labels prepared by NSW EPA and anticipated to be applicable to operational waste generated by the Project is provided in **Figure 6**.

Figure 6 Example of labels for MGBs for operational waste

6.7 Communication Strategies

Waste management initiatives and management measures should be clearly communicated to facility managers, staff, caretakers / cleaners and students. Benefits of providing this communication include:

- Improved satisfaction with services;
- Increased ability and willingness to participate in recycling;
- Improved amenity and safety;
- Improved knowledge and awareness through standardisation of services;
- Increased awareness or achievement of environmental goals and targets;
- Reduced contamination of recyclables stream;
- Increased recovery of recyclables and organics (where implemented) material; and
- Greater contribution to state-wide targets for waste reduction and resource recovery.

[24] http://www.epa.nsw.gov.au/wastetools/signs-posters-symbols.htm

The following communication strategies are suggested for consideration:

- Use consistent signage and colour coding throughout the College;
- Ensure all users are informed of correct waste separation and management procedures;
- Provide directional signage to show locations / routes to waste storage areas;
- Clearly label general / comingled waste bins to ensure no cross contamination and to identify the types of waste that may be disposed of in each bin; and
- Educate all students / employees / contractors conducting work on the property ensuring they adhere to this SWMMP.

Signs approved by the NSW EPA for labelling of bins and waste storage areas are available online (http://www.epa.nsw.gov.au/wastetools/signs-posters-symbols.htm).

6.8 Monitoring and Reporting

Auditing and visual monitoring of bins and bin areas should be undertaken by the facility manager at the following frequencies:

- Weekly, within the first two months of operation to ensure the waste management system is sufficient for the operation; and
- Every six months, to ensure waste is being managed appropriately.

Any deficiencies identified in the waste management system, including (but not limited to) unexpected waste volumes, should is to be rectified by the facility manager as soon as practicable.

6.9 Roles and Responsibilities

It is the responsibility of the facility manager to implement this SWMMP and a responsibility of all students and staff to follow the waste management procedures set out by the SWMMP. A summary of recommended roles and responsibilities is provided in **Table 12**.

Table 12 Suggested roles and responsibilities

Responsible Person	General Tasks
Facility Managers	Ensure the SWMMP is implemented throughout the life of the operation.
	Update the SWMMP as needed to ensure the plan remains applicable.
	Undertake liaison with and management of waste and recycling collections by Council and / or contractors.
	Conduct inspections of bins and waste storage / service areas on a regular basis for condition and cleanliness.
	Organise cleaning and maintenance requirements for all bins and waste storage / service areas as required.
	Manage any complaints and non-compliances reported through waste audits etc.
	Ensure effective signage, communication and education is provided to alert new tenants, facility management staff and visitors about the provisions of this SWMMP.
	Monitor and maintain signage to ensure it remains clean, clear and applicable.
	Ultimately responsible for the management of all waste management equipment, cleaning requirements, waste transfer and collection arrangements.
	Manage unexpected waste volumes to mitigate waste overflow in storage areas.
	Ensure all waste compactors (if applicable) are maintained and operational.
Cleaners	Monitor bins to ensure no overfilling occurs.
	Ensure bins and waste storage / service areas are kept tidy.
	Transfer waste from the Library to waste storage / service area as required.
	Transfer recycling from the Library into waste storage / service area as directed / required.
	Cleaning of bins and waste storage / service area per Facility Manager direction.
	Maintain / operate compactors (if applicable), ensuring no overfilling occurs.
Students	Transfer recycling from the Library into waste storage / service area as directed / required.
	Adhere to all waste management directions as given by the Facility Manager.
Staff	Adhere to all waste management directions as given by the Facility Manager.

Appendix A

SSD 8922 SEARS KEY ISSUES (WASTE)

KEY ISSUE 18 - WASTE

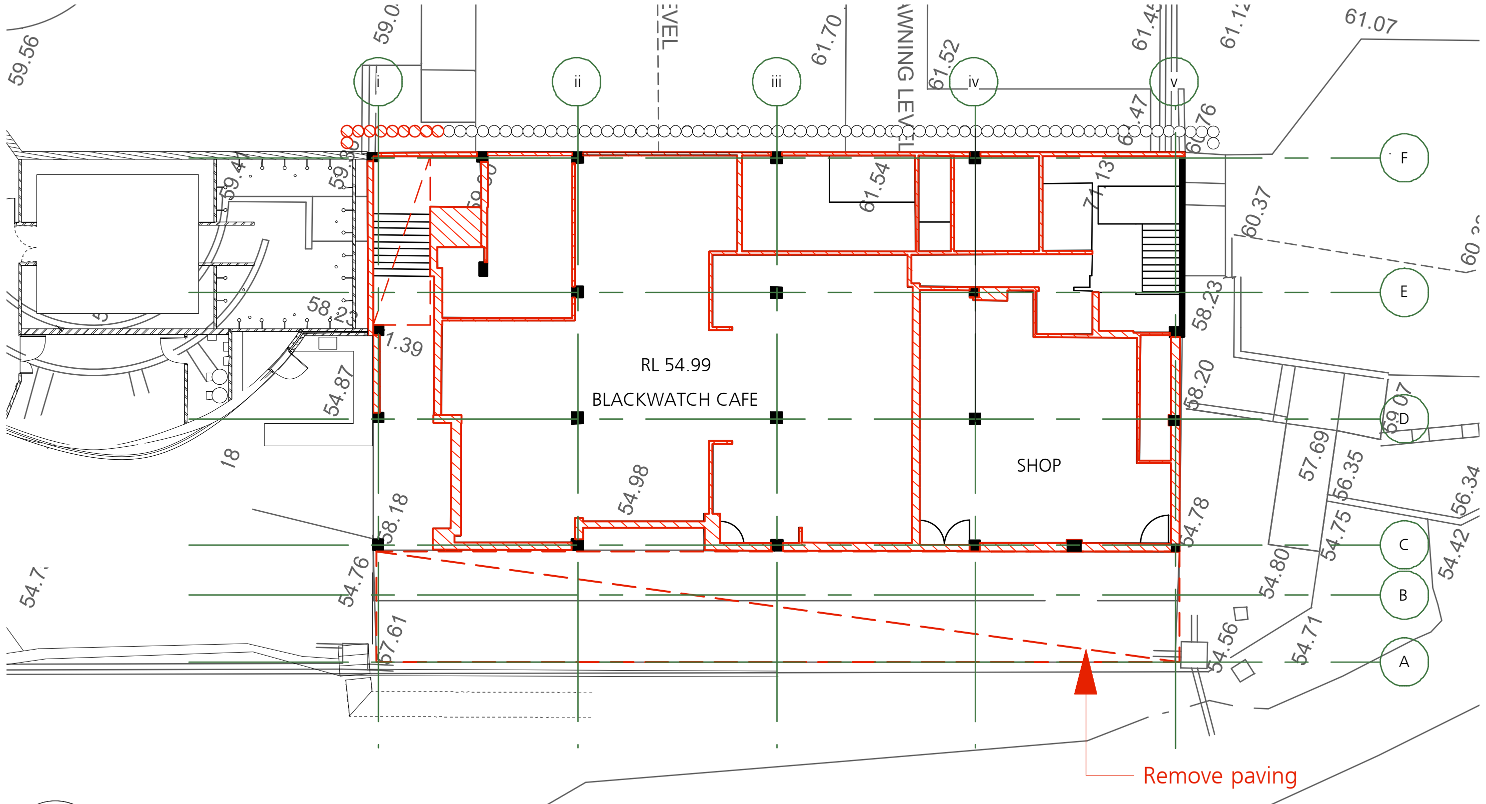
Table 13 lists the relevant sections within the SWMMP that specifically address each of the Waste Key Issues as specified by the NSW Planning & Environment's Secretary's Environmental Assessment Requirements (SEARs) for the SSD 8922.

Table 13 SSD 8922 SEARs key issues (18) pertaining to waste

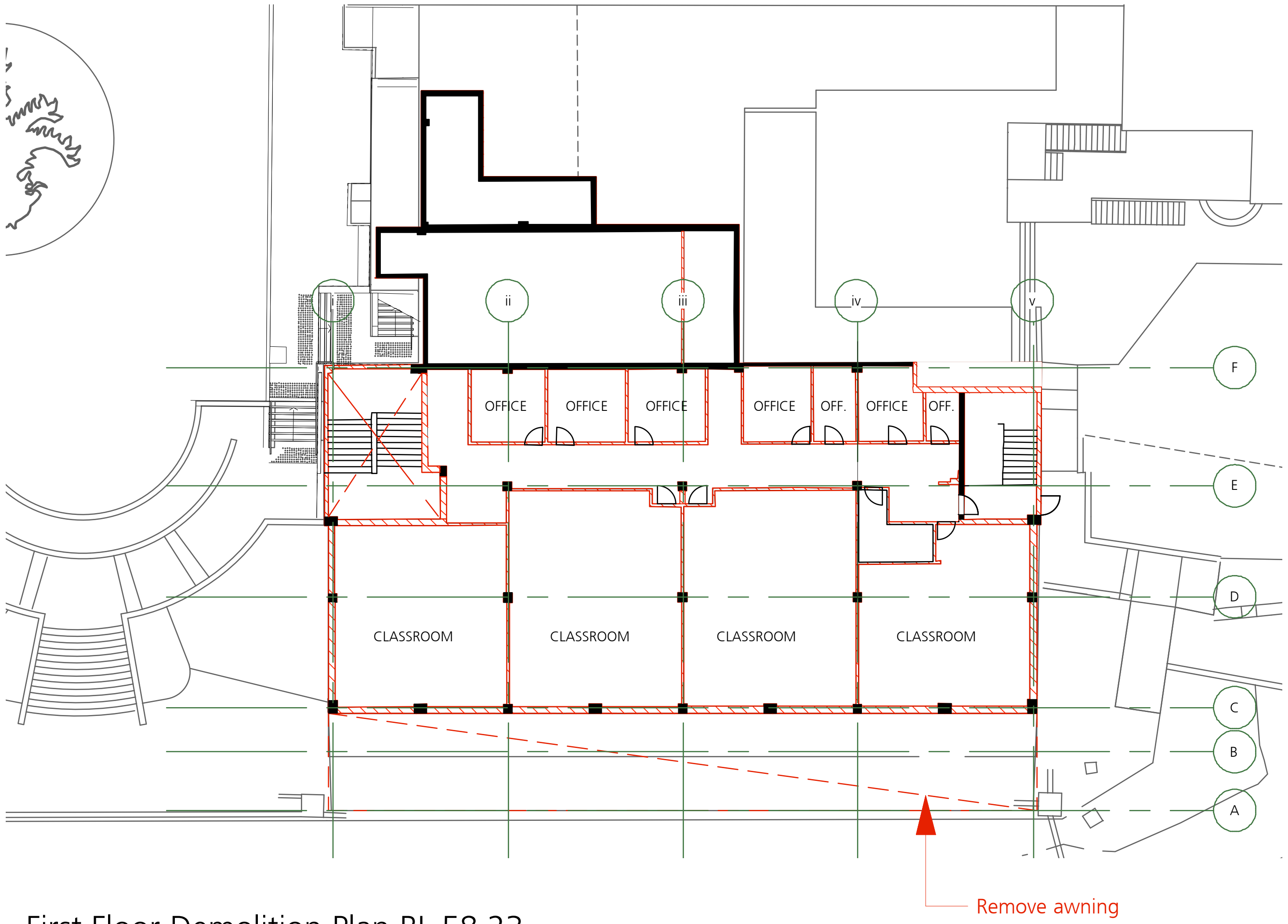
Key Issue	Section Addressing Key Issue
Identify, quantify and classify the likely waste streams to be generated during construction ~~and operation~~ and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.	Section 5
Identify, quantify and classify the likely waste streams to be generated during ~~construction and~~ operation and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.	Section 6
Identify appropriate servicing arrangements (including but not limited to, waste management, loading zones, mechanical plant) for the site.	Section 5 (Figure 3), Section 6.3 Section 6.5.

Appendix B

ARCHITECTURAL DRAWINGS



1 Ground Floor Demolition Plan RL 54.99
Scale: 1:300



1 First Floor Demolition Plan RL 58.23
Scale: 1:300

LEGEND: DEMOLISH

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GF + FF DEMOLITION PLAN

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1:300 @ A3

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P2

DATE
NOVEMBER 2017

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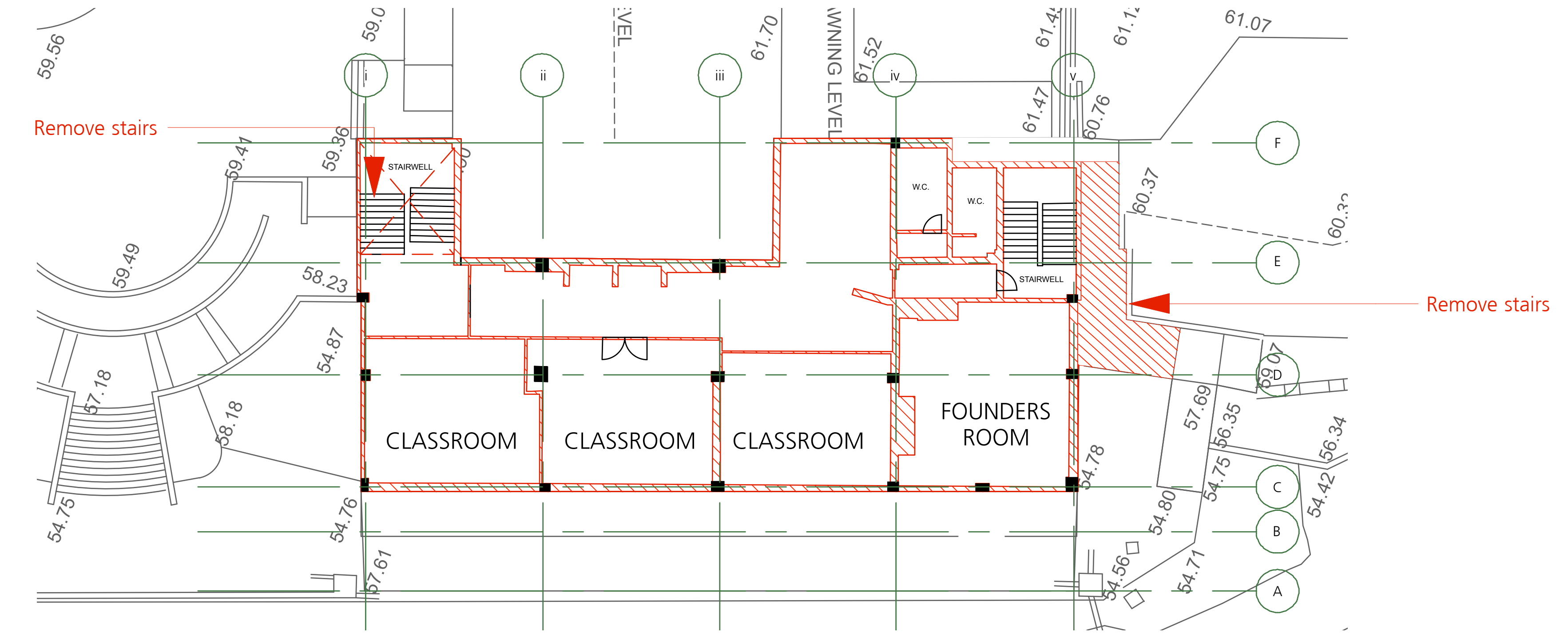
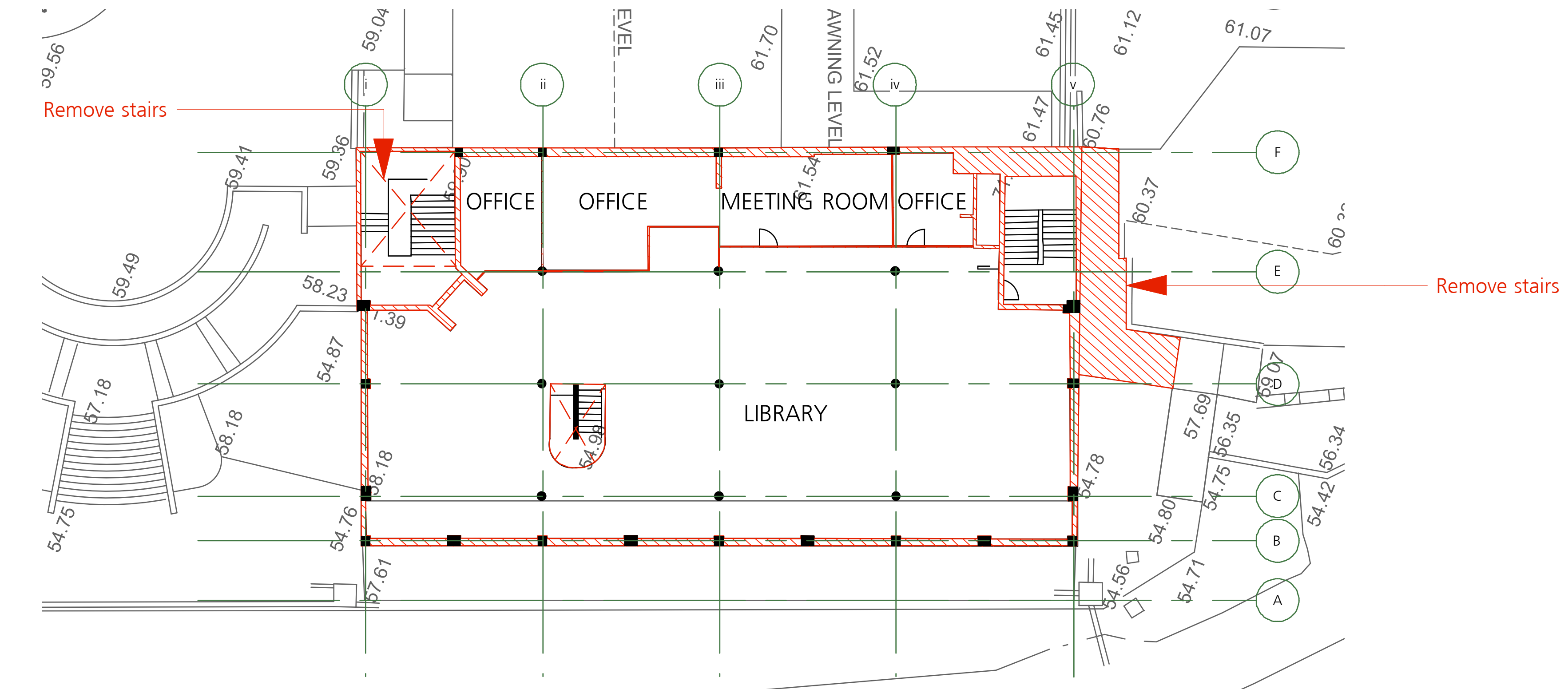


1 Second Floor Demolition Plan EXG RL 61.57
Scale: 1:300



2 Third Floor Demolition Plan EXG RL 65.275
Scale: 1:300

LEGEND: DEMOLISH

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SECOND + THIRD FLOOR DEMOLITION PLAN

DRAWN BY
JC, CF , JW

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1:300 @ A3

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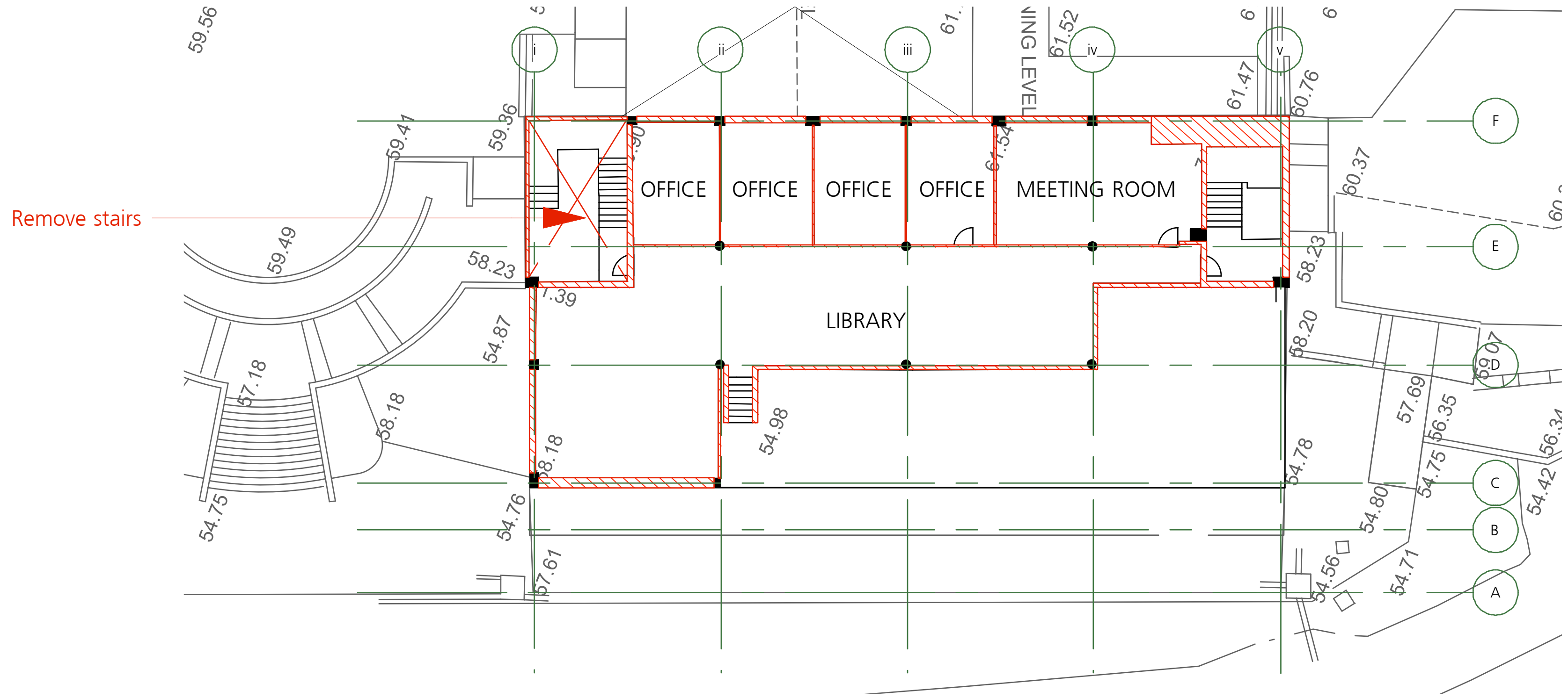
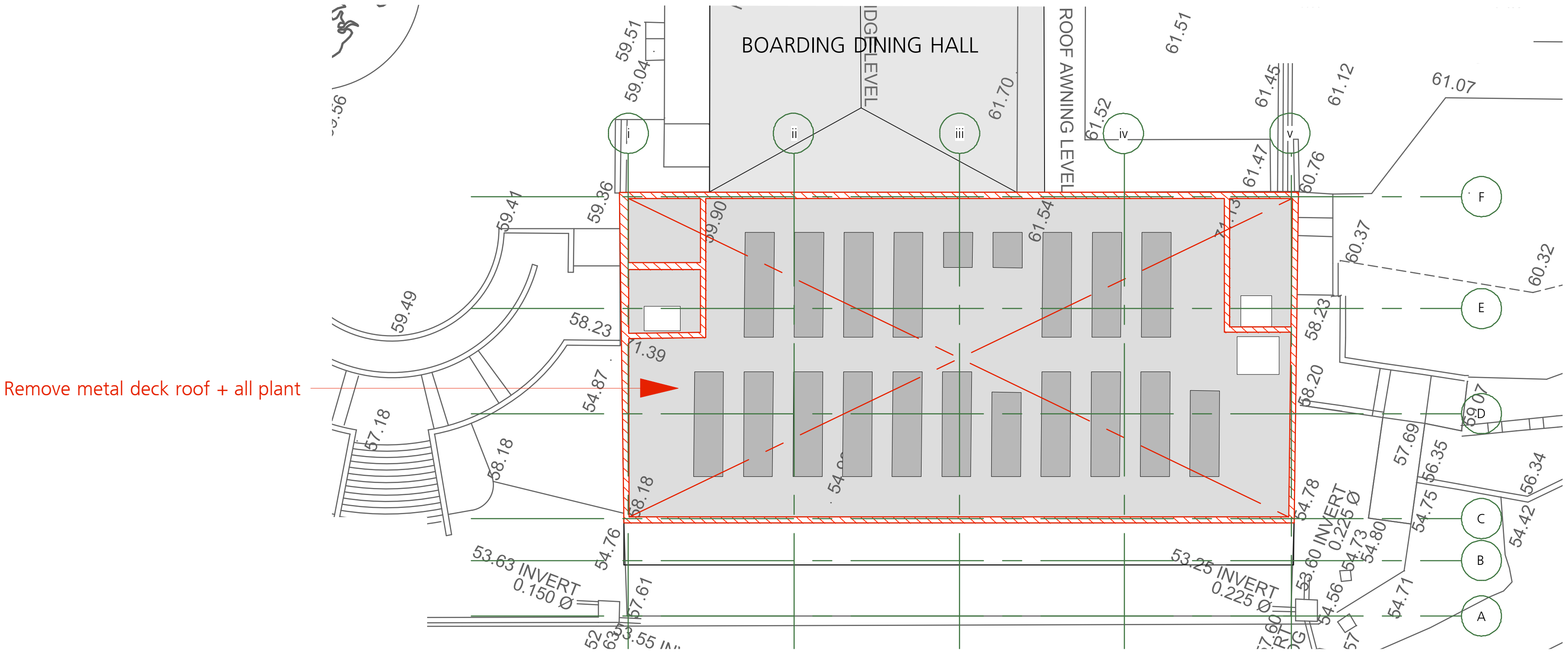
P1

DATE
NOVEMBER 2017

DRAWING NUMBER
SSD1.02/17-151



1 Fourth Floor Demollition Plan EXG RL 67.95
Scale: 1:300



2 Roof Demolition Plan EXG RL 71.39
Scale: 1:300

LEGEND: DEMOLISH

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FOURTH FLOOR + ROOF DEMOLITION PLAN

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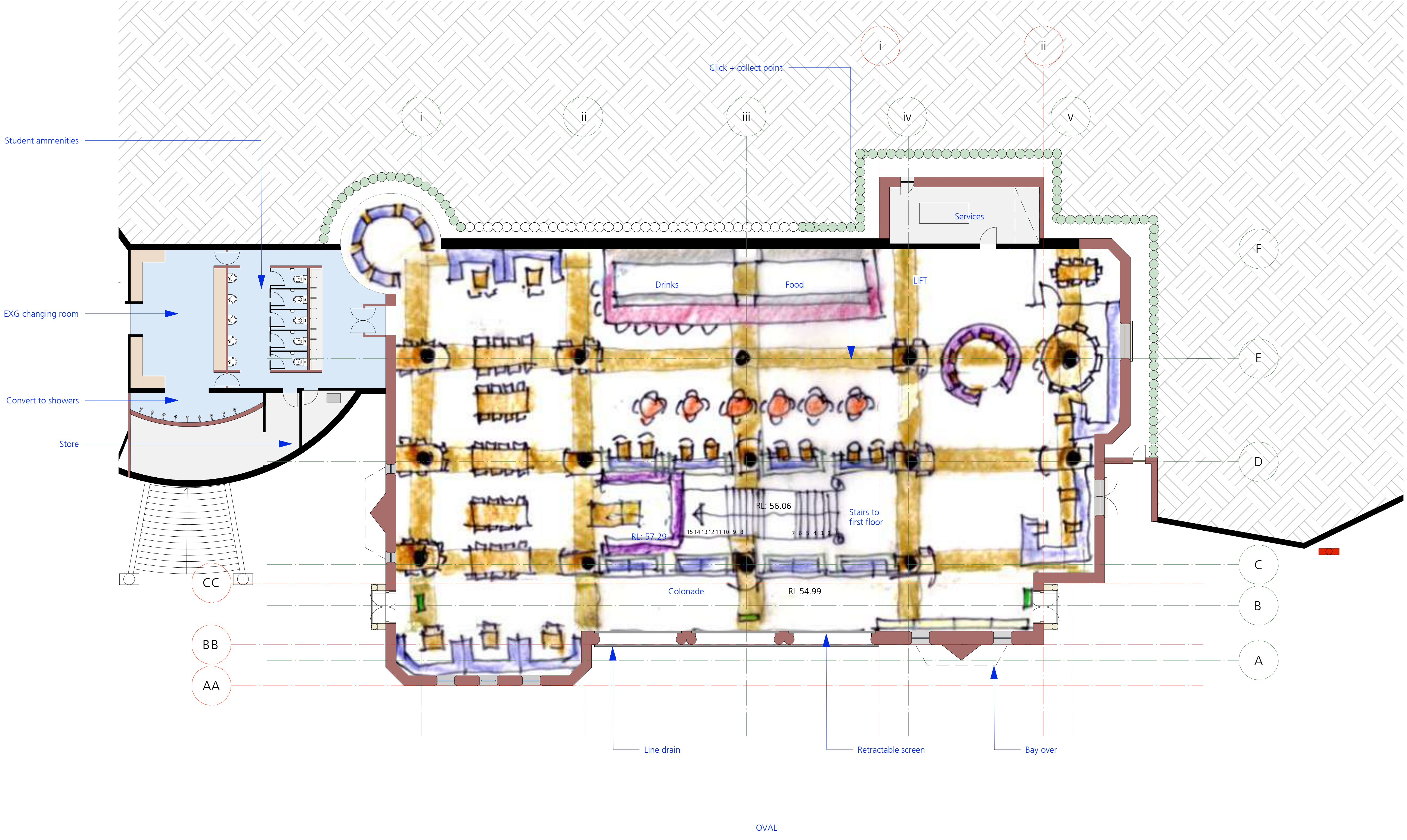
SSD1.02/17-152



1 Proposed Ground Floor Plan
Scale: 1:200. Black Watch

Floor Area: 635m2

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PROPOSED GROUND FLOOR PLAN

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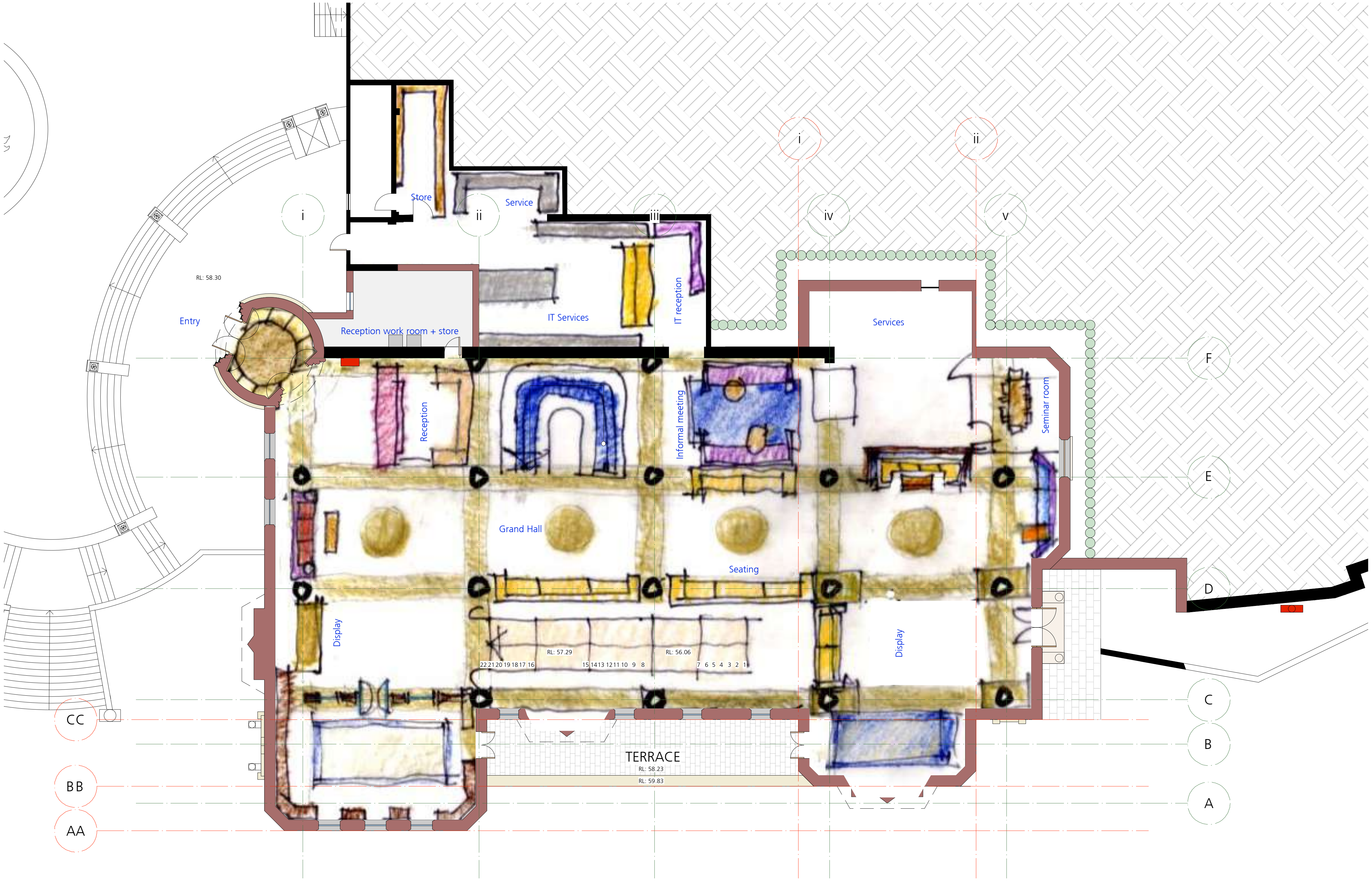
SSD1.02/17-201



1

Proposed First Floor Plan

Scale: 1:200. Reception

NOTES:
1. All platform lifts to comply with BCA Part E3.6

Floor Area: 668m2

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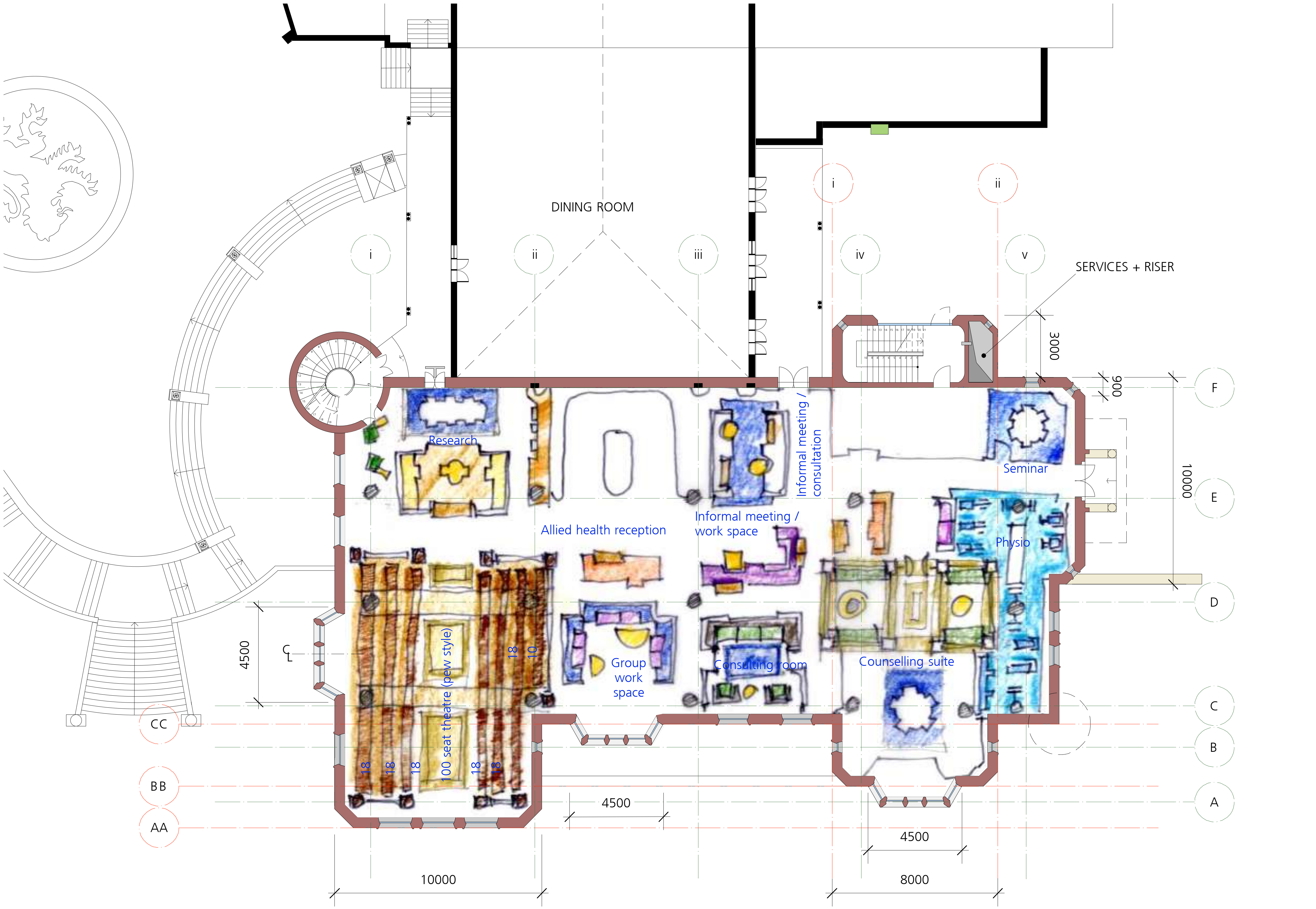

1 Proposed Second Floor Plan
Scale: 1:200. Allied Health

Floor Area: 575m2

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PROPOSED SECOND FLOOR PLAN

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DATE
FEBRUARY 2018

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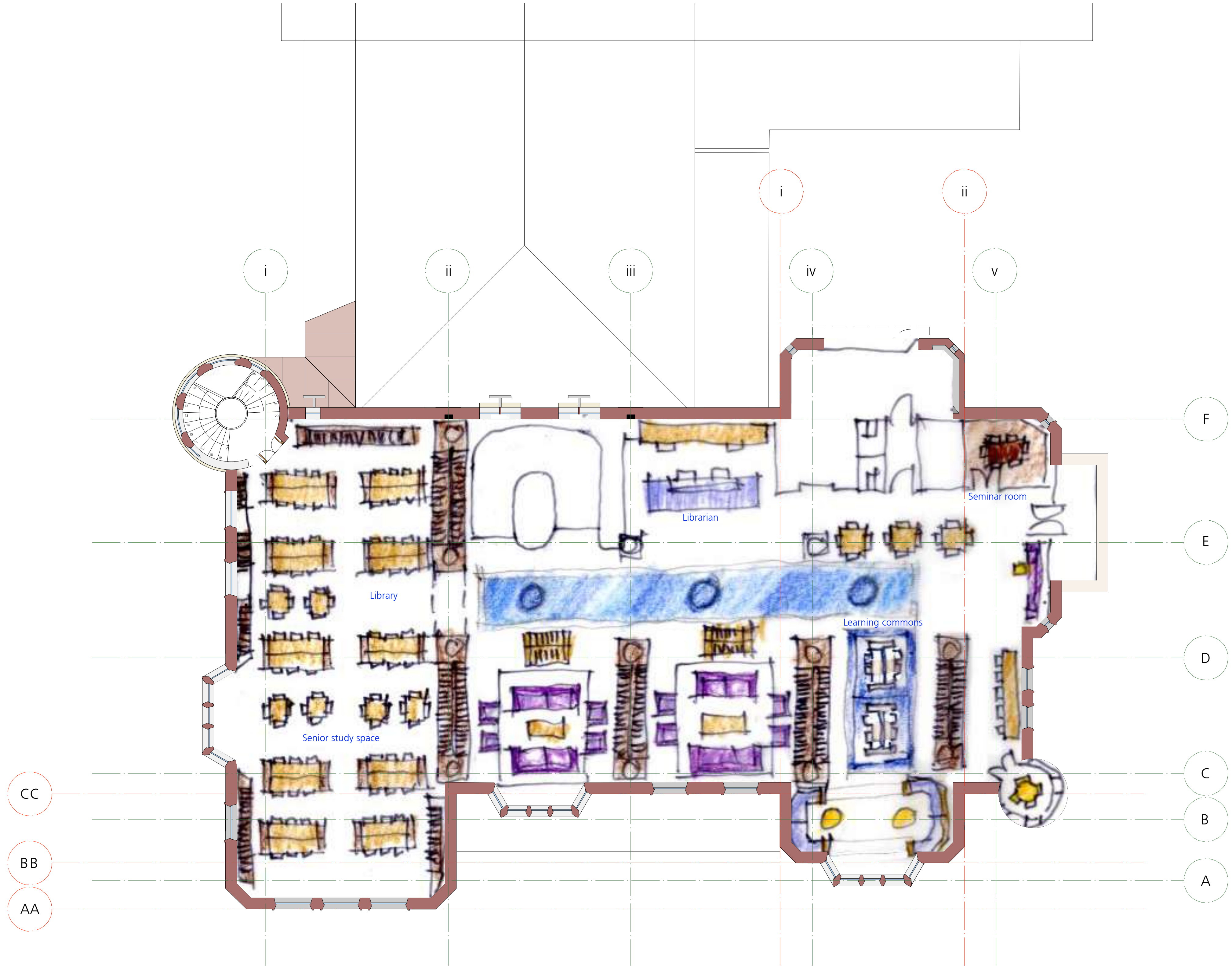

1 Proposed Third Floor Plan
Scale: 1:200. Library + Senior Study

Floor Area: 654m2

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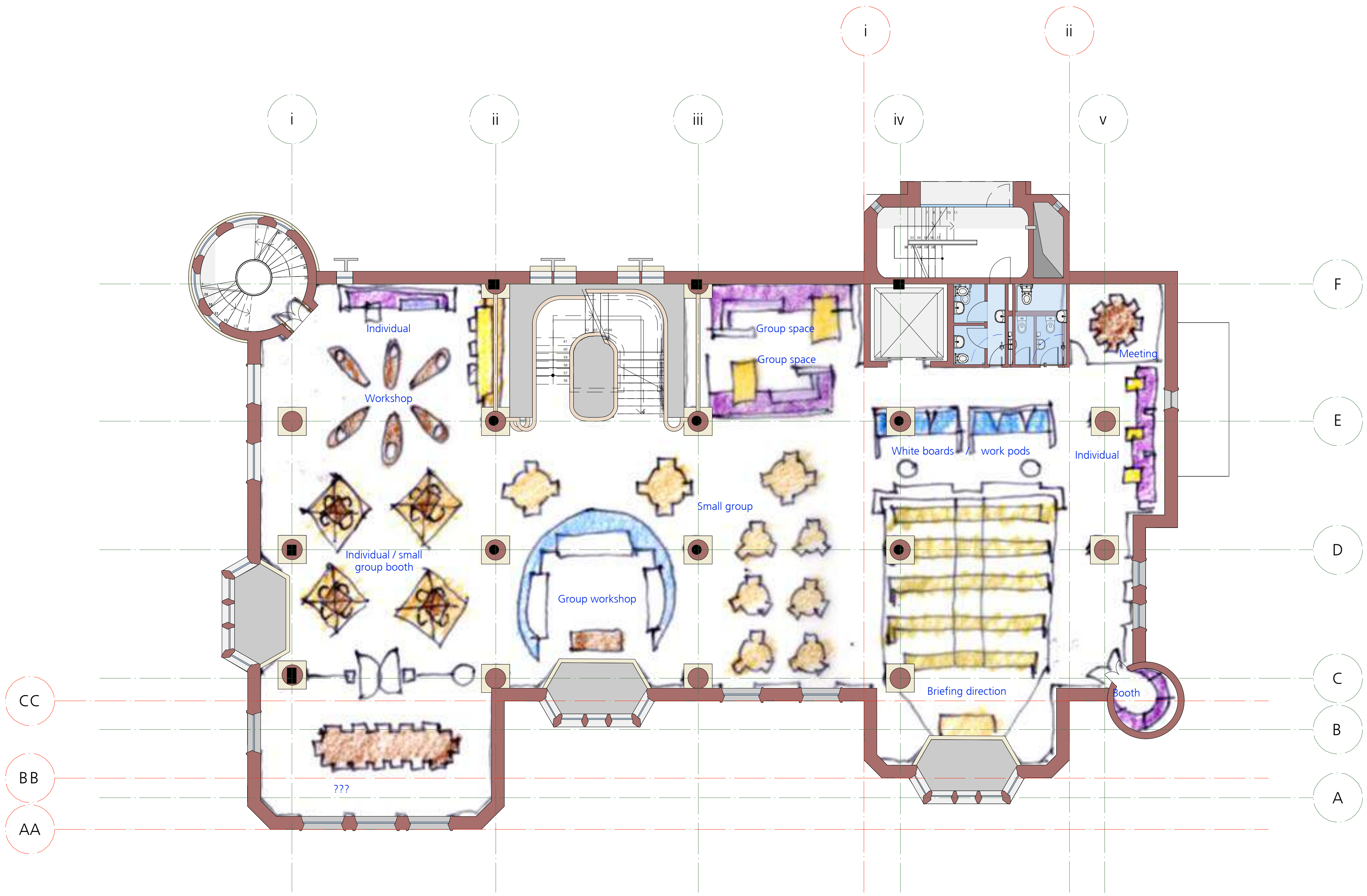

1 Proposed Fourth Floor Plan
Scale: 1:200. Teacher Education, Experiemtnal Class + Research

Floor Area: 655m2

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STEVEN ADAMS
THE SCOTS COLLEGE

PROJECT
LIBRARY RENOVATION

ADDRESS
29-53 Victoria Rd
Bellevue Hill, NSW

DRAWING TITLE
PROPOSED FOURTH FLOOR PLAN

DRAWN BY
JC, CF , JW

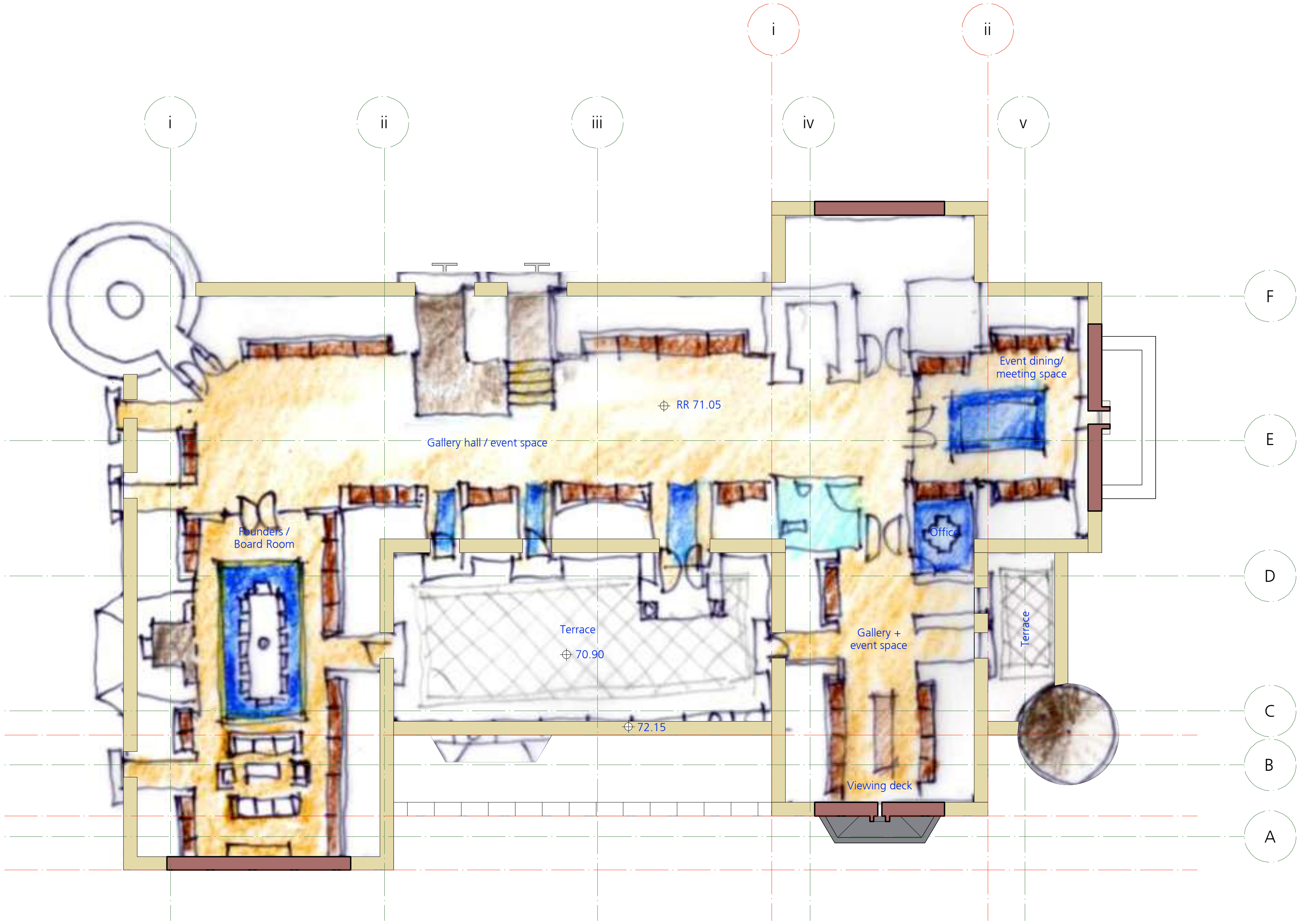
SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P3

DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-205



1 Proposed Fifth Floor Plan
Scale: 1:200. Founders Room + Event Space

Floor Area: 312m2

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JCA Architects Pty Ltd ABN 53 139 457 784
Nominated Architect
John Cockings NSW ARB6055 AIA

GENERAL NOTES

- Consult with ALL relevant authorities prior to commencing works
- DO NOT scale. All dimensions are nominal + should be confirmed on site prior to commencement
- Obtain setting out information from architect PRIOR to commencement
- Bring discrepencies to the immediate attention of the Architect
- If unsure of any aspect of the works seek instruction from the Architect before proceeding
- All drawings must be read in conjunction with the council consent, specification, schedules, site notes + instructions issued by the Architect
- This material / work is protected by Copyright

CONSULTANTS

TPOS
Quantity Surveyors

BBC
Planning Consultants

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SSD1.02/17-206

JCL DEVELOPMENT SOLUTIONS

Hydraulic and Fire Engineering Consultants
14 Page St Moruya NSW ph 02 44742401

The Scots College
Proposed Refurbishment of the Stevenson Library
29-53 Victoria Road Bellevue Hill, NSW

Stormwater Drainage and Sediment, Erosion and Dust Control Management Report No 2017-T29B
Reference documents - Plan set No 2017-T29B/H01 to H06

Issue 1 14 March 2018

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Sediment Erosion and Dust Control

• The assessment includes details of proposed erosion and sediment controls (during construction), the proposed stormwater management system (during operations), and management and mitigation measures for the containment of pollutants (e.g. fuel spill) and prevention of potential water quality impacts during construction and operation. As part of the works, erosion and sedimentation controls shall be installed and maintained throughout the duration of construction works in accordance with Managing Urban Stormwater - Soils & Construction Volume 1 (Landcom, 2004). Prior to any earthworks commencing on site, all erosion and sediment control measures will need to be implemented in accordance with the above specifications. These measures shall generally include, as necessary:

• Installation of A-Class hoarding around the perimeter of the site;

• Installation of truck wash down facilities at each point of exit from the site;

• Installation of sediment fencing around disturbed areas, including any stockpiled topsoil;

• Placement of geotextile bags filled with sand and/or gravel around and along existing and proposed catch drains and stormwater drainage pits;

• Minimising the volume of contaminated water during the works wherever possible by directing surface water away from excavations, depressions, pits and stockpiles by the construction of drainage works such as bunds and diversion drains. Sediment basin(s) may be employed as deemed necessary for the collection of surface water for maintenance of water quality and/or re-use;

• Recycling water, where possible, by reusing on site as dust suppression or for other site operations including wheel washing and truck washing subject to suitable treatment measures.

Surface Water Quality to be checked with the implementation of erosion and sediment control measures will ensure that surface water runoff quality from both external and internal catchments is maintained at acceptable levels during construction.

There are no groundwater interception works proposed during either construction or operation. Construction of the works will have minimal potential to intercept groundwater, as the majority of works will be undertaken above the level of the groundwater table.

Water & Stormwater Management Plan

Impact Group commits to the preparation of a detailed Water and Stormwater Management Plan that addresses water quality and water monitoring requirements for the duration of construction works associated with the development.

Internal Stormwater Drainage

The stormwater drainage network within is designed to provide:

a. Low flows directed through water quality measures (nominally up to a 3 month ARI event); and

b. Internal site drainage with a capacity to capture and convey all storm events up to the 100 year ARI event.

The internal stormwater drainage network will be designed generally in accordance with the following

standards and guidelines:

a) *Australian Rainfall and Runoff Volume 1 and 2;*
b) *NSW Floodplain Development Manual 2005;*
c) Woollahra Council DCP 2015
d) Part E General controls for all developments.
e) Chapter E2: Stormwater and flood risk management
f) *AS3500 – Stormwater and Drainage Design codes;*
g) *Water Sensitive Urban Design; Book 1 – Policy* (Landcom, 2009), which is considered current best practice or stormwater management in NSW and suggests the following targets for reduction of pollutant mean annual load:
- 85% for Total Suspended Solids (TSS)
- 65% for Total Phosphorus (TP)
- 45% for Total Nitrogen (TN).

h) *Emi-5 Stormwater Green Stars (2 points)*, which recommends the following targets for stormwater quantity management and reduction of pollutant mean annual load*:*
- 1.5 year ARI post development peak flows not exceeding 1.5 year ARI pre-development peak flows;
- 90% reduction of GP;
- 80% reduction of TSS;
- 60% reduction of TP;
- 45% reduction of TN; and
- 90% reduction of Free Oils.

The target reductions from each of the above design requirements will be met.

Internal Stormwater Drainage Strategy

The drainage strategy for the development provides for capture and conveyance of all flows during storm events up to and including the 100 year ARI storm within the pit and pipe network and controlled overland flows. The current internal drainage strategy is presented on the site drawings.

Rainfall data used as 100yr for roof discharge @ 262mm/hr 20yr for pavement runoff @ 210mm/hr.

The stormwater treatment train for the ultimate development will incorporate water sensitive urban design (WSUD) principles to remove gross pollutants, suspended solids and nutrients. The treatment train may consist of a range of measures, including (but not limited to):

- Gross Pollutant Traps (e.g. Stormwater360 Enviropods or equivalent)

Existing Stormwater Network

The existing stormwater network is characterised by a series of in-ground piped stormwater systems (typically 225mm in diameter) draining to Cranbrook Lane. Note that the existing landscape O.S.D. basin, approximately 80M3 storage capacity, is to be maintained, refer to plan 2017-T29B H06.

Groundwater Management during Construction
No specific groundwater management controls will be required during construction, as no groundwater interception works are proposed.

Overland Flow and Flooding

Prominent overland flow paths adjacent to library building are described as follows:1. Overland flow splits at the intersection of Victoria Road and Ginahgulla Road with the majority of the flow diverting to the entrance of The Scots College courtyard. The collected overland flow is channelled as sheet flow across the existing courtyard with final disposal across the existing grassed oval. Maximum depth of flow across the courtyard is 61mm providing a minimum freeboard to first floor level of the library of 160mm in overland flow zone.

Conclusion

This report supports a State Significant Development Application (SSD) submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979*. The Development Application (DA) seeks approval for the renovation of the Stevenson Library at Scot College Bellevue Hill.
The proposed stormwater management measures will result in no adverse impact on surrounding neighbours or public spaces.
The internal drainage system will capture and convey storm events up to and including the 100 year ARI event whilst also providing water quality treatment through treatment train.

Aargus

Environmental - Remediation - Engineering - Laboratories - Drilling

HAZARDOUS MATERIALS ASSESSMENT

TSC Stevenson Library
The Scots College, 29-53 Victoria Street, Bellevue Hill NSW

Prepared for

The Scots College C/- Impact Group Pty Ltd

22nd March 2018

Ref: ES7155

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1	Nick Kariotoglou	Aargus Pty Ltd (Library)
2	The Scots College	C/- Impact Group Pty Ltd

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It is expected that these custodians would be responsible for:

- the storage of the document
- ensuring prompt incorporation of amendments
- making the document available to pertinent personnel within the organisation
- encouraging observance of the document by such personnel
- making the document available for audit

DOCUMENT HISTORY

Document No.	Revision No.	Issue Date	Description
ES7155	0	21.03.2018	Draft Issue

Approved By:

Mark Kelly
Environmental Manager

Date: 21st March 2018

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APPENDICIES

REGULATORY BACKGROUND INFORMATION

All work associated with the inspection and reporting of hazardous building materials is generally undertaken in accordance with the following legislation, guidelines and standards:

GUIDELINES/REGULATIONS/DOCUMENTS
Asbestos *National Code of Practice How to Manage and Control Asbestos in the Workplace,* Safe Work Australia 2011 *National Code of Practice How to Safely Remove Asbestos,* Safe Work Australia 2011 *Code of Practice for the Safe Removal of Asbestos 2nd Edition,* National Occupational Health and Safety Commission: 2002, 2005 *Code of Practice for the Management and Control of Asbestos in Workplaces,* National Occupational Health and Safety Commission: 2018, 2005 *Management Of Asbestos In The Non-Occupational Environment*, Environmental Health Committee, Department of Health and Ageing, 2005 *Working with Asbestos: Guide,* WorkCover Authority of New South Wales, 2008 *Asbestos: The survey guide,* Health and Safety Executive, UK, 2010
SMF *National Standard for the Safe Use of Synthetic Mineral Fibres* [National Occupational Health and Safety Commission:1004(1990)] *National Code of Practice for the Safe Use of Synthetic Mineral Fibres* [National Occupational Health and Safety Commission:2006(1990)]
Lead *Guide to Lead Paint Management, Part 1: Industrial Applications,* Australian Standard AS4361.1, 1995 *Guide to Lead Paint Management, Part 2: Residential and Commercial Buildings,* Australian Standard AS4361.2, 1998 *National Standard for the Control of Inorganic Lead at Work,* National Occupational Health and Safety Commission: 1012, 1994 *National Code of Practice for the Control and Safe Use of Inorganic Lead at Work,* National Occupational Health and Safety Commission: 2015, 1994 *Guidance Note For Ceiling Dusts Containing Lead,* WorkCover Authority of New South Wales

Code of Practice for Ceiling Dust Removal, Australian Dust Removalists Association, http://www.adra.com.au/cop.html
PCBs *Polychlorinated Biphenyls Management Plan,* Environmental Protection & Heritage Council, Revised Edition, April 2003 *Identification of PCB-Containing Capacitors,* Australian and New Zealand Environment and Conservation Council (ANZECC), 1997 *Polychlorinated Biphenyl (PCB) Chemical Control Order 1997,* made under the *Environmentally*
Guidelines/Regulations/Documents *Hazardous Chemicals Act 1985*
General *Work Health and Safety Act,* NSW Government 2011 *Work Health and Safety Regulation,* NSW Government 2011 *Control of Workplace Hazardous Substances, Code of Practice,* WorkCover Authority of NSW, 2006 *National Code of Practice for the Control of Workplace Hazardous Substances* , National Occupational Health and Safety Commission: 2007, 1994 *The Demolition of Structures,* Australian Standard AS2601, 2001 *Woollahra Municipal Council* Asbestos Policy

1.0 INTRODUCTION

Aargus Pty Ltd was appointed by Impact Group Pty Ltd on behalf of The Scots College (the "client") to conduct a Hazardous Materials Assessment of the TSC Stevenson Library to be demolished as part of its redevelopment located at The Scots College 29-53 Victoria Street, Bellevue Hill NSW (the "site").

This inspection was to ascertain the extent, type and condition of hazardous materials within the nominated building, associated building structures and surrounding soils. For the purpose of this report, these materials include, but not limited to, asbestos-containing materials (ACM), synthetic mineral fibres (SMF), lead based paint (LP), dust swab samples for Lead dust, polychlorinated biphenyls (PCBs) within fluorescent light capacitors and perimeter surface soils for visible asbestos containing materials. The location & site features of the nominated site are shown in Appendix A.

The nominated sites were inspected on Sunday 11th March 2018 by Con Kariotoglou (Project Manager / WHS Consultant) of Aargus Pty Ltd, *NSW WorkCover Approved Asbestos Assessor, Licence No. LAA001006,* and included an inspection of all external and internal building structures within the boundaries of the TSC Stevenson Library.

All fieldwork and reporting was conducted in accordance with Aargus Fieldwork Protocols 2012 (Appendix C), the NSW Work Health and Safety Regulations 2011, SafeWork NSW Codes of Practice and Australian Standard AS2601:2001 – The Demolition of Structures.

1.1 Objectives and Scope of Works

The objectives of this hazardous materials assessment are to identify and, if possible, quantify any potential hazardous materials found at the site and determine if these materials present a potential health risk to people currently using the site or involved in the demolition/refurbishment of the site.

Our professional judgement and experience was used in the identification and location of hazardous materials in accessible and representative areas using non-destructive methods (if occupied). However, it is not possible without substantial stripping and demolition of the building to guarantee that every source of hazardous material has been detected. Therefore, care should be exercised when opening any previously un-inspected and non-accessible areas.

Should any personnel come across any suspected hazardous material or materials unknown to them, work should cease immediately in the affected areas until further sampling and investigation is performed.

The nominated building was occupied at the time of this assessment. The inspection was conducted during out of normal business hours on a Sunday. Our scope of works to undertake the project included:

- Conducting a site inspection to identify all areas of potential concern (such as roofing, insulation, switchboards, building materials etc);
- Site photographs;
- Interpretation of results and findings; and
- Recommendations and final conclusions drawn from the assessment results.

1.2 Notification and Consultation

It should be noted that under Asbestos/Hazardous Material Regulations, there is a requirement for the employer or occupier to record the findings of the asbestos/hazardous materials risk assessment and provide the information to Health and Safety Representatives for any relevant designated work group.

This Hazardous Materials Assessment survey report should not be used for the purposes of costing for the removal or programming of future refurbishment or demolition works unless accompanied by an appropriate and site-specific scope of works as part of a Hazardous Material Management and Abatement Program. In the case of the site, which is to be demolished, the Hazardous Material Management and Abatement Program would be the responsibility of the Demolition Contractor. This Hazardous Materials Assessment report should be read in its entirety and must not be copied, distributed or referred to in part only.

Unless specifically noted, the survey generally does not cover:

- Inaccessible locations such as small voids, cavities or beneath steel grates and the like;
- Materials which are obscured or covered by a second building fabric, such as a ceiling above a false ceiling, or a second concealed floor covering beneath the primary floor covering;
- Air conditioning, heating, mechanical, electrical or other equipment which requires specialist knowledge, and all internal areas of live operational plant which cannot be safely accesses, unless otherwise specified;
- General exterior ground surface and subsurface areas eg. Asbestos in fill/soil;
- Materials dumped, hidden, or otherwise placed in locations which one could not reasonably anticipate;

- Materials other than normal building fabric, materials in laboratories or special purpose facilities and building materials that cannot be reasonably and safely assessed without assistance; and
- Settled dust is generally not sampled or commented on, unless otherwise targeted during this inspection. Settled dust may contain hazardous constituents, particularly if it is in the vicinity of hazardous materials or areas where hazardous materials have been removed.
- Where materials suspected of being hazardous are identified they are normally reported on to the best of the consultant's ability. Analysis is not always included, however a visual assessment is commented on.

2.0 SITE INFORMATION

2.1 Site Identification

The nominated site is located at 29-53 Victoria Street, Bellevue Hill NSW, in the Local Government Area of Woollahra Municipal Council (refer to Appendix A – Site location Figure 1). The site is registered as:

- Lot 1 in DP231713
- Lot 1 in DP929570
- Lot 1 in DP663629
- Lot 1 in DP1064059
- Lots 10, 11, 12, 13 in DP14952.

2.2 Site Description

The following descriptions of surrounding lands and building structures should be read in conjunction to Site Features in Appendix A and Site Photographs in Appendix C, as well as the HAZMAT Registry at the end of this report. This HAZMAT report relates only to the TSC Stevenson Library building structure within the site that was inspected. The main features of the nominated building inspected include the following:

TSC Stevenson Library:

Access to the Library is from within the grounds of The Scots College. The Library is situated within the central western portion of the site. Access to the site is off Victoria Street along the western boundary of the site. The Library is rectangular in shape and has a total area of approximately 575m^2 with a perimeter of approximately 200m. The site comprises of the following:

- The exterior of the building consists of brick walls with concrete columns and slabs with aluminium awnings, windows and doors around the perimeter of the building, with the exception of exit fire / emergency exit doors which are timber. The roof consists of corrugated metal roofing structures.
- Exterior lighting appears to contain light globes and with no evidence of PCB Capacitors.
- All exterior painted walls appears to be new and in good condition with no evidence of paint deterioration and flaking.
- The interior of the Library consists of three distinct levels.
    - The ground floor consist of a cafeteria and lunch room with Gyprock internal walls and ceilings and concrete polished floor. Also the northern ground floor store room consists of internal Gyprock walls and ceilings with carpet on a concrete floor.
    - The first floor consisted of classrooms on the eastern side of the building and teachers offices on the western side of the building. All rooms consisted of carpet flooring with Gyprock internal walls. The classrooms on the eastern side contained vermiculite ceilings, while the teacher’s offices consisted of Gyprock Ceilings.
    - The second floor consisted classrooms on the eastern side of the building with a foyer area leading to the main College dining room towards the western side of the building. The classrooms consisted of Gyprock internal walls and ceilings and carpet on timber flooring. The foyer area consisted of Gyprock internal walls and ceilings and tiled flooring. The staff and visitor’s toilets consisted of tiled walls and floors.
    - The third level consisted of the Library covering the entire area of the level. The Library consisted of a vermiculite ceiling above the bottom level reception area and all the offices along the western portion of the Library while the remainder of the Library including the upper

mezzanine level consisted of Gyprock internal walls and ceiling. Carpet flooring covered the entire Library area on both levels.

- All interior paintwork on walls and ceiling within all levels of the building appears to be new and in good condition with no evidence of paint deterioration or flaking.
- All interior lighting appears to contain light globes or fluorescent lights with no evidence of PCB Capacitors.
- The building was unoccupied at the time of the inspection.

Table 1: Potentially Hazardous Materials within the TSC Stevenson Library

Hazardous Material	Location
Fibre-cement sheeting	External northern façade awning above emergency exit
Vermiculite ceiling	Internal ceilings within first, second classrooms and third level Library
Vinyl Flooring	Frist level hallway
Asbestos Dust	Within all ceiling spaces on all three levels
Lead Dust	Within all ceiling spaces on all three levels
Lead Paint	Interior glossy coated doors of Library

3.0 SAMPLING METHODOLOGY

The hazardous materials assessment inspection was conducted in accordance with Aargus Fieldwork Protocols 2012 (Appendix C), the NSW Work Health and Safety Regulations 2011, SafeWorks NSW Codes of Practice and Australian Standard AS2601:2001 – The Demolition of Structures.

The survey consisted of a visual walk-through inspection with limited sampling/analysis as required. If multiple locations are of similar construction and appear similar, then an inspection is commonly undertaken of one (1) and the inspection results assumed to be consistent for the remainder.

The visual inspection was targeted in the areas of most concern such as lagging around pipe work, cooling and insulation material, building materials, roofing, flooring and sound proofing.

The assessment was conducted on the basis of the condition, type and location of the materials at the time of inspection. The scope of this investigation did not allow destructive and intrusive sampling techniques to be undertaken at all locations, due to the occupancy of the majority of locations, therefore the register may have limitations as a reference document for the purposes of renovation or demolition as certain areas within the property were inaccessible.

3.1 Asbestos Containing Materials

This portion of the assessment was undertaken in accordance with the following guidelines: *The Management and Control of Asbestos in Workplaces [NOHSC:2018*

(2005)]. Representative samples of construction materials identified as potentially containing asbestos were obtained using hand tools by personnel wearing suitable personal protective equipment (PPE). The samples were placed in sealed plastic bags and labelled with a unique job number, sampling location and date. All samples were recorded on the chain of custody (COC) record presented in Appendix D.

Following the completion of the field inspection, the samples were forwarded to a National Association of Testing Authorities (NATA) registered laboratory, Australian Safer Environment & Technology (ASET) Pty Ltd (NATA Accreditation No. 14484), for asbestos analysis. The asbestos samples were analysed using stereo and polarising light microscopy methods with dispersion staining techniques.

3.2 Lead Containing Materials

Representative samples of deteriorated paint films and accumulated dust that potentially contain elevated lead concentrations were obtained using hand tools by personnel wearing suitable PPE.

Only significantly deteriorated paint systems that are considered likely to impact on demolition/refurbishment practices or that are considered a health or environmental hazard were sampled and recorded.

The paint flakes obtained included all layers of paint on a particular surface and so are considered to be composites of the materials at each location. The paint flake samples were placed in sealed plastic bags and labelled with a unique job number, sampling location and date. All samples were recorded on the chain of custody (COC) record presented in Appendix C.

In accordance with the Australia Standard, AS4361.2 – 1998 "*Guide to Lead Paint Management, Part 2: Residential and Commercial Buildings*", a lead in paint concentration greater than 1.0% w/w is considered to be lead based paint.

Settled dust sampling involved the collection of settled dust from a known surface area by wet wipe. The area should preferably be $0.09m^2$ (which corresponds to an area 30 cm × 30cm) and in any event not less than $0.01m^2$, depending on the amount of dust present. A non-alcoholic moistened wipe is folded to form a firm swab. The swab is placed flat onto the surface in one corner of the area to be sampled and rubbed across the entire area in an 'S' pattern. The wipe is re-folded so that the collected dust is on the inside and is again rubbed across the area at 90° to the first 'S'. The wipe is again folded with the dust inside and placed in the sterile sample container.

Following the completion of the field inspection, the samples were forwarded to a NATA registered laboratory for analysis, ALS Laboratories (NATA Accreditation No. 825. Analysis for lead content is performed using a nitric and hydrochloric acid digest followed by ICP-AES (Inductively Coupled Plasma – Atomic Emission Spectroscopy) quantification methods.

The result, when received from the laboratory, is converted to milligrams, and then divided by the area sampled (in square metres) to give a lead loading expressed in mg/m^2 (or mg/kg).

As stated above, a lead in paint concentration greater than 1% w/w is considered to be lead based paint.

Australian Standard AS 4361.2-1998 *Guide to Lead Paint Management Part 2: Residential and Commercial Buildings*, does not offer any general guidance on lead levels in dust but it does have surface dust lead loading values as acceptance levels after lead paint management activities. The acceptance levels for surface dust are:

- Interior floors 1 mg/m2 (as lead);
- Interior window sills 5 mg/m2 (as lead); and
- Exterior surfaces 8 mg/m2 (as lead).

Aargus uses the Australian Standard levels above as a guide in assessing lead dust risks. These figures can also be used to assess the risk of exposure from other lead sources. The acceptance level of lead in dust for exterior surfaces of 8 mg/m2 is considered the most appropriate guideline for comparison for lead in ceiling dust.

3.3 Polychlorinated Biphenyls (PCBs) Containing Electrical Equipment

The major use of PCBs in the electrical industry has been inside transformers and capacitors. Transformers may include relatively small transformers inside electrical mains/fuse cabinets. Capacitors containing PCBs were installed in numerous types of fluorescent light fittings during the 1950's, 60's and 70's. Representative samples of each type of electrical equipment identified within the existing structure were visually examined to assess whether the equipment is insulated with PCBs. Details on the make, type, capacitance, dimensions, date and power were recorded and checked with the ANZECC database of known PCB containing electrical equipment and the results of the review were noted.

3.4 Synthetic Mineral Fibre Containing Materials

Construction materials identified as potentially containing synthetic mineral fibre (SMF) were examined by site personnel and their location was noted. In the event that the materials were suspected to contain asbestos fibres, representative samples were obtained using hand tools by personnel wearing suitable PPE. The material samples were placed in sealed plastic bags and labelled with a unique job number, sampling location and date. Following the completion of the field inspection, the samples were forwarded to a NATA registered laboratory for asbestos fibre analysis. The samples were analysed using stereo and polarising light microscopy methods with dispersion staining techniques.

3.5 Electrical Backing Boards

Where accessible, an assessment was conducted on the switchboards and electrical backboards to check for hazardous materials. Samples were collected from materials where it was deemed safe to do so, otherwise a visual assessment was undertaken for potential hazardous materials.

3.6 Material Sampling

Our professional judgement and experience was used in the identification and location of asbestos and lead containing materials in accessible and representative areas using non-destructive methods. Therefore on Sunday 11th March 2018, five (5) samples for laboratory asbestos analysis and four (4) samples for lead analysis were collected from the site during the inspection. A visual inspection / positive identification was also undertaken within accessible areas during the inspection.

The following samples were collected for laboratory analysis:

Table 2: Sample Collection

Sample No.	Date Sampled	Sample Location and Description	Analyte Requested
ES7155: AS1	11.03.18	Fibre-cement Sheeting - External northern façade awning above emergency exit	Asbestos
ES7155: AS2	11.03.18	Dust accumulation within ceiling space above ground floor Kitchen	Asbestos
ES7155: AS3	11.03.18	Dust accumulation within ceiling space above ground floor Kitchen	Lead
ES7155: AS4	11.03.18	Vermiculite ceiling within first floor Classroom 0200	Asbestos
ES7155: AS5	11.03.18	Vinyl flooring within first floor hallway	Asbestos
ES7155: AS6	11.03.18	Dust accumulation within ceiling space above first floor hallway	Asbestos
ES7155: AS7	11.03.18	Dust accumulation within ceiling space above first floor hallway	Lead
ES7155: AS8	11.03.18	Lead paint on glossy blue doors within first floor	Lead
ES7155: AS9	11.03.18	Lead paint on glossy grey doors within first floor	Lead

**Samples were processed and sent to a NATA Registered Laboratory under Chain of Custody*

3.7 Areas Not Accessible/Not Inspected/Not Sampled

It is noted that given the constraints of practicable access encountered during the risk assessment survey, the following areas were not accessed or inspected:

- Ground floor store room adjacent to air conditioning plant. Access unavailable. Locked. Unlikely to contain hazardous materials.
- First Floor Classroom 0301. Access unavailable. Locked. Unlikely to contain hazardous materials. Presumed similar layout to Classroom 0300 which was inspected.
- First Floor “The Founder’s Room”. Access unavailable. Locked. Unlikely to contain hazardous materials.
- First Floor Ladies “Staff & Visitor’s” Toilets. Not inspected. Unlikely to contain hazardous materials. Presumed similar layout to adjacent Gentlemen’s toilets.

- All Electrical Distribution Boards within the building was inspected but not sampled due to live electricity. Unlikely to contain hazardous materials within electrical backing boards. Caution taken when dismantling the electrical boards and our office contacted if any suspect materials are identified.
- Exterior roofing structures of the building. Access unavailable. Unlikely to contain hazardous materials. Caution taken when dismantling the roofing structures of the building and our office contacted if any suspect materials are identified.
- Third floor Library offices. The majority of the offices were locked and inaccessible. Unlikely to contain hazardous materials.
- Vermiculite ceilings within the third floor Library not sampled as they were similar to sample AS4.

4.0 RESULTS

The results of the field sampling are provided in the following tables.

Table 3: Results for Asbestos Containing Materials

Sample No.	Sample Location & Description	Asbestos Detected
ES7155:AS1	Fibre-cement Sheeting - External northern façade awning above emergency exit	No Asbestos detected
ES7155:AS2	Dust accumulation within ceiling space above ground floor Kitchen	No Asbestos detected
ES7155:AS4	Vermiculite ceiling within first floor Classroom 0200	No Asbestos detected
ES7155:AS5	Vinyl flooring within first floor hallway	No Asbestos detected
ES7155:AS6	Dust accumulation within ceiling space above first floor hallway	No Asbestos detected

Test Method AN602 – Qualitative identification of Asbestos Fibres, Synthetic Mineral Fibres and Organic Fibres in bulk samples using Polarised Light Microscopy and Dispersal Staining Techniques.

As indicated in Table 5 above, no Asbestos was detected in samples collected.

Table 4: Results for Lead Containing Paint Materials

Sample	Description	Lead in Paint (mg/kg)	Lead in Paint %
ES7155: AS3	Dust accumulation within ceiling space above ground floor Kitchen	88.1	0.00881
ES7155: AS7	Dust accumulation within ceiling space above first floor hallway	33.4	0.00334
ES7155: AS8	Lead paint on glossy blue doors within first floor	161	0.0161
ES7155: AS9	Lead paint on glossy grey doors within first floor	8	0.0008
Threshold Level (NHMRC – 2001)		**1,000**	**0.1**

Test Method: EG005T Total Metals by ICP-AES
NEPM 2013 LOR = 5mg/kg
Results assessed against existing old paint guidelines as buildings have been unoccupied for over eight years.

*Australian maximum allowable lead concentration in house paint from 1997 (NHMRC)
* For existing old paint, levels exceeding **1.0% lead (10,000mg/kg)** should be managed in accordance with AS4361.1 – *1995 Guide to Lead Paint Management, Part 1: Industrial Applications* and AS4361.2 – *1998 Guide to Lead Paint Management Part 2 – Residential and Commercial Buildings*.
* For new paint, levels exceeding **0.1% lead (1,000mg/kg)** should be managed in accordance with the aforementioned guidelines.

As indicated in Table 5 above, the concentration of lead within all the paint samples collected were below the relevant threshold level (NHMRC-2001).

5.0 FIELDWORK OBSERVATIONS

During the inspection on Sunday 11th March 2018, the following observations were undertaken within the boundaries of the site, which may also contain potential hazardous materials, however at the time of the inspection, sampling of the potentially hazardous materials were unable to be undertaken due to height restrictions, health and safety issues, confined spaces, inaccessibility or the like.

- Exterior roof, flashings and gutters of Library. No sampling due to inaccessibility and height restrictions. **Unlikely to contain hazardous materials.**
- Electrical Distribution Boards. No sampling due to live electricity. **Unlikely to contain hazardous materials.**

6.0 RISK ASSESSMENT

Risk Assessment is the overall process of risk identification, risk analysis and risk evaluation. The purpose of a risk assessment is to allow informed decisions to be made about hazardous material control measures, induction and training, air monitoring and health surveillance requirements.

The semi-quantitative risk assessment process adopted by Aargus is based on *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines* (Standards Australia, 2009). The risk assessment algorithm adopted by Aargus is based on HG264 Asbestos: The Survey Guide (UK Health and Safety Executive 2010). The potential risk factors posed by ACM in premises are influenced by a number of interrelated factors including:

- ACM classification and potential for fibre release (e.g. is the material bound by another stable matrix as in bonded ACM or soft and unbound with a high potential for fibre release as in friable ACM);
- Degree of damage / weathering (e.g. is the material weathered or damaged);
- Management such as encapsulation or enclosure (e.g. is the material effectively managed by way of encapsulation or enclosure);
- Potential for disturbance (i.e. how likely is the item / material likely to be disturbed given the location, extent, potential for fibre release); and
- Location (e.g. is the material indoors within a constricted space or outdoors).

The risk assessment for the survey of the nominated property within this report has been determined in accordance with Appendix D.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Asbestos Containing Materials

No Asbestos fibre containing construction materials have been identified within the exterior or interior of the Library, including ceiling voids.

Prior to demolition or refurbishment work this document must be provided as a register to the demolition/building contractor.

If previously unidentified materials (potentially containing asbestos) are identified during the demolition phase, works should cease and the material should be inspected and classified by an experienced consultant. The area should be isolated and barricaded until the material has been classified as non-hazardous or removed and the area cleared.

7.2 Lead Paint

- No Lead Paint materials were identified within the exterior and interior of the building.

7.3 PCB Containing Electrical Equipment

- No potential PCB containing capacitors were visually identified within the building.

- All fluorescent light fittings within all the buildings unless confirmed otherwise by inspection in the presence of a licensed electrician appeared new and in good condition.

7.4 SMF Materials

- No potential sources of SMF containing materials have been visually identified within the building.
- All roofing insulation appeared to be new and in good condition.

In Summary

Due to the absence of Hazardous Material located at the premises inspected, no *'Hazardous Materials Register'* is included with this report. The results within this report are indicative of all exterior/interior building and associated structures.

Copies of the register must be kept by the site owner and a copy placed at an allocated position near the entrance of the property. The register may not contain all hazardous materials at the nominated site and may preclude areas where no access was made available for various reasons. This register should be read by any employer or self-employed person who proposes to carry out work involving dismantling part of the building. The register is provided if the building or part of it or essential plant in or on it is to be demolished. The register is to be supplied to any principal contractor working on the premise. The register is to be supplied on the sale of the building to the buyer and the report is to be provided to contractors as part of any demolition program.

In conclusion, our findings have satisfied the expected Woollahra Municipal Council Development Consent requirements for a hazardous materials survey to be conducted at the property and have determined that the site, as it currently stands, presents minimal environmental or human health concerns from asbestos, synthetic mineral fibres, lead in paint and PCB contamination.

We would be pleased to provide further information on any aspects of this report.

For and on behalf of

Aargus Pty Ltd

Con Kariotoglou
Project Manager / WHS Consultant
NSW WorkCover Approved Asbestos Assessor
Licence No. LAA001006

Reviewed By:

Mark Kelly
Environmental Manager

8.0 LIMITATIONS

All work is conducted in a professional manner, with due diligence and appropriate care. However due to the disproportionate cost of potential damages or liability relative to the cost of our services, Aargus cannot offer any guarantee that all hazardous materials have been identified. Subsequently, Aargus' liability to the client or any other party resulting from the assessment, whether under contract law, tort law or otherwise, is waivered. No liability is taken for materials not assessed or areas not inspected.

If during future work materials which are suspected of being hazardous are identified, all work within the area of concern should cease, the suspect materials should be sent for laboratory analysis and expert advice should be sought from an Occupational Hygienist.

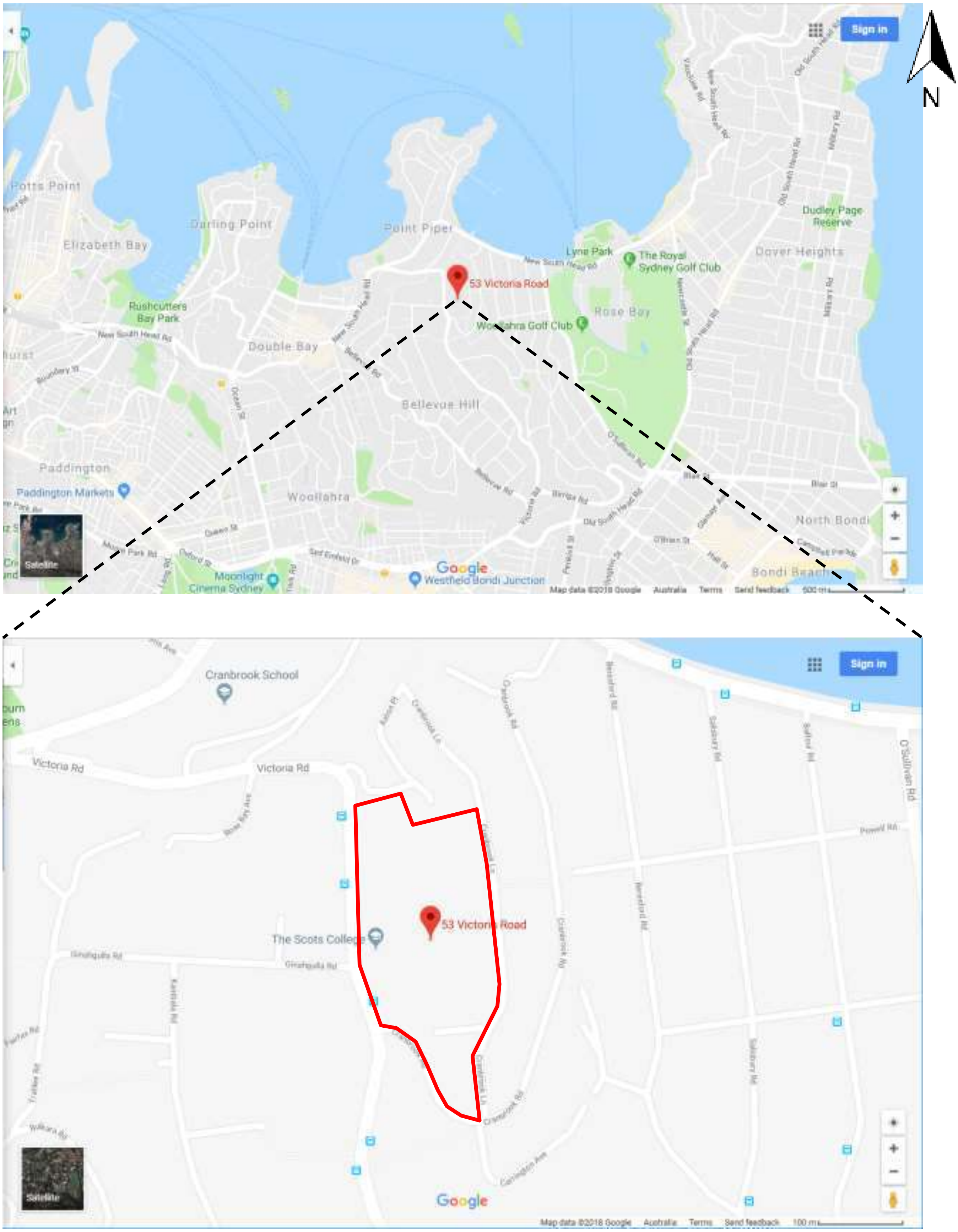
Aargus reports are not to be reproduced or reviewed except in full. All reports are prepared for a particular client's objective and therefore should not be used by any third party as a basis for future decision-making. The client is addressed at the front of this report.

APPENDIX A

SITE LOCATION & SITE FEATURES

Aargus

SITE LOCALITY MAP



Source: https://www.google.com.au/maps

PROJECT DETAILS		DRAWING DETAILS			
Project Title	Hazardous Materials Assessment	Figure No.	1	Rev No.	0
Project No.	ES7155	Scale	As above	Size	A4
Client	The Scots College C/- Impact Group Pty Ltd	Drawn by	CK	Date	11.03.18
Site Address	29-53 Victoria Street, Bellevue Hill NSW	Approved by	MK	Date	11.03.18

Aargus

SITE FEATURES

N

LEGEND

1. Scots College – Sports field & Tennis Courts
2. Scots College - Buildings
3. Scots College – TSC Stevenson Library – HAZMAT investigation
4. Neighbouring Low Density Residential properties

Source: https://www.google.com.au/maps

PROJECT DETAILS		Aargus	**DRAWING DETAILS**			
Project Title	Hazardous Materials Assessment		**Figure No.**	2	**Rev No.**	0
Project No.	ES7155		**Scale**	As above	**Size**	A4
Client	The Scots College C/- Impact Group Pty Ltd		**Drawn by**	CK	**Date**	06.03.18
Site Address	29-53 Victoria Street, Bellevue Hill NSW		**Approved by**	MK	**Date**	06.03.18

APPENDIX B

SITE PHOTOGRAPHS

Aargus

SITE PHOTOGRAPHS

Client:	Scots College C/- Impact Group Pty Ltd
Project:	HAZMAT
Site Location:	29-53 Victoria Street, Bellevue Hill NSW
Job No.:	ES7155
Photos Taken By:	CK

ACM = Asbestos Containing Materials, SMF = Synthetic Mineral Fibres, PCB = Poly Chlorinated Biphenyls

Aargus

Photograph N° 1

View of TSC Stevenson Library, Scots College.
Showing eastern facade of building.

Photograph N° 2

View of TSC Stevenson Library, Scots College.
Showing southern facade of building.
Looking north. Inspected 11.03.2018

Photograph N° 3

View of TSC Stevenson Library, Scots College.
Showing eastern aluminium awning.
Looking north. Inspected 11.03.2018

Photograph N° 4

View of TSC Stevenson Library, Scots College.
Showing typical aluminium windows throughout building.
Inspected 11.03.2018

Photograph N° 5

View of TSC Stevenson Library, Scots College.
Showing **Sample AS1 location.** Fibre-plaster material awning above emergency exit along northern facade.

Photograph N° 6

View of TSC Stevenson Library, Scots College.
Showing air conditioning plant for Library along northern facade. Inspected 11.03.2018

SITE PHOTOGRAPHS

Client:	Scots College C/- Impact Group Pty Ltd
Project:	HAZMAT
Site Location:	29-53 Victoria Street, Bellevue Hill NSW
Job No.:	ES7155
Photos Taken By:	CK

ACM = Asbestos Containing Materials, SMF = Synthetic Mineral Fibres, PCB = Poly Chlorinated Biphenyls

Aargus

Photograph Nº 7

View of TSC Stevenson Library, Scots College.
Showing ground level cafeteria.

Photograph Nº 8

View of TSC Stevenson Library, Scots College.
Showing ground level meeting room adjacent to cafeteria. Inspected 11.03.2018

Photograph Nº 9

View of TSC Stevenson Library, Scots College.
Showing ground level cafeteria kitchen.
Inspected 11.03.2018

Photograph Nº 10

View of TSC Stevenson Library, Scots College.
Showing plasterboard ceiling panels above ground level cafeteria kitchen. Inspected 11.03.2018

Photograph Nº 11

View of TSC Stevenson Library, Scots College.
Showing **Sample AS2 & AS3 locations**. Ceiling space dust above level cafeteria kitchen. Inspected 11.03.2018

Photograph Nº 12

View of TSC Stevenson Library, Scots College.
Showing northern ground level store room.
Inspected 11.03.2018

SITE PHOTOGRAPHS

Client:	Scots College C/- Impact Group Pty Ltd
Project:	HAZMAT
Site Location:	29-53 Victoria Street, Bellevue Hill NSW
Job No.:	ES7155
Photos Taken By:	CK

ACM = Asbestos Containing Materials, SMF = Synthetic Mineral Fibres, PCB = Poly Chlorinated Biphenyls

Aargus

Photograph Nº 13

View of TSC Stevenson Library, Scots College.
Showing first level hallway.

Photograph Nº 14

View of TSC Stevenson Library, Scots College. Showing first level classroom 0200.
Inspected 11.03.2018

Photograph Nº 15

View of TSC Stevenson Library, Scots College.
Showing **Sample AS4 location**. Vermiculite ceilings in classroom 0200. Inspected 11.03.2018

Photograph Nº 16

View of TSC Stevenson Library, Scots College.
Showing **Sample AS5 location**. Vinyl flooring within hallway.
Inspected 11.03.2018

Photograph Nº 17

View of TSC Stevenson Library, Scots College.
Showing **Sample AS6 & AS7 locations**. Ceiling space dust above first level hallway. Inspected 11.03.2018

Photograph Nº 18

View of TSC Stevenson Library, Scots College.
Showing **Sample AS6 & AS7 locations**. Ceiling space dust above first level hallway. Inspected 11.03.2018

SITE PHOTOGRAPHS

Client:	Scots College C/- Impact Group Pty Ltd
Project:	HAZMAT
Site Location:	29-53 Victoria Street, Bellevue Hill NSW
Job No.:	ES7155
Photos Taken By:	CK

ACM = Asbestos Containing Materials, SMF = Synthetic Mineral Fibres, PCB = Poly Chlorinated Biphenyls

Photograph Nº 19

View of TSC Stevenson Library, Scots College. Showing **Sample AS8 locations**. Lead paint on first

Photograph Nº 20

View of TSC Stevenson Library, Scots College. Showing **Sample AS8 locations**. Lead paint on first level grey doors. Inspected 11.03.2018

Photograph Nº 21

View of TSC Stevenson Library, Scots College. Showing second level classroom 0300. Inspected 11.03.2018

Photograph Nº 22

View of TSC Stevenson Library, Scots College. Showing second level classroom 0300. Inspected 11.03.2018

Photograph Nº 23

View of TSC Stevenson Library, Scots College. Showing second level classroom 0301. Locked and inaccessible.Inspected 11.03.2018

Photograph Nº 24

View of TSC Stevenson Library, Scots College. Showing second level The Founders' Room. Locked and inaccessible.Inspected 11.03.2018

SITE PHOTOGRAPHS

Client:	Scots College C/- Impact Group Pty Ltd
Project:	HAZMAT
Site Location:	29-53 Victoria Street, Bellevue Hill NSW
Job No.:	ES7155
Photos Taken By:	CK

ACM = Asbestos Containing Materials, SMF = Synthetic Mineral Fibres, PCB = Poly Chlorinated Biphenyls

Photograph Nº 25

View of TSC Stevenson Library, Scots College.
Showing Staff and Visitors Toilets.

Photograph Nº 26

View of TSC Stevenson Library, Scots College.
Showing Male Toilets.
Inspected 11.03.2018

Photograph Nº 27

View of TSC Stevenson Library, Scots College.
Showing third level classroom Library.
Inspected 11.03.2018

Photograph Nº 28

View of TSC Stevenson Library, Scots College.
Showing third level classroom Library.
Inspected 11.03.2018

Photograph Nº 29

View of TSC Stevenson Library, Scots College.
Showing Vermiculite ceiling above Library reception area.
As per Sample AS4 location. Inspected 11.03.2018

Photograph Nº 30

View of TSC Stevenson Library, Scots College.
Showing third floor Library typical office area.
Inspected 11.03.2018

APPENDIX C

LABORATORY CERTIFICATES

Aargus

AUSTRALIAN SAFER ENVIRONMENT & TECHNOLOGY PTY LTD

ABN 36 088 095 112

Our ref : ASET63152/ 66332 / 1 - 5
Your ref : ES7155 - HAZMAT - Bellevue Hill
NATA Accreditation No: 14484

WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025.

15 March 2018

Aargus Pty Ltd.
6 Carter Street
Lidcombe NSW 2141

Attn: Mr Con Kariotoglou

Dear Con

Asbestos Identification

This report presents the results of five samples, forwarded by Aargus Pty Ltd. on 14 March 2018, for analysis for asbestos.

1.Introduction: Five samples forwarded were examined and analysed for the presence of asbestos.

2. Methods : The samples were examined under a Stereo Microscope and selected fibres were analysed by Polarized Light Microscopy in conjunction with Dispersion Staining method **(Australian Standard AS 4964 - 2004 and Safer Environment Method 1 as the supplementary work instruction) (Qualitative Analysis only).**

3. Results :

Sample No. 1. ASET63152 / 66332 / 1. AS1.
Approx dimensions 3.0 cm x 1.5 cm x 0.45 cm
The sample consisted of a fragment of a fibro plaster cement material containing organic fibres.
No asbestos detected.

Sample No. 2. ASET63152 / 66332 / 2. AS2.
Approx dimensions 10.0 cm x 10.0 cm x 0.3 cm
The sample consisted of a mixture of dust particles, sand, organic fibres, synthetic mineral fibres, fragments of plaster, paint flakes, cement and plant matter.
No asbestos detected.

Sample No. 3. ASET63152 / 66332 / 3. AS4.
Approx dimensions 4.0 cm x 4.0 cm x 0.5 cm
The sample consisted of fragments of a soft plaster material containing vermiculite like material.
No asbestos detected.

Sample No. 4. ASET63152 / 66332 / 4. AS5.
Approx dimensions 1.5 cm x 1.0 cm x 0.2 cm
The sample consisted of a fragment of a linoleum material.
No asbestos detected.

Sample No. 5. ASET63152 / 66332 / 5. AS6.
Approx dimensions 10.0 cm x 1.0 cm x 0.4 cm
The sample consisted of a mixture of dust particles, sand, organic fibres, synthetic mineral fibres, fragments of plaster, paint flakes, cement and plant matter.
No asbestos detected.

Analysed and reported by,

Nisansala Maddage. BSc(Hons), Grad Dip (Occ Hyg)
Occupational Hygienist/Approved Identifier
Approved Signatory

WORLD RECOGNISED
ACCREDITATION

Accredited for compliance with ISO/IEC 17025.

The results contained in this report relate only to the sample/s submitted for testing. Australian Safer Environment & Technology accepts no responsibility for whether or not the submitted sample/s is/are representative. Results indicating "No asbestos detected" indicates a reporting limit specified in AS4964 -2004 which is 0.1g/ Kg (0.01%). Any amounts detected at assumed lower level than that would be reported, however those assumed lower levels may be treated as "No asbestos detected" as specified and recommended by AS4964-2004. Trace / respirable level asbestos will be reported only when detected.

ASET63152 / 66332 / 1-5

AARGUS PTY LTD

Laboratory Test Request / Chain of Custody Record

446 Parramatta Road
PETERSHAM NSW 2049
P O Box 398 Tel: 1300 137 038
DRUMMOYNE NSW 1470 Fax: 1300 136 038

Email reports: cynthia@aargus.net; dereck@aargus.net; mark.kelly@aargus.net; con@aargus.net; anika@aargus.net

TO: ASET - Australian Safer Environment & Technology Pty Ltd, Sydney Suite 710 / 90 George Street PO Box 1644 HORNSBY, NSW 2077 HORNSBY WESTFIELD NSW 1635	Sampling Date: 11.03.2018 Job No: ES7155 Sampled By: CK Project: HAZMAT
PH: 02 9987 2183 FAX: 02 9987 2151 ATTN: Samples Receipt EMAIL asel@bigpond.net.au	Project Manager: CK Location: Bellevue Hill

Results required by: Friday 16th March 2018

Sampling details			Sample type											
Location	Depth (m)	Date	Soil	Metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	TPH	BTEX	PAH	Phenols	VOC		Asbestos Presence / Absence	Asbestos %w/w	Analysis Suite(s)	KEEP SAMPLE?
1 AS1	-	11.03.2018	fibre-cement								✓			YES
2 AS2	-	11.03.2018	dust								✓			YES
3 AS4	-	11.03.2018	vermiculite								✓			YES
4 AS5	-	11.03.2018	vinyl tile								✓			YES
5 AS6	-	11.03.2018	dust								✓			YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
Con Kariotoglou	CK	12.03.2018	Josh	[signature]	14/3 330Pm

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sample (glass jar)	DSP	Disturbed soil sample (small plastic bag)
WP	Water sample, plastic bottle	DSG	Disturbed soil sample (glass jar)	✓	Test required
GV	Glass vial	OTH	Other	ACAN	Air sample, canister

* mole H^+/tonne

RECEIVED
14 MAR 2018
BY: SW

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1807926**	Page	: 1 of 4
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CLAUDIA @AARGUS	Contact	: Customer Services ES
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 1300137038	Telephone	: +61-2-8784 8555
Project	: ES7155 HAZMAT	Date Samples Received	: 15-Mar-2018 10:30
Order number	:	Date Analysis Commenced	: 16-Mar-2018
C-O-C number	: ----	Issue Date	: 19-Mar-2018 17:45
Sampler	: CK		
Site	: BELLEVUE HILL		
Quote number	: EN/222/17		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
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.

- EA144: NATA accreditation covers the standard 8 metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg)
- EA144: The metal concentration in the filter is reported in µg/filter on a total filter basis calculated up from the proportion of the filter paper analysed.

Analytical Results

Sub-Matrix: **DUST** (Matrix: **AIR**)			Client sample ID	**AS3**	**AS7**	**----**	**----**	**----**
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES1807926-001**	**ES1807926-002**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EA144A: Suite A Particulate Base Metals in Filter Papers								
Lead	7439-92-1	0.5	µg/filter paper	**88.1**	**33.4**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: PAINT
(Matrix: SOIL)

			Client sample ID	AS8	AS9	----	----	----
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1807926-003	ES1807926-004	--------	--------	--------
				Result	Result	----	----	----
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	5	mg/kg	161	8	----	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1807926**		Page	: 1 of 3
Client	: **AARGUS PTY LTD**		Laboratory	: Environmental Division Sydney
Contact	: CLAUDIA @AARGUS		Contact	: Customer Services ES
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047		Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 1300137038		Telephone	: +61-2-8784 8555
Project	: ES7155 HAZMAT		Date Samples Received	: 15-Mar-2018
Order number	:		Date Analysis Commenced	: 16-Mar-2018
C-O-C number	: ----		Issue Date	: 19-Mar-2018
Sampler	: CK			
Site	: BELLEVUE HILL			
Quote number	: EN/222/17			
No. of samples received	: 4			
No. of samples analysed	: 4			

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1500921)									
ES1807926-003	AS8	EG005P: Lead	7439-92-1	5	mg/kg	161	148	8.38	0% - 20%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **AIR**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA144A: Suite A Particulate Base Metals in Filter Papers (QCLot: 1500919)								
EA144A-MS: Lead	7439-92-1	0.5	µg/filter paper	<0.5	----	----	----	----

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1500921)								
EG005P: Lead	7439-92-1	5	mg/kg	<5	50 mg/kg	106	81	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1807926**	Page	: 1 of 4
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CLAUDIA @AARGUS	Telephone	: +61-2-8784 8555
Project	: ES7155 HAZMAT	Date Samples Received	: 15-Mar-2018
Site	: BELLEVUE HILL	Issue Date	: 19-Mar-2018
Sampler	: CK	No. of samples received	: 4
Order number	:	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **AIR**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA144A: Suite A Particulate Base Metals in Filter Papers							
Snap Lock Bag (EA144A-MS) AS3, AS7	**11-Mar-2018**	**16-Mar-2018**	07-Sep-2018	✓	**16-Mar-2018**	07-Sep-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES							
Snap Lock Bag (EG005P) AS8, AS9	**11-Mar-2018**	**16-Mar-2018**	07-Sep-2018	✓	**16-Mar-2018**	07-Sep-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **AIR**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB)							
Filter paper analysis for suite A by ICPMS	EA144A-MS	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Total Metals by ICP-AES (Paint matricies)	EG005P	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Metals by ICP-AES (Paint matricies)	EG005P	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Metals by ICP-AES (Paint matricies)	EG005P	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Filter paper analysis for suite A by ICPMS	EA144A-MS	AIR	In house: Referenced to AS2800-1985. Residue in air from either High Volume samplers or personal OH&S papers are digested in Nitric acid and analyzed for metals.
Total Metals by ICP-AES (Paint matricies)	EG005P	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals in paint are determined following a specific acid digestion. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. ALS is not NATA accredited for this service.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Particulate Base Metals - HVS	EA144	AIR	In house: Referenced to AS2800-1985 Residue in air from either High Volume samplers or personal OH&S papers are digested in Nitric acid and analyzed for metals.
Preparation of Acid Extracts of Paints	EN37	SOIL	In house: Referenced to AS/NZS 1580.1.501. Samples are digested with Nitric acid prior to analysis.

Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1807926**

Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CLAUDIA @AARGUS	Contact	: Customer Services ES
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: CLAUDIA@AARGUS.NET	E-mail	: ALSEnviro.Sydney@alsglobal.com
Telephone	: +61 1300137038	Telephone	: +61-2-8784 8555
Facsimile	: +61 1300136038	Facsimile	: +61-2-8784 8500
Project	: ES7155 HAZMAT	Page	: 1 of 3
Order number	:	Quote number	: EB2017AARGUS0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: BELLEVUE HILL		
Sampler	: CK		

Dates

Date Samples Received	: 15-Mar-2018 10:30	Issue Date	: 16-Mar-2018
Client Requested Due Date	: 16-Mar-2018	Scheduled Reporting Date	: **19-Mar-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 23.6'C
Receipt Detail	:	No. of samples received / analysed	: 4 / 4

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Filter paper analysis for suite A by ICPMS : EA144A-MS		
AS3	- Snap Lock Bag	- Personal Filter
AS7	- Snap Lock Bag	- Personal Filter

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **AIR**

Laboratory sample ID	Client sampling date / time	Client sample ID	AIR - EA144A-MS Filter paper analysis for suite A by ICPMS
ES1807926-001	11-Mar-2018 00:00	AS3	✓
ES1807926-002	11-Mar-2018 00:00	AS7	✓

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EG005P Total Metals by ICP-AES (Paint Matrices)
ES1807926-003	11-Mar-2018 00:00	AS8	✓
ES1807926-004	11-Mar-2018 00:00	AS9	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- *AU Certificate of Analysis - NATA (COA)	Email	anika@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	anika@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	anika@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	anika@aargus.net
- A4 - AU Tax Invoice (INV)	Email	anika@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	anika@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	anika@aargus.net
- EDI Format - XTab (XTAB)	Email	anika@aargus.net
CLAUDIA @AARGUS		
- *AU Certificate of Analysis - NATA (COA)	Email	CLAUDIA@AARGUS.NET
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	CLAUDIA@AARGUS.NET
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	CLAUDIA@AARGUS.NET
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	CLAUDIA@AARGUS.NET
- A4 - AU Tax Invoice (INV)	Email	CLAUDIA@AARGUS.NET
- EDI Format - ENMRG (ENMRG)	Email	CLAUDIA@AARGUS.NET
- EDI Format - ESDAT (ESDAT)	Email	CLAUDIA@AARGUS.NET
- EDI Format - XTab (XTAB)	Email	CLAUDIA@AARGUS.NET
CON KARIOTOGLOU		
- *AU Certificate of Analysis - NATA (COA)	Email	con@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	con@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	con@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	con@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	con@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	con@aargus.net
- EDI Format - XTab (XTAB)	Email	con@aargus.net
DERECK		
- *AU Certificate of Analysis - NATA (COA)	Email	dereck@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	dereck@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	dereck@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	dereck@aargus.net
- A4 - AU Tax Invoice (INV)	Email	dereck@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	dereck@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	dereck@aargus.net
- EDI Format - XTab (XTAB)	Email	dereck@aargus.net
MARK KELLY		
- *AU Certificate of Analysis - NATA (COA)	Email	mark.kelly@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mark.kelly@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mark.kelly@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mark.kelly@aargus.net
- A4 - AU Tax Invoice (INV)	Email	mark.kelly@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	mark.kelly@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	mark.kelly@aargus.net
- EDI Format - XTab (XTAB)	Email	mark.kelly@aargus.net

AARGUS PTY LTD

Laboratory Test Request / Chain of Custody Record

446 Parramatta Road
PETERSHAM NSW 2049

P O Box 398
DRUMMOYNE NSW 1470

Tel: 1300 137 038
Fax: 1300 136 038

Email reports & invoices: cynthia@aargus.net; dereck@aargus.net; mark.kelly@aargus.net; con@aargus.net; anika@aargus.net

TO: ALS (Australian Laboratory Services)
277 - 289 Woodpark Road
Smithfield, NSW 2164

PH: 02 8784 8555 FAX: 02 8784 8500

ATTN: Brenda Hong

Sampling Date: 11.03.2018 Job No: ES7155

Sampled By: CK Project: HAZMAT

Project Manager: CK Location: Bellevue Hill

Results By: Friday 16th March 2018

Quotation number (if applicable): SY/418/15

Location	Depth (m)	Date	Sample type: Soil	Sample type: Water	Heavy Metals As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	TPH and BTEX	PAH			Lead Paint	Lead in Dust			Schedule Suite	KEEP SAMPLE
AS3	-	11.03.2018	dust								✓				YES
AS7	-	11.03.2018	dust								✓				YES
AS8	-	11.03.2018	paint flakes							✓					YES
AS9	-	11.03.2018	paint flakes							✓					YES

Relinquished by: Name		Signature	Date	Received by: Name	Signature	Date
Con Kariotoglou		CK	12.03.2018	NT		15/03/18, 10:30

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sample (glass jar)	DSP	Disturbed soil sample (sm
WP	Water sample, plastic bottle	DSG	Disturbed soil sample (glass jar)	✓	Test required

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Environmental Division
Sydney
Work Order Reference
ES1807926

Telephone : +61-2-8784 8555

APPENDIX D

ASBESTOS RISK ASSESSMENT

Aargus

Environmental - Remediation - Engineering - Laboratories - Drilling

ASBESTOS RISK ASSESSMENT HAZARD LEVELS

Risk Factor		Description	Rating
Status	Non-Friable (Bonded)	ACM with Asbestos contained in a stable matrix	1
	Friable	ACM which when dry may become crumbled, pulverised or reduced to powder using hand pressure	4
Condition Risk	Undamaged	No visible signs of damage or deterioration	1
	Fair	Some evidence of damage / deterioration	3
	Poor	ACM which is heavily damaged or deteriorated	5
Management Risk	Satisfactory	ACM which is effectively managed by encapsulation or enclosure	1
	Fair	ACM with limited management	2
	Unsatisfactory	ACM which is not adequately managed	3
Disturbance Potential	Unlikely	Not likely to be disturbed during normal operations	1
	Possible	ACM which may be disturbed during normal operations	3
	Likely	The material is likely to be disturbed during normal operations	5
Location Risk	Low	ACM is present in an open environment (ie. outdoors)	1
	Moderate	ACM is present within a semi-enclosed environment (ie. large factory or wet weather area)	2
	High	ACM is present within an enclosed or indoor environment	3

SEMI-QUALITATIVE RISK ASSESSMENT ALGORITHM

Status + Condition Risk + Management Risk + Disturbance Potential + Location Risk = <u>Risk Score</u>

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ASBESTOS RISK ASSESSMENT SCORE SHEET AND ACTION PRIORITY

Risk Score	Risk Description	Action Priority
5-10	**Low Risk** Products or materials that pose a negligible risk of exposure to Asbestos. ACM occurrences in this category are typically in good condition, are unlikely to be disturbed, and will not readily release Asbestos fibres on contact. These materials should be labelled where practicable. The material should not be unnecessarily disturbed.	**Low Priority** Monitor condition annually. Recommend that airborne fibre monitoring is conducted annually.
11-15	**Moderate Risk** Products or materials that may pose a risk of exposure to Asbestos. Bonded ACM occurrences in this category may be in poor condition, and / or be likely to be disturbed, and may readily release Asbestos fibres on contact. This category may also relate to friable ACM which is adequately managed. These materials should be labelled where practicable. The material should not be unnecessarily disturbed.	**Moderate Priority** Conduct management works within 3-6 months. Monitor condition 6-monthly. Airborne fibre monitoring at least 6-monthly.
16-20	**High Risk** Product or materials that pose an elevated risk of exposure to Asbestos. This category would usually relate to friable ACM which is not adequately managed. Management works will be required immediately. These materials and surrounding areas should be clearly signposted. The material should not be unnecessarily disturbed – an exclusion zone of approximately 5m (at least) may be required.	**High Priority** Conduct make-safe management work immediately. Monitor condition daily and/ or monthly. Regular daily and/or monthly airborne fibre monitoring considered essential.

**References: AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines (Standards Australia, 2009), HG 264 Asbestos: The Survey Guide (UK Health and Safety Executive, 2010), NSW Work Health Safety Regulations 2011, and NSW WorkCover Codes of Practice.*

APPENDIX E

GENERAL HAZARDOUS MATERIAL INFORMATION

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Environmental - Remediation - Engineering - Laboratories - Drilling

GENERAL HAZARDOUS MATERIALS INFORMATION

1.1 ASBESTOS

Asbestos is the fibrous form of various mineral silicates, which belong to the Serpentine and Amphibole groups. The more significant species of asbestos in terms of health risks include Chrysotile (white), Crocidolite (blue), Amosite (brown or grey). As a product, asbestos has a remarkable ability to resist heat and considerable resistance to acids, alkalines and other chemicals. It is also a very good non-conductor of electricity. Asbestos is found in a wide variety of materials which include insulation, roofing materials, floor tiling, cement products, resins and in many other building materials and structures.

Exposure to the asbestos dust will occur primarily during a disturbance of the material when dust is formed and dispersed as airborne contamination. Drilling, sawing, sanding, grinding and cracking of the materials will generally provide enough disturbances to create harmful dust.

Health Aspects and Exposure Standards

Inhalation of high concentrations of asbestos may result in asbestosis, a progressive scarring of lung tissue and lung cancer, or mesothelioma, a form of lung cancer. The destructive nature on lung tissues of asbestos fibres below 3 microns (3µm) in diameter has been well documented, especially that of blue and brown forms of asbestos. Common latency periods for associated diseases to develop are within 10 to 50 years, which emphasizes the need to minimize potential exposure pathways and maximizing control measures and monitoring procedures.

Any admissible exposure to airborne asbestos should be kept as low as achievable and in any case below the specified exposure standards. These standards are determined by the *National Commission for Occupational Exposures*. Below is a summary of the threshold limits for airborne concentrations measured as a time-weighted average (TWA) fibre concentration.

Table 1: Exposure Standards – TWA Fibre Concentration Limits

Asbestos Species	Concentration (fibres/mL)
Chrysotile	0.1
Crocidolite	0.1
Amosite	0.1
Other forms	0.1
Other mixtures of species	0.1

Asbestos Containing Materials

Asbestos-containing materials can be classified into the following main categories:

- Sprayed or trowelled asbestos material applied to ceilings, walls and other surfaces for fire-rating purposes. This material is commonly referred to as ***limpet asbestos.***
- Asbestos-containing insulation on pipes, boilers, tanks, ducts etc. which is often referred to as ***asbestos lagging.***
- Asbestos cement products, cementitious or concrete like products.
- Asbestos paper products, millboard in electrical switchboards or underlying lining for linoleum or vinyl floor coverings.
- Asbestos textiles, braided asbestos, rope, tape, gaskets etc. (Note that rope and millboard are potentially friable).
- Vinyl tiles, linoleum and vinyl flooring mastic and associated adhesives.
- Asbestos-containing compounds, gaskets and mastic from mechanical fittings, and roofing membranes.

- Electrical switchboards containing compressed asbestos tar electrical boards, asbestos cement sheeting, asbestos tape to spark arresters and asbestos millboard from inside auxiliary switchboxes/fuse boards.
- Roofing sealants, bituminous membranes, tar composites and similar materials were occasionally mixed with asbestos materials.
- Some office furnishings such as wall partitions may contain an asbestos cement internal lining plaster or "Stramit" type panelling. Certain types of older vinyl covered desktops and workbenches may contain an underlying asbestos millboard lining.

Sprayed Asbestos Materials

Sprayed asbestos or limpet asbestos is most often found on structural steel members to provide a fire rating. Limpet asbestos is a ***friable*** material. Friable materials are materials which can be easily crumbled, pulverised or reduced to powder by hand pressure. Limpet asbestos tends to be the most friable of all asbestos-containing materials and can contain relatively high percentage of asbestos (30% - 90%).

Limpet asbestos can slowly release fibres as the materials age i.e. as its friability increases. Direct mechanical damage or excessive machinery vibration can lead to more significant release or airborne asbestos fibres.

Asbestos Containing Lagging Materials

Insulation such as lagging usually contains a smaller percentage of asbestos (usually 20% - 50%). Protective jackets on insulation materials (such as metal jacketing or calico on pipe lagging) prevent asbestos fibre release. Physical damage to the protective jacket however, may lead to the release of respirable fibres. The binding material in the insulation can deteriorate with age rendering it more friable.

Asbestos Cement Sheeting Material

Asbestos cement products and asbestos gaskets generally do not present a significant health risk unless due to occasional damage is negligible and thus not a significant risk. Care must be taken therefore, in the removal of asbestos cement products to avoid the release of airborne fibres. Unless analysis of fibre-cement products indicates otherwise, these materials should be considered as containing asbestos.

External asbestos cement claddings become weathered after many years by gradual loss of cement from the exposed surface. This leaves loosely bound layers enriched with asbestos fibres. In other words, the material becomes more friable through the weathering process.

Asbestos Containing Vinyl Products

Vinyl tiles and linoleum flooring manufactured before 1984 may contain asbestos in various quantities in a well bound cohesive matrix. Asbestos containing vinyl floor and wall coverings generally do not present a significant health risk unless they are sanded or otherwise mechanically abraded so as to release asbestos dust. Fibre release due to occasional damage is negligible and thus not a significant health risk. Care must be taken therefore, in the removal of asbestos containing vinyl tiles to avoid the release of airborne fibres. Unless analysis of vinyl tiles and linoleum flooring indicates otherwise, these materials should be considered as containing asbestos.

Asbestos Containing Gaskets

Gaskets and sealing compounds in equipment, duct work and re-heat air conditioning boxes may contain asbestos. These should be replaced with non-asbestos equivalents during routine maintenance. In addition, asbestos containing mastic and seals in air handling duct work joints. These usually do not pose a hazard as the asbestos fibres are firmly held within plastic resinous compound and should be replaced as part of routine maintenance or removed during the demolition of the plant equipment.

Asbestos Insulation to Re-Heat Boxes

Insulation to internal lining of ductwork sections and electrical re-heat air conditioning boxes generally contain asbestos millboard. These should be replaced with non-asbestos equivalents during routine maintenance.

Asbestos Risk Assessment Factors

In summary, to access the health risk posed by the presence of asbestos-containing material, all relevant factors must be considered. These factors include:

- Evidence of physical damage;
- Evidence of water damage;
- Proximity to air plenums of direct airstream;
- Friability of asbestos material;
- Requirement for access for building operations;
- Requirement for access for maintenance operations;
- Likelihood of disturbance of the asbestos material;
- Accessibility;
- Exposed surface area;
- Environmental conditions;

These aspects are in turn judged upon (i) potential for fibre generation, and (ii) the potential for exposure. Where these factors have indicated that there is a possibility of exposure to airborne fibres, appropriate recommendations for repair, maintenance or abatement of the asbestos-containing materials are made.

The assessment of asbestos materials should be subject to periodic review. The period between each visual inspection should be determined by the condition and location of the asbestos.

1.2 SYNTHETIC MINERAL FIBRES (SMF)

In the late 1980's the International Agency for Research on Cancer (IARC) evaluated certain SMF materials as being possibly carcinogenic to humans. The similarity in application and appearance to asbestos has resulted in some community concern regarding the health effects associated with exposure to SMF.

Current medical research indicates that the slightly increased risk of lung cancer for workers employed in the early days of rockwool and slagwool manufacture, and workers in the glasswool section is not anticipated under present day working conditions. However, acute health effects such as eye, skin and upper respiratory tract irritation can occur with certain SMF products.

Caution is required when handling SMF products in order to minimise disturbance of the materials and subsequent airborne SMF fibre levels. Where SMF materials are to be installed or removed, then suitable controls and appropriate personal protection are to be provided.

It is recommended that the following Code of Practice be closely adhered to for appropriate procedures when handling such materials:

- WorkSafe Australia Synthetic Mineral Fibre, National Standard & National Code of Practice, CAN 1990.

1.3 POLYCHLORINATED BIPHENYLS (PCBs)

PCBs are usually identified as a colourless to darker coloured oily liquid. PCBs are considered probable carcinogens. They can be absorbed through the skin, inhaled as a vapour or ingested, therefore contact with them should be prevented. They are often found in old transformer and metalised capacitors of fluorescent light fittings. These synthetic compounds are chemically stable, have good insulating properties and do not degrade appreciably over time or with exposure to high temperatures. It is these properties that made PCBs useful in electrical devices.

1.4 LEAD CONTAINING PAINT

Lead Paint, as defined by the Australian Standard AS4361.2-1998 Guide to Lead Paint Management – Part 2: Residential and Commercial Buildings, is that which contains in excess of 1% Lead by weight.

Lead Carbonate (white lead) was once the main white pigment in paints for houses and public buildings. Paint with lead pigment was manufactured up until the late 1960s, and in 1969 the National Health and Medical Research Council's Uniform Paint Standard was amended to restrict lead content in domestic paint.

Many older Australian homes and buildings still contain lead paint, even though it can be covered with layers of more recent paint. Lead paint was used mainly on exterior surfaces, and to a lesser degree on interior doors plus door and window architraves, especially in undercoats and primers, where concentrations of up to 20% lead content were used. Interior walls weren't commonly painted with paint containing white lead pigment, though some colours did contain red, orange and yellow lead pigments.

All paint manufactured for Australia dwellings from the 1970s onwards have been required to contain less than 1% lead, though higher lead-content industrial paints can have been applied since then to housing and commercial buildings.

Lead in any form is toxic to humans when ingested or inhaled, with repeated transmission of particles cumulating in lead poisoning. Lead paint removal poses two potential avenues of transmission. Firstly by inhalation or ingestion by workers and public in the vicinity of the works, and secondly by the deposition of particles on nearby footpaths, streets or soil where they can be resuspended, tracked into houses or buildings where it can be inhaled or ingested.

APPENDIX F

UNEXPECTED ASBESTOS FINDS PROTOCOL

Aargus

Unexpected Asbestos Finds Protocol

In the event of an "Unexpected Asbestos Finds"

↓

Immediately cease work and contact site foreman

↓

Site Foreman to construct temporary barricading & signage to prevent worker access to the unexpected asbestos substance(s) and install appropriate "wet method" or "containment" dust control measures

↓

Site foreman to contact Client and arrange inspection by Occupational Hygienist / WHS Consultant

↓

Hygienist / Consultant to undertake detailed inspection and sampling & analysis as per the documented sampling procedures outlined in this HAZMAT or relevant Asbestos Removal Control Plan.

↓

Hygienist / Consultant to assess field screening and/or analytical results against documented site results

↓

If suspect materials and/or surrounding soils assessed are asbestos free and/or low risk to human health

↓

Site foreman to remove safety barricades and environmental controls and continue work

If asbestos materials assessed are present and high risk to human health

↓

Hygienist / Consultant to supervise remediation works and undertake validation/clearance as per the remediation/validation/clearance plan

↓

Site Foreman to remove barricades and environmental controls and continue work

↓

WHS Consultant to submit assessment/validation/clearance to site foreman for distribution

APPENDIX G

AARGUS FIELDWORK PROTOCOLS

Aargus

Environmental - Remediation - Engineering - Laboratories - Drilling

Sampling Quality & Fieldwork Assurance Protocols

NOTE:
Whilst these protocols are based upon standard industry best practice, since preparing this document, the new recently released NEPM 2013 Guidelines may provide more updated methodologies used in sampling, quality and fieldwork procedures. This document therefore is in the process of being updated.

January 2014

HEAD OFFICE: PO Box 398 Drummoyne NSW 1470
Aargus Pty Ltd ACN 050 212 710 • Aargus Holdings Pty Ltd ACN 063 579 313
Aargus Australia Pty Ltd ACN 086 993 937 • Aargus Recruitment Pty Ltd ACN 098 905 894
Telephone: 1300 137 038 • Facsimile: 1300 136 038 • Email: admin@aargus.net • Website: www.aargus.net

TABLE OF CONTENTS

LIST OF TABLES

ATTACHMENTS

Groundwater Well & Wellhead Construction Details

Asbestos Risk Assessment

1 OBJECTIVE AND SCOPE

The objective of Aargus Pty Ltd (Aargus) Protocols is to ensure that the methodology followed during fieldworks is adequate to provide data which is usable and representative of the conditions actually encountered at the site.

The scope of these protocols is to:

- Outline the methods and procedures for the field investigations during an engineering, laboratory or environmental assessment or remediation and validation program; and

- Specify methods and procedures which ensure that soil and groundwater samples recovered are representative of the actual subsurface or surface conditions at the site, as well as ensuring that the risk of introducing external contamination to samples and to the environment is minimised.

These protocols must be adhered to by Aargus personnel and by sub-contractors involved in field investigations under Aargus Management. Any deviations from these protocols should be explained within the Aargus Report to which they are attached.

2 SOIL SAMPLING

2.1 Collection methods

Possible collection methods

Soil samples are generally collected by drilling or excavating the subsurface, using one of the following drilling / excavating technique:

- Rotary air hammer
- Hand auger, trowel or manual handling (shovel)
- Solid or hollow auger
- Backhoe or Excavator

Rotary Air Hammer

The air hammer technique requires the use of synthetic blend lubricants to prevent potential contamination of the borehole if a leak were to occur. In addition, micro-filters are installed into the drilling airline to avoid contamination by hydrocarbons present in the compressed air.

Samples of rock are generally not collected. Where rock samples are needed, specialised techniques are used.

Hand auger, trowel or manual

A hand auger or trowel is generally used to investigate subsurface conditions of unconsolidated materials at shallow depths or in areas difficult to access with other equipment. Samples are recovered from the hand auger, taking care to avoid cross contamination, especially between samples from the same hole but at different depths. Sampling equipment is to be thoroughly cleaned between sampling events, in accordance with the procedures outlined in Section 2.5 Equipment decontamination. In the case of laboratory sampling, a pick and shovel can be used to gather adequate sample size as cross contamination is not considered an issue.

Solid or Hollow auger

Solid and hollow auger drilling techniques are well suited to unconsolidated materials. The main advantage of the hollow auger technique is that the drill rods allow access of sampling equipment at specified depths within the annulus of the drill rods.

Samples of soil are recovered using a split spoon sampler at specific depth intervals. The split spoon sampler is driven into the soil by the drill rig whilst attached to the end of the drill rods. The retrieved sample is then split lengthways into two halves when duplicate samples are required. A few centimetres of soil from the top of the split spoon sampler is discarded. Samples for volatile analysis are collected first, without mixing.

Test pits and trenches excavated with a backhoe or an excavator

Test Pit and Trenches excavated with a backhoe/excavator are used to collect relatively shallow (i.e. less than 3.5m depth) soil samples on occasions where:

- Access multiple sample locations at a site are needed;
- A description of the subsurface soil profile to approximately 3.5 m depth is required (generally in unsaturated conditions);
- The investigated site is free from known underground services and access problems;
- The investigated site is free from impenetrable surface or near surface layers including concrete and asphalt pavements; and
- Undisturbed soil samples are required, usually at multiple depths.

Backfilling

On completion of drilling / test pitting, the investigated locations are backfilled with cuttings and compacted. Excess drill cuttings are disposed of appropriately. If the sampling location is located in an area used for the circulation of people or vehicles, the top of the sampling location should be sealed with mortar.

2.2 Soil logging

The lithological logging of soil samples and subsurface conditions is undertaken by Aargus personnel. The soil characteristics are logged in accordance with the Australian Standard *AS1726-1993 Geotechnical Site Investigations.* This includes description of grain size, visible staining, odour and colour, and of the clues which may suggest that the soil may be contaminated. Descriptions of soils are made using the Northcote method.

2.3 Collecting soil samples

The soil sample is collected using a stainless steel trowel, split tube sampler, or directly with the hand if the sampler wears disposable gloves. Soils are quickly transferred into 250g clean amber glass jars, which have been acid washed and solvent rinsed. The jars are sealed with a screw-on teflon lined plastic lid, labelled, and placed for storage in an ice filled chest. Alternatively for engineering and laboratory sampling, 20kg plastic bulk bags are used and appropriately labelled.

2.4 Labelling of soil samples

Samples are labelled with the following information:

- Job number;
- Date of sample collection;
- Name of the Aargus professional who collected the sample; and
- Sample number: the letters used to label the samples are BH, C, SS, SP, TP and V which refer respectively to borehole samples, composite samples, surface samples, stockpile samples, test pit samples and validation samples. For borehole samples, BH3.1.0 is the sample taken from borehole 3 at 1.0m below ground level. For stockpile samples, SP1/1 is the first sample from stockpile 1. TP1.2.5 is the sample taken from testpit 1 at a depth of 2.5 metres below ground level. V3/F is the validation sample taken from location V3, the letters F N, S, E and W refer to the floor, north, south, east and west walls of an excavation; if some contamination is found in the validation sample, then chasing out of the contamination is required and in this case, the label of the sample is changed by adding /1 or /2 according to the number of times the contamination has been chased out. B stands for blind and could be B1, B2 etc. dependant on how many blind samples were taken.

2.5 Equipment decontamination

The drilling and sampling equipment are cleaned using an appropriate surfactant (e.g. phosphate-free detergent or Decon 90), then rinsed with tap water prior to final rinsing with distilled water.

The following procedures shall be followed for decontamination of drilling and sampling equipment where required:

- buckets or tubs used for decontamination shall be cleaned with tap water and detergent and rinsed with tap water before sampling commences;
- fill first bucket or tub with tap water, and phosphate free detergent;
- fill second bucket or tub with tap water;
- clean equipment thoroughly in detergent water, using a stiff brush; rinse equipment in tap water;
- dry equipment with disposable towels;

- rinse equipment by thoroughly spraying with tap water, then final rinse with distilled water;
- allow equipment to dry; and
- change water and detergent solution between sampling event where required or when water is dirty.

Sampling decontaminated equipment should be kept in a clean area to prevent cross-contamination. Equipment that cannot be thoroughly decontaminated using the detergent wash and water rinse should be cleaned with steam or high pressure water or if a cleaner is not available, not used for further sampling (and labelled clearly "not decontaminated") or discarded. Equipment decontaminated using the high pressure steam cleaner will be treated as described above. Any equipment that cannot be thoroughly decontaminated shall be discarded and replaced.

A new pair of latex gloves is used to handle each sample. Contaminated materials such as disposable clothing should be disposed of in accordance with environmental best practice.

2.6 Surveying of sampling locations

Sampling locations are generally located by measured reference to existing ground and site features, e.g. fences, buildings.

If the survey for location and elevation is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist using proprietary laser dumpies and theodolites required can be obtained by the use of Aargus field equipment. Aargus also has GPS equipment and level meters.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

3 GROUNDWATER SAMPLING

3.1 Groundwater Sampling Objectives

The primary objective of any groundwater (quality) sampling is to produce groundwater samples that are representative of groundwater in the aquifer and will remain representative until analytical determination or measurements are made.

3.2 Groundwater well construction

Typically wells are installed to gain access to the groundwater to be sampled. Well construction details will depend on hydrogeological setting of the site, for example the depth to groundwater strata present. Relevant information regarding the hydrogeological setting will have been obtained prior the development of any groundwater sampling program.

The preferred drilling methods will depend on the hydrogeological setting of the site and the objectives of the groundwater sampling program. For example, shallow wells in unconsolidated materials, such as sand, may be drilled using a hand auger. Drill rigs using solid of hollow flight augers may be used to drill deeper wells or through semi consolidated materials, such as stiff clay. Rotary air hammer drilling may be used were well is to be drilled through consolidated materials, such as rock. Soil samples may also be collected during drilling (see Section 2 SOIL SAMPLING).

Drilling methods and materials must not have an unacceptable impact on the groundwater to be sampled. For example, if groundwater from the wells is to be tested for organic analytes, petroleum based lubricants are not to be used and oil traps must be installed on compressed air lines. Drilling techniques should also minimise compaction or smearing of the boreholes wells and transport of material into different zones, in particular, when drilling through potentially contaminated material to access groundwater.

Drill cuttings accumulated over a hole are to be removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples may be collected at a range of depths in the borehole profile during drilling.

The depth of groundwater well depends of the purpose of the investigation on the soil profile and the regional geology of the area. If the borehole location is covered by concrete, coring of the superficial hard layer is undertaken first.

Petroleum based lubricants are not used on drilling and sampling equipment, instead, Teflon based greases are used where appropriate. An Aargus professional monitors and records drilling activities, procedures adopted, materials used, progress of the stages of well construction, screen location, standpipe lens, placement, of sand filters and well seals, and general completion details, as well as the lithology of the subsurface, visible staining, unusual odours and colours (if any).

The use of a rotary air hammer rig has many advantages for consolidated material (e.g. rock), including:

- Large diameter to allow precise placement of groundwater monitoring equipment;
- No injection of drilling fluids into the formation with resulting benefits in ensuring integrity of recovered samples, and therefore no need to dispose off-site drilling fluids;
- Rapid penetration in consolidated material; and
- Provision of reliable indications of saturated conditions whilst drilling.

Drill cuttings accumulated over a hole are removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples are taken at a range of depths in the borehole profile.

Construction of the monitoring well may be carried out by the Aargus professional or the drilling contractor under the direct supervision of the Aargus environmental scientist/engineer. Typically on completion of drilling, slotted heavy duty PVC pipe (generally 50mm in diameter for the installation of monitoring well) is inserted into the drilled hole. The base of the pipe is capped prior to insertion in order to prevent natural soils entering the well from below. The drilled area surrounding the pipe screen is filled with coarse-grained sand. Bentonite or cement grout seal plugs may be placed above the screen depending on the hydrogeological setting of the site and sand cement mix. Excess drill cuttings are disposed of in accordance with environmental best practice.

The Aargus professional will monitor and record drilling activities, and materials encountered during drilling (including visible staining, unusual odours and colours (if any)). They will log the procedures adopted, materials used, and well construction (i.e. location of the screen, placement of sand packs and well seals and general completion details).

3.3 Development of monitoring wells

Development is the process of removing fine sand silt and clay from the aquifer around the well screen in order to maximise the hydraulic connection between the bore and the formation.

Development involves removal of fluids that may have been introduced during drilling operations as well as fines from the sand filter and screens. Well development generally involves actively agitating the water column in the well then pumping water out until, ideally, water pumped comes out visibly clean and of constant quality. Development can be undertaken immediately after installation of the groundwater well or after sufficient time has been allowed for bentonite / grout seals to consolidate.

Bores used for groundwater quality monitoring should be developed after drilling, then left for a period until bore chemistry can be demonstrated to have stabilised, anywhere between 24 hours and 7 days.

3.4 Purging of monitoring well

In most groundwater monitoring wells, there is a column of stagnant water above the screen that remains standing in the bore between sampling rounds. Stagnant water is generally not representative of formation water because it is in contact with bore construction materials for extended periods, is in direct contact with the atmosphere and is subject to different chemical equilibrium.

Purging is the process of removing this water from the well prior to sampling. In newly installed wells, the disturbance cause by drilling may also affect water present in the well, and purging may be carried out concurrently with well development. Ideally wells should be purged at the lowest rate practicable until stable water chemistry is achieved.

Purging is to be performed less than 24 hours before sample collection, but usually it is performed just before sampling. The default procedure for purging a groundwater monitoring well is as follows:

- If required, measure the concentration of volatile organic vapours in the well standpipe headspace.
- Measure the depth to the standing water level in the well standpipe and the total depth of the well relative to a reference mark (generally the top of the groundwater pipe). The depth of any light non-aqueous phase liquids (LNAPL) floating on the standing water should be recorded if present using an interface probe or other suitable device.
- Calculate the volume of the groundwater in the well standpipe. The internal diameter of the well casing and the diameter of the drill hole are used to calculate the volume of water to be removed during development (nominally a minimum of three well volumes, including water present in the sand pack, should be abstracted during purging).

- Samples of water are collected generally following development/purging of each well volume. The samples are measured immediately in the field for water quality parameters, pH, electrical conductivity, redox potential and temperature. Water quality measurement probes are to be calibrated against stock standards on regular basis and decontaminated between wells.

- Pump/bail groundwater from the well until the water quality parameters have stabilised (i.e. within 10% of the previous reading) or the well is pumped/bailed dry. Collect all purged water into an appropriate volume measurement vessel. Purged water is disposed of appropriately.

- Record all appropriate development details on the well development and sampling sheet.

- Decontaminate all equipment used in the purging procedure.

3.5 Groundwater sampling

For each sampling event, starting water levels, purging times and volumes, water quality parameters and sample details are recorded on well development and sampling sheets.

At each groundwater monitoring well, a polyethylene sheet or Eski lid is placed beside the well head and firmly fixed into position. Sampling equipment is placed onto the sheet to avoid cross contamination between the ground surface and the groundwater in the well.

Groundwater samples are collected in a bailer (Stainless Steel or disposable polymer) fitted with an emptying device. The bailer is decontaminated prior to use. All groundwater samples are retrieved at an appropriate rate in order for turbulence (which leads to cloudy samples) to be minimised.

When collecting a water sample the bailer is lowered gently into the well, until it is within the screened interval. The bailer is then steadily withdrawn, to minimise agitation of water in the well and disturbance of the surrounding sand filter material.

The procedure for using the bailer is:

- Slowly lower the bailer into the water and allow it to sink and fill with a minimum of disturbance;

- Empty the first bailer sample into a container in order to measure the volume of bailed water and to rinse the bailer with well water;

- Emptying the bailer through the bottom-emptying device (BED) collects the samples. The sample is discharged down the side of the sample bottle to minimise entry turbulence;
- Collect samples for volatile organics first, followed by semi-volatiles, other organics and then inorganics;
- The flow from the BED is adjusted so that a relatively low flow rate is maintained.

3.6 Low flow purging

Purging large volumes of water can be impractical, hazardous or may adversely affect the contaminant distribution in the sub-surface (e.g. through dilution). Low-flow purging involves minimal disturbance of the water column and aquifer and is preferable to the removal of a number of bore volumes. This method removes only small volumes of water, typically at rates of 0.1 to 1.0L/min, at a discrete depth within the bore.

Low-flow purging consists essentially of the following steps:

- The pump inlet is carefully and slowly placed in the middle or slightly above the middle of the screened interval at the point where the contaminant concentration is required (dedicated pumps, such as bladder pumps, are ideal for low-flow sampling). Placement of the pump inlet too close to the bottom of the bore can cause increased entrainment of solids, which have collected in the bore over time.
- Purging begins, typically at a rate of 0.1 to 1.0L/min, although higher rates may be possible provident the rate of purging does not cause significant draw down in the bore.
- During purging, groundwater stabilisation parameters should be measured and recorded to determine when they stabilise.
- When parameters have stabilised, the sample may be collected, at a rate slower or equal to purge rate.

3.7 Labelling of water samples

The water samples are identified with the same information than soil samples. GW4/2 is the sample collected from well GW4, and 2 refers to the sample number from this well, i.e. second time the well is sampled.

3.8 Sampling containers

Water samples are generally collected in bottles and containers provided by the laboratory who will analyse the samples. These are generally plastic bottles for inorganic analysis, and amber glass bottles for organic analysis. Vials are used to collect samples to be analysed for volatile organics. Sampling containers have appropriate preservatives added.

The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. When performing purge and trap analyses, the vials are filled to 100% of their capacity. For headspace analyses, the vials are filled to approximately 75% of their capacity.

3.9 Well surveying

If the survey for location and elevation of a groundwater well is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist if the level of precision required can be obtained by the use of Aargus field equipment.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

If the elevation is given by a licensed surveyor, the top of the standpipe and the ground surface adjacent to the standpipe are generally given to the nearest 0.01m and may be referenced to the Australian Height Datum (AHD). Relative levels (RLs) can be used if general contours are required.

4 SURFACE WATERS AND STORMWATER SAMPLING

4.1 Surface waters

Surface water samples are collected by hand, using automatic samplers, batch samplers or continuous samplers which can be installed to take samples at discrete time intervals or continuously. For well mixed surface water samples (up to 1m depth) a sample bottle is immersed by hand covered by a glove below the surface. Samples are also taken with sample poles that have extension arms so that more representative samples can be taken. For areas where access is difficult, samples can be collected using a retractable sample extension pole (sample bottle on the end) or in a bucket and transferred to sample bottles immediately following collection.

Other methods such as pumping systems, depth samplers, automatic samplers, and integrating systems are all relatively similar with water samples being supplied to a discharge point where samples can be collected in appropriate bottles.

4.2 Stormwater

The monitoring of stormwater quality is generally required prior to reject waters into stormwater drains. Field measurements are generally carried out using a Hanna Multiprobe prior to the discharge of the water to stormwater. The water parameters measured include pH, electrical conductivity (EC, in mS/cm) and Total Dissolved Solids (TDS).

If sampling is required, samples to be analysed for inorganic compounds are collected in plastic bottles, and samples to be analysed for organic compounds are collected in amber glass bottles. The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. Sample containers may have preservatives added, in accordance with the laboratory recommendations.

Vials are used for volatile organic analysis. When performing purge and trap analysis, the vials should be filled to 100% of their capacity, whereas for headspace measurements, the vials should be filled to approximately 75% of their capacity..

4.3 Filtration devices

Water filtration devices may be required to filter surface water before it is discharged to the stormwater network, in order to remove suspended solids in water. One of the most simple and commonly used filtration device consists of between two to four retention sedimentation bays with a geotextile covering the inlet and outlet hoses.

Litter traps (wire or plastic grids or netting) may also be used to remove larger particles or debris. Other techniques to reduce the amount of suspended matter in water include wet basins, artificial wetlands, infiltration trenches and basins, sand filters and porous pavements. Some of these latter methods are also likely to reduce the bacterial levels in water.

The use of these filtration devices does not preclude carrying out monitoring of water quality following treatment and prior to discharge, particularly to the stormwater system.

5 FIELD TESTING

5.1 Field measurements

Field measurement of soils and groundwater parameters provides a rapid means of assessing certain aspects of soil and water quality. They are generally taken to:

- Ensure that formation water is being sampled
- Ensure screening of soils prepares samples for laboratory testing
- Provide on-site measurements for soil and water quality parameters that are sensitive to sampling and may change rapidly (e.g. temperature, pH, redox and dissolved oxygen (DO)).
- Compare with laboratory measurements of these parameters to assist in the interpretation of analytical results of other parameters (e.g. check for chemical changes due to holding time, preservation and transport).

Field measurements may be taken either in-situ or after groundwater has been extracted from a bore. Field measurements should be taken immediately before collecting each sample.

pH and dissolved oxygen meters need to be calibrated before every use, in accordance with the manufacturer's instructions. If field meters are to be used over several hours, periodic readings of a reference solution must be made to ensure calibration is stable.

5.2 PID Photo Ionisation Detector

Photo Ionisation Detector (PID) measurements are used to provide indicative field measurements of the amount of ionisable vapours released from a soil or water sample into the head space above the sample.

The procedure for field screening of samples using the PID is as follows:

- Prior to testing commencing, the PID is calibrated using standard laboratory calibration gas. The battery of the PID should also be sufficiently charged for the duration of the testing;

- The background concentrations of total ionisable compounds in the ambient air in the vicinity of the work area are established prior to the commencement of site activities. Background measurements are normally taken approximately 5 to 10m upwind of the work area. The readings are observed before and after each measurement of a sample to ensure that the PID is operating correctly. The maximums, fluctuations and other relevant comments are recorded.
- A glass sample jar is filled with the soil sample to be tested. The jar should not be filled more than 3/4 full;
- The jar is sealed with aluminium foil or plastic wrap and the lid is screwed;
- At least 20 minutes after placing the sample into the sampling jar, check that the PID reading is constant and similar to the background. Insert the top of the PID through the foil or plastic wrap in order to measure the ionisable vapour concentrations in the airspace above the sample;
- Monitor and record the PID readings noting fluctuations and maximum readings;
- Monitor the readings after returning the PID to a location with background concentrations. Interchangeable, clean, in-line filters for the PID probe are available to allow rapid decontamination of the unit in the field if background readings measured by the instrument are significantly greater than the background air concentration initially established;
- If perforations are present in the aluminium foil prior to analysis reseal the jar and test after having waited again for at least 20minutes.

An alternative acceptable method is to place the soil to be tested in a disposable zip loc plastic bag and test the sample by punching a hole in the bag with the PID tube to sample the gas from the bag.

6 ACID SULFATE SOILS

6.1 Desktop Classification

An initial review of Acid Sulphate Soils (ASS) Planning Maps is undertaken to identify the likelihood and risk of ASS being present at the site. The following geomorphic conditions of the site are also checked as an indication of the presence of

ASS: sediments of recent geological age (Holocene) ~ 6000 to 10 000 years old; soil horizons less than 5m AHD (Australian Height Datum); marine or estuarine sediments and tidal lakes; coastal wetlands or back swamp areas; waterlogged or scalded areas; inter-dune swales or coastal sand dunes; areas where the dominant vegetation is mangroves, reeds, rushes and other swamp tolerant and marine vegetation; areas identified in geological descriptions or in maps bearing sulfide minerals, coal deposits or former marine shales/sediments; and deeper older estuarine sediments >10m below the ground surface.

6.2 Site Walkover

The presence on site of hydrogen sulphide odours, acid scalds, flocculated iron, monosulfidic sludges, salt crusts, stressed vegetation, corrosion of concrete and/or steel structures and water logged soils are noted as cues for the presence of ASS.

6.3 Visual Classification

Visual indicators taken into account for the presence of ASS are the presence of jarosite (pale yellow colour) horizons or mottling, unripe muds (waterlogged, soft, blue grey or dark greenish grey in colour), silty sands and sands (mid to dark grey in colour) and the presence of shells.

6.4 Sample Collection

Samples are collected to at least one metre below the depth of the proposed excavation or estimated drop in the water table, or two metres below ground level, whichever is deepest. Samples are collected from every soil horizon or every 0.25m. Large shells, stones and fragments of wood, charcoal and other matter are noted, but removed from the sample. Small roots are not removed from the sample. If laboratory analysis is required, samples are sent for laboratory testing within 24 hours of sampling.

6.5 Field Testing

The field pH peroxide test (pH_{FOX}) is used to obtain an indication of the presence of oxidisable sulphur in the soil. The procedure for this test is as follows:

- A small sample of soil (<100g) is collected in a glass jar and split into two sub-samples. One sub-sample is made into a 1:5 (soil : deionised water) solution in order to measure field soil pH and electrical conductivity (EC) analysis. If the resulting pH is less than 4 (pH_F<4), the sample is identified as actual acid sulphate soil (AASS)

- The second sub-sample is made into a 1:5 (soil : Hydrogen Peroxide) solution to measure pH of oxidised soil. Sodium Hydroxide (NaOH)-adjusted analytical (30%) grade Hydrogen Peroxide (H_2O_2) is used as the soil oxidising agent. A mobile electronic pH/EC probe is used to measure soil pH.
- The presence of oxidisable sulphides, organic matter or manganese in the sample, will trigger a chemical reaction. The type of effervescence and any colour change is noted with the final pH measured to give an indication of the potential change in pH should the soil remain exposed to oxygen. If the resulting pH is less than 3 (pH_{FOX}<3) or if pH_{FOX} is at least one unit less than the $pH_{F,}$ this suggests that the soil tested is potential acid sulfate soil (PASS).

6.6 Laboratory Testing

When the field test suggests that the material tested contains ASS or PASS, this should be confirmed by laboratory analysis (POCAS/SPOCAS or TOS testing).

7 NOISE MONITORING

Measurements are taken at a range of times during the day in order to assess the trends in noise emission over time. Noise is measured using a hand-held Rion NA-29 Sound Level Meter with digital microphone. Some noise meters change and appropriate equipment which is calibrated is used for all monitoring. The reference level of the meter is checked before and after the measurements using a Rion NC-73 Sound Level Calibrator to ensure there is no significant drift. Noise measurements are made over a 15-minute interval using the “fast” response of the sound level meter. 5dB would be added if the noise is substantially tonal or impulsive in character. Measurements should be adapted to the type of noise being measured i.e. construction, occupation, club, etc.

8 DUST MONITORING

Sampling is conducted at locations of potential concern. The deposit gauge static sampler contains a glass funnel measuring approximately 150mm with the angle of the cones sides being 60 degrees, placed into a rubber stoppers in the mouth of a five-litre glass receptacle. The deposit gauge is placed in a stand so that the height of the funnel of the deposit gauge is between 1.8 and 2.2m above ground level. A quantity of 7.8g copper sulfate pentahydrate dissolved in water is placed in the glass receptacle in order to prevent algal growth.

Exposure periods vary depending on the purpose of the investigation but typically the period is 30 ±2 days. Samples are usually analysed for measured soils: total solids, insoluble solids, ash and combustible solids.

Dust can also be measured using a High Volume Air Sampler. Such sampler should be located at least 2 metre away from any structures so that an undisturbed sample can be collected. HVASs can be used indoors or outdoors.

9 ASBESTOS INSPECTION, FIELDWORK AND SAMPLING

9.1 Assessment of soils that may contain asbestos contamination

Soils that are assessed as part of an environmental site assessment may be in-situ fill soils or stockpiled soils. The site/area-specific assessment for asbestos should be made in accordance with standard site investigation procedures with care taken during the site inspection stage. Details regarding assessment for asbestos are found within the WA Department of Health guidance (DoH 2009a) guidelines and draft NEPM 2011 guidelines. The assessment process may move from a preliminary site investigation to a more comprehensive detailed site investigation where required and indicators for asbestos are present. For most cases, a detailed environmental site assessment may not be needed if no soil contamination is found other than asbestos as a management approach will be preferred and qualitative assessment of the lateral extent of soil contamination will be sufficient. The severity of Asbestos risk can be calculated using the Aargus Asbestos Risk Assessment Hazard Level sheet found in the attachments of this document.

Assessment would normally require a sampling and analysis plan (SAP) to support the investigations and also any validation sampling that occurs. A site asbestos management plan (AMP) may be required to protect the public and workers during the assessment phase, as well as long term users of the site.

Initial inspections during site and soil assessments should be grid-based as far as practical in the first instance to detect any visible asbestos. The identified areas should then be surveyed in more detail along with suspect locations indicated as a result of the desktop study. enHealth 2005 *(Appendix V: Sample inspection and investigation form)* provides an asbestos visual inspection checklist. Relevant guidelines recommend that such an approach be used to assist the systematic collection of relevant data.

Site inspection methods should be adopted to prevent further degradation or distribution of asbestos. This may include: restricted on-site use of vehicles and equipment; minimal disturbance of stockpiled or discarded materials; and the use of equipment and footwear scrub-down areas.

The most likely presence of asbestos, if present, will be visible on the surface and in significant quantities. The main exception is free fibre which will be hard to identify unless in bulk. An experienced inspector (Aargus OH&S scientist or experienced senior) is likely to identify asbestos as such, but confirmation of representative samples by analysis is appropriate if there is any uncertainty.

If the surface is heavily vegetated, then confidence in the visual inspection will be lessened. Some careful vegetation clearance may help to clarify the situation.

The inspection should also include any asbestos-containing structures, especially if in poor repair, footprints of demolished structures, and debris that has been dumped on the site, particularly demolition waste

The condition, quantities and location of the asbestos should be evaluated in general terms to inform initial remediation and management decisions. The following basic approach is generally appropriate:

- Where there is good historic information on the sources of the asbestos contamination, the estimated surface area of contamination can be considered equivalent to the visually delineated area of impact, and up to 1 m in all directions to account for uncertainty;

- The depth of contamination may be inferred from the desktop investigation, or later informed by targeted sampling. In either case, an additional 30 cm should be incorporated to account for uncertainty;

- The condition of ACM (Asbestos Cement Material) should be considered equivalent to the most degraded samples found in an area, noting that this may vary across different areas;

- Where significant amounts of free asbestos fibres may have been exposed over time, the immediate surrounding area should also be considered contaminated.

9.2 Preliminary Site Investigation

Sampling during the PSI is not normally recommended, since either a management strategy may be adequately defined based on other PSI investigation findings or because it is evident that a detailed site investigation (DSI) will be necessary anyway. Limited PSI sampling may be appropriate for the following reasons:

- To form part of the initial site or soil assessment;
- To confirm that asbestos is present/absent, including as free fibre;
- To roughly delineate the contamination's lateral and vertical extent;
- To inform the Sampling and Analysis Plan for the Detailed Site Investigation;
- To obtain a preliminary idea of appropriate management options;
- For air sampling, to ascertain what additional site-control measures are warranted or if immediate response actions are required.

PSI sampling would most likely be surface hand-picking or targeted sampling (also in accordance with general site/area soil assessment requirements as part of standard site assessments). Any sampling should be based on a Sampling and Analysis Program.

Fragments if found must be inspected by an appropriately qualified and experienced asbestos consultant (Aargus OH&S scientist or experienced senior). The default assumption should be that any suspect material does contain asbestos and appropriate management action should be initiated. Where confirmation is required regarding the nature of the fibre in the ACM, identification by transmission electron microscopy is the favoured method to determine if the suspect material in the cement matrix is asbestos.

9.3 Detailed Site Assessment

A DSI is an investigation which confirms and delineates potential or actual contamination through a comprehensive sampling program. These form part of the standard Aargus sampling protocols for site and soil assessments and elements specific to asbestos are provided below as additional items to review when taking asbestos into consideration.

A DSI is not usually required if the contamination is demonstrated to be ACM in limited quantities sitting on the soil surface (simple surface impact). Hand-picking as outlined below may be sufficient to manage this type of contamination. The AMP can be used instead for management purposes just for asbestos, although this will depend on site-specific circumstances, especially the remediation approach proposed. A DSI should only be undertaken when delineation of asbestos impacts must be accurate, such as if:

- The remediation or management approach requires asbestos to be removed or relocated from an area;
- Asbestos contamination is due to friable or free-fibre generating material;
- Land uses are to be determined and delineated according to the extent and nature of asbestos contamination.

A DSI may also help resolve uncertain findings from the PSI, or to help assess the likely effectiveness of alternative remediation and management strategies.

Care is necessary during the DSI to ensure that sampling and monitoring results are not compromised due to poor site management practices, specifically:

- Sampling should follow removal of any asbestos material that may be actively generating asbestos free fibres, such as exposed ACM products in poor condition;
- Investigations should follow any planned demolition of asbestos-containing structures or buildings, or removal of asbestos from within them, unless the demolition is closely monitored and the associated removal site is professionally validated;
- All equipment operation, vehicle movements and dust during the sampling and monitoring regime need to be carefully managed.

Qualitative assessment may be sufficient to determine that the distribution of ACM is limited and that no further action, or limited action such as removal of minor surface material, is all that is required. Where there is a concern (and a need to determine) that the level of ACM may exceed the screening criterion, quantitative assessment using a graivimetric approach may be undertaken to assess the site-specific risk. This more detailed assessment may also be carried out when ongoing management of the site under regulatory controls is a potential requirement. This approach should be checked first as in general a zero tolerance of asbestos is the preferred regulatory approach at the moment.

Detailed site assessment should be undertaken for sensitive land uses where asbestos contamination (using a gravimetric approach) is likely to approach or exceed screening criteria. This may involve a quantitative, thorough; and well-argued risk assessment involving a detailed test pit and trenching program based on site history where it is available, and appraisal of the relevant site7specific risk issues.

9.4 Sampling of Asbestos

Surface distribution - ACM fragments are often present as surface deposits on sites from past poor demolition and building practices. While isolated fragments across the surface of a site are usually of low concern, any surface material may present a risk of exposure over time from decay through corrosive weathering or abrasion by vehicle traffic and other activities. There should be no visible ACM fragments greater than 7mm x 7mm on the surface or in the top 10cm of soil, which can be achieved by multi-directional raking or tilling and hand picking (as described below). When cohesive soils or a large surface area is involved it may be more practical to skim the top 10cm of soil for disposal in accordance with regulatory requirements. The exposed surface of the site can then be further visually assessed by an appropriately qualified and experienced professional on a systematic basis where some localised hand picking or additional earthworks may be required.

ACM through a soil profile, test pits or boreholes may reveal the presence of ACM in fill through a soil profile. This can be quantified on a gravimetric basis and compared to the screening criteria in Schedule B1 of the NEPM.

Judgmental sampling targets particular areas of a site based on known or likely contamination, which is the preferred approach. It depends heavily on a thorough PSI and should reflect the state of the site at that time. Judgmental sampling can help avoid unnecessary broad area sampling. Judgmental sampling may need to be augmented or substituted by grid sampling.

Grid sampling is most appropriate when asbestos contamination is widespread or may be present at unknown locations. If the contamination is buried then test pits in particular and/or boreholes are used for either the judgmental or grid-based regimes.

The following situations are especially relevant to judgmental sampling:

- If contamination 'hot spots' are identified by the PSI, a sampling strategy is required to confirm their extent, which if indicated to be sub-surface should include test pits and stratified sampling methods;
- The SAP provides for opportunistic (discretionary) sampling to be conducted as necessary, for example, when unexpected suspect asbestos products or unusual soil strata are encountered;
- Areas that will remain covered by hardstand do not require sampling. However, if asbestos is likely, its presence will be assumed unless sampling indicates otherwise. If sampling cannot readily meet the recommended density because of hardstands, targeted sampling in key locations is suitable to allow limited characterisation of sub-surface contamination;
- If structures containing asbestos have been removed, the former 'footprint'

should be investigated, unless the removal was properly managed and documented. In addition to a visual inspection, sub-surface sampling should only be necessary if the structure was partially buried, for instance, asbestos fencing, or subsequent soil disturbance has occurred. Sampling below 30 cm depth is not generally warranted. Sampling should extend laterally up to 50 cm outside the footprint perimeter, and include soak-wells. A sampling interval of 5-10 m along and within the footprint perimeter is recommended, aligned with any adjacent grid sampling pattern;

- Disused sub-surface asbestos structures and products, such as former service trenches or piping, may be localised areas of potential contamination. If not properly documented, these should be delineated by sampling, although validation sampling would suffice if structure removal is undertaken.

Hand-picking (Emu bob) primarily refers to the visual inspection of the soil surface and manual collection of ACM, as outlined below.

Process

- Can use a rake to sample down to a depth of 10cm;
- Most suitable for ACM, and possibly for low levels of FA (Friable Asbestos);
- Relevant where contamination is known or considered only to be on or near the soil surface and may be attributed to a defined event;
- Limited application for deeper contamination or if there is surface vegetation or debris. Raking may be difficult except in sand or loose fill;
- Used to characterise the extent and level of contamination, whilst concurrently reducing its impact.

Method

- Locations and weights of asbestos material should be recorded;
- Rake teeth should be <7mm spaced apart and >10 cm long;
- At least 2 passes of picking (and of raking if appropriate) made with 90^{o} direction change between each and using a grid pattern;
- Material should not be further damaged or buried by the process;
- % contamination may be calculated, using 1 cm as soil depth for handpicking or using the rake teeth length as appropriate;

- Final visual inspection of the area should not detect surface ACM.

Tilling refers to a process of mechanically turning over surface soils to facilitate the presentation and collection of asbestos fragments. The process and its implementation are outlined below.

Process

- Most suitable for ACM, not for fibre-generating materials;
- Generally conducted across the entire zone of suspected impact;
- Relevant for contamination within top 30cm of soil;
- Limited application for deeper contamination or if there is surface vegetation or debris;
- Used to characterise the extent and level of contamination, whilst concurrently reducing ACM impact.

Method

- Usually preceded by hand-picking;
- Locations and weights of asbestos material should be recorded;
- Soils should be pre-wet to the tilling depth, and the dust controlled;
- Rotor blades should present ACM optimally for 1 or 2 spotters closely following depending on speed, till breadth and contamination level;
- At least 2 passes with 90^{o} direction change using a grid pattern;
- Material should not be further damaged or buried from the process;
- Evaluated areas normally cannot be considered representative of other locations;
- Percentage contamination may be calculated using an estimate of the average impact depth as well as the area involved;
- Final visual inspection of the area should not detect surface ACM.

Screening is applied to both the small-scale separation of ACM fragments from localised soil samples and the large-scale treatment of an area to detect and quantify asbestos contamination, with concomitant remediation. This Section deals with large-scale mechanical screening. The process and its implementation are outlined below.

Process

- Most suitable for minor ACM impact, not for fibre-generating materials;
- Other sampling methods are preferable because of potential dust/fibre generation;
- Generally conducted across the entire zone of suspected impact;
- Relevant for larger volumes of reasonably accessible and delineated contamination;
- Used to effectively characterise the extent and level of contamination, whilst concurrently reducing ACM impact.

Method

- May be preceded by hand-picking if appropriate;
- Oversized ACM may be removed by ‘screening down’ from larger mesh sizes to the final screening mesh;
- Final mesh size of <7mm is recommended. Anything larger will require validation sampling;
- ACM weights/concentrations should be closely correlated to locations or stockpiles to allow re-sampling or segregation if required;
- Impacted soil should not be mixed with other soil in a way that might compromise the concentration calculations;
- Soils should be pre-wet and procedure subject to strong dust/fibre control and monitoring measures as outlined in a Dust Management Plan;
- Evaluated areas normally cannot be considered representative of other locations;
- Percentage contamination may be calculated using the weight of ACM found

for a particular strata, area or volume;

- Final visual inspection of the stockpile surface should not detect ACM.

Test Pits and Trenching is used if asbestos extends below surface soils (>30cm), especially if contamination distribution is uncertain. Aargus recommends use of test pits instead of boreholes (where machines are available) because buried ACM and FA can be more readily identified, differing strata distinguished and there is more sampling flexibility. Specified large sample sizes should be used for both methods with reliance put on visual methods of asbestos detection and concentration calculation wherever possible. The process and its implementation are outlined below.

Process

- Suitable for all asbestos types, but especially ACM, and FA if fibre disturbance is manageable;
- Relevant if contamination is buried and of unknown location and depth.

Method

- Sampling should be conducted to 30cm below the likely lower limit of potential contamination unless this is greater than 3m;
- Suspect asbestos material or construction debris should be targeted and all sample locations noted;
- Precautions are necessary to protect workers and public from wall collapse or hole hazards, and potential fibre release from excavation/sampling.

ACM & FA

- At least one 10L sample from each relevant stratum (or per 1m depth) of one wall, and discretionary samples from other suspect spots;
- Sample screened manually on-site through a <7mm sieve or spread out for inspection on a contrasting colour material (recommended for FA);
- Identified ACM and FA weighed to calculate asbestos soil concentration for individual samples.

AF (Asbestos Fines)

- At least one wetted 500ml sample from each relevant stratum or 1m depth (if thick) of one wall, and discretionary samples from other suspect spots;
- May be done with ACM/FA sampling, or at another wall position; Whole sample submitted for laboratory analysis.

Boreholes are used generally during the site sampling process but where suspect asbestos is present and if equipment is available, TPs are recommended. Borehole sampling may be appropriate where physical obstructions may limit soil access or generation of asbestos contaminated dust is a potential problem. The sample taking and assessment is similar to that for TPs. The process and its implementation are outlined below.

Process

- Suitable for all asbestos types;
- Relevant if contamination is buried and of unknown location and depth

Method

- Sampling should be conducted to 30cm below the likely lower limit of potential contamination unless this is greater than 3m;
- Suspect asbestos material or construction debris should be targeted and all sample locations/ depths noted.

ACM & FA

- Corer diameter should be at least 15cm;
- At least one 10L sample if practical from each relevant stratum (or per 1m depth) of core. Cross-strata samples are permissible provided that asbestos detections are further investigated;
- Sample screened manually on-site through a <7mm sieve or spread out for inspection on a contrasting colour material (recommended for FA);
- Identified ACM and FA weighed to calculate asbestos soil concentration for individual samples.

AF

- At least one wetted 500ml sample from each relevant stratum (or per 1m depth);
- May be done with ACM/FA sampling;
- Whole sample submitted for laboratory analysis.

Soil stockpiles intended for use on-site and of unknown quality should be assessed for asbestos contamination. Aargus intends to adopt a conservative approach to stockpile assessment and use because of associated uncertainties and risks.

If the stockpiles originated on the site from areas not likely to be contaminated, for instance, no indication of building activity or waste, the assessment can consist of a close visual examination and hand-picking over the whole stockpile surface. If any asbestos is found or the soil came from asbestos suspect areas on site, then the stockpiles should normally be considered contaminated. These stockpiles and any imported soil, aggregate or crushed material of unknown quality should not be used as “clean” fill without further investigation and management if necessary.

The sampling regime outlined below can be used to assess better the level and nature of contamination. This is designed to be consistent with the sampling density included in standard site and soil assessments for an area likely to be contaminated.

Process

- Suitable for all asbestos types;
- Confidence in results is not as high as with other sampling procedures.

Method

- Sampling should be spread over the whole stockpile surface at a minimum rate of 14 locations per 1,000 m^3;
- If soil is subject to a conveyor process (not recommended for FA or AF) then a minimum of 1 sample should be taken per $70m^3$ of material;
- Suspect asbestos material or construction debris should be targeted and all sample locations noted.

ACM and FA

- At least one 10L sample from each location;
- Sample screened manually on-site through a <7mm sieve or spread out inspection on a contrasting colour fabric (recommended for FA);
- Identified ACM and FA weighed to calculate asbestos soil concentration for individual samples.

AF

- At least one wetted 500ml sample from each location;
- May be done with ACM/FA sampling, or at another spot;
- Whole sample submitted for laboratory analysis.

For ACM, if the contamination is below the investigation criteria then the stockpile may be used on the site as non-contaminated fill, subject to suitable controls. Controls should include closely monitoring the installation process for asbestos and visual inspection and hand-pick sampling of the new soil surface and also the stockpile footprint. It may also be appropriate to undertake test pit sampling of the installed material. Depending on the results, it may be necessary to remediate the installed soil and stockpile footprint.

If any free fibre or FA is found in the stockpile, it would not normally be useable as “clean” fill and would be regarded as contaminated unless extensive sampling demonstrates otherwise.

Air quality monitoring (AQM) for asbestos fibre, dust and other contaminant emissions should be considered during the DSI, remediation and site development processes. Asbestos fibre and dust (as a surrogate for asbestos fibre) are of particular interest.

10 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

10.1 Introduction

Inaccuracies in sampling and analytical programs can result from many causes, including collection of unrepresentative samples, unanticipated interferences between elements during laboratory analyses, equipment malfunctions and operator error. Inappropriate sampling, preservation, handling, storage and analytical techniques can also reduce the precision and accuracy of results.

The Australian Standard AS4482.1-2005 *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds* has documented procedures for quality assurance (QA) and quality control (QC) for sampling and analysis to ensure that the required degree of accuracy and precision is obtained. The Australian Standard also recommends the use of two laboratories for the implementation of a QA program for the analyses in addition to the QC procedures followed by the primary laboratory.

10.2 Field QAQC samples

General

Procedures for duplicate sampling should be identical to those used for routine sampling and duplicate samples will be despatched for analysis for the same parameters using the same methods as the routine samples. No homogenisation of samples which may induce the loss of volatile compounds (such as BTEX) should occur. Whenever possible, the selection of samples for duplicate analyses should be biased towards samples believed to contain the contaminant of concern.

Intra-laboratory duplicates

Intra-laboratory duplicate samples, also referred to as Blind duplicates, are used to assess the variation in analyte concentration between samples collected from the same sampling point and / or also the repeatability of the laboratory analyses. Samples are split in the field to form a primary sample and a QC duplicate (intra-laboratory replicate) sample. The intra-laboratory duplicates are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. These samples are submitted to the laboratory as two individual samples without any indication to the laboratory that they have been duplicated.

Intra-laboratory duplicate samples should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one intra-laboratory duplicate sample should be included in each batch of samples.

Inter-laboratory duplicates

Inter-laboratory duplicate samples, also referred to as Split duplicates, provide a check on the analytical proficiency of the laboratories. The samples are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. One sample from each set is submitted to a different laboratory for analysis. The same analytes should be determined by both laboratories using the same analytical methods.

Inter-laboratory duplicates should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one inter-laboratory duplicate sample should be included in each batch of samples.

Blanks

Rinsate Blanks

Rinsate blank samples provide information on the potential for cross-contamination of substances from the sampling equipment used. Rinsate blanks are collected where cross-contamination of samples is likely to impact on the validity of the sampling and assessment process (e.g. when the investigation level of a contaminant is close to the detection limit for this contaminant). They are prepared in the field using empty bottles and the distilled water used during the final rinse of sampling equipment. After completion of the decontamination process, fresh distilled water is poured over the sampling equipment and collected. The distilled water is exposed to the air for approximately the same time the sample would be exposed. The collected water is then transferred to an appropriate sample bottle and the proper preservative added, if required.

One rinsate blank par day and / or one per piece of sampling equipment are collected during the decontamination process, and analysed for the analytes of interest. At least one rinsate blank should be included in each batch of samples. One rinsate blank should be collected for every 50 samples collected and analysed for the full suite of analytes.

Trip Blanks / Spikes

Trip blanks / spikes are a check on the sample contamination originating or lost from sample transport, handling, and shipping. These are samples of soil or water prepared by the laboratory with a zero or known concentration of analytes.

Field Blanks

Field blanks are a check on sample contamination originating from sample transport, handling, shipping, site conditions or sample containers. These are similar to trip blanks except the water is transferred to sample containers on site.

10.3 Laboratory quality assurance / quality control

The laboratories undertake the analyses utilising their own internal procedures and their test methods (for which they are NATA, or equivalent, accredited) and in accordance with their own quality assurance system which forms part of their accreditation.

Laboratory duplicate samples

Laboratory duplicate samples measure precision. These samples are taken from one sample submitted for analytical testing in a batch. The rate of duplicate analysis will be according to the requirements of the laboratory's accreditation but should be at least one per batch. Precision is reported as standard deviation SD or Relative Percent Difference %RPD, being:

$$\%RPD = \frac{(D1 - D2)}{(D1 + D2)} \times 200$$

where: D1: sample concentration and D2: duplicate sample concentration

Replicate data for precision is expected to be less than 30% RPD at concentration levels greater than ten times the EQL, or less than 50% RPD at concentration levels less than ten times the EQL. Sample results with a RPD exceeding 100% require specific discussion. Note that certain methods may allow for threshold limits outside of these limits.

Matrix Spiked Samples

Matrix spiked samples are used to monitor the performance of the analytical methods used, and to assess whether the sample matrix has an effect of on the extraction and analytical techniques. A sample is spiked by adding an aliquot of known concentration of the target analyte(s) to the sample matrix prior to sample extraction and analysis. These samples should be analysed at a rate of approximately 5% of all analyses, or at least one per batch. Matrix spikes are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR-SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory (generally ranging between 70% and 130%) and referenced to US EPA SW-846 method guidelines values.

Laboratory Blank

Laboratory blanks are used to correct for possible contamination resulting from the preparation or processing of the samples. These are usually an organic or aqueous solution that is as free as possible of analyte and contains all the reagents in the same volume as used in the processing of the samples. Laboratory blanks must be carried through the complete sample preparation procedure and contain the same reagent concentrations in the final solution as in the sample solution used for analysis. Laboratory blanks should be analysed at a rate of once per process batch, and typically at a rate of 5% of all analyses.

Laboratory Control Samples

Laboratory Control Samples, also referred to as Quality Control Check Samples, are used to assess the repeatability and long term accuracy of the laboratory analysis. These are externally prepared and supplied reference material containing representative analytes under investigation. Recovery check portions should be fortified at concentrations that are easily quantified but within the range of concentrations expected for real samples. Laboratory Control samples should be analysed at a rate of one per process batch, and typically at a rate of 5% of analyses. Laboratory control samples are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR-SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values. Ideally, all calculated recovery values should be within the acceptable limits. However, in the event that control limit outliers are reported, professional judgement is used to assess the extent to which such results may affect the overall usability of data.

Surrogates

Surrogates are used to provide a means of checking, for every analysis, that no gross errors have occurred at any stage of the procedure leading to significant analyte losses. Surrogate are quality control monitoring spikes, which are added to all fields and QAQC samples at the beginning of the sample extraction process in the laboratory. Surrogates are closely related to the sample analytes being measured (particularly with regard to extraction, recovery through clean-up procedures and response to chromatography) and are not normally found in the natural environment.

Surrogate spikes will not interfere with quantification of any analytes of interest and may be separately and independently quantified by virtue of, for example, chromatographic separation or production of different mass ions in a GC/MS system. Surrogates are measured as Percent Recovery %R expressed as:

$$\%R = \frac{(SSR)}{SA} \times 100$$

where: SSR: spiked sample result and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values.

11 DATA QUALITY OBJECTIVES

11.1 General

Data Quality Objectives (DQOs) are defined to ensure that the data is sufficiently accurate and precise to be used for the purpose of the project works. DQOs are defined for a number of areas including:

- sampling methods;
- decontamination procedures;
- sample storage (including nature of the containers) and preservation;
- laboratory analysis, including PQL, recoveries (surrogates, spikes), duplicates;
- preparation of CoC forms;

- document and data completeness; and
- data comparability.

The NSW DEC Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd Ed) 2006 also provide a seven step process for Data Quality Objectives (DQOs). These are as follows:

- State the problem
- Identify the decisions
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision errors
- Optimise the design for obtaining data

DQOs must be adopted for all assessments and remediation programmes. The DQO process must be commenced before any investigative works begin on a project.

11.2 Field DQOs

The DQOs for sampling methods, decontamination procedures, sample storage (including nature of the containers) and preservation, preparation of CoC forms, and document and data completeness are the Aargus protocols which have been described in the previous sections of this document.

11.3 Assessment of RPD values for field duplicate samples

The criteria used to assess RPD values for field duplicate samples is based on discussion reported in AS4482.1 1997, a summary of which is presented below:

Table 1: RPD acceptance criteria

Sample type	Typical acceptable RPD
Intra-laboratory duplicate (blind duplicate)	30-50°% (*)
Inter-laboratory duplicate (split duplicate)	30-50% (*)

It is noted that other factors such as sampling technique, sample variability, absolute concentration relative to criteria and laboratory performance should also be considered when evaluating RPD values.

The Australian Standard also states that the variation can be expected to be higher for organic analytes than for inorganics, and for low concentrations of analytes (lower than five times the detection limit). Based on Aargus Pty Ltd experience, RPD up to 70% are considered to be acceptable for organic species. RPD of 100% or more are generally considered to demonstrate poor correlation and should be discussed.

11.4 Laboratory Data Quality Objectives (DQO)

General

Aargus also provides internal laboratory testing for a range of physical parameters. Aargus is NATA certified to conduct these tests.

Labmark is the Aargus-preferred laboratory for the chemical analysis of primary samples. Labmark is accredited by the National Association of Testing Authorities (NATA).

The laboratory generally used by Aargus for analysing inter-duplicate samples is Labmark.

Analytical methods including detection limits are provided on each laboratory report and are checked as part of the data review process.

Laboratory QA/QC

Specific to Labmark, standard QA/QC data includes LCS, MB, CRM (CRM metals only), Laboratory Duplicate (1 in first 5-10 samples, then every tenth sample) and Spike sample (1 in first 5-20 samples, then every 20th sample), and surrogate recovery's (target organics). All QA/QC is reviewed by a senior chemist prior to customer release and includes a DQO comment on final report. Additional QA/QC maybe performed on batches less than 10 samples; however additional charges shall apply at the appropriate analytical rate/sample.

Laboratory analyses DQOs

The following table summarises laboratory analyses DQOs.

Table 2: Laboratory Data Quality Objectives (DQOs)

Laboratory QA/QC Testing	**Laboratory QA/QC Acceptance Criteria**
Method Blanks	For all inorganic analytes the Method Blanks must be less than the LOR. For organics Method Blanks must contain levels less than or equal to LOR.
Surrogate Spikes	At least two of three routine level soil sample Surrogate Spike recoveries are to be within 70-130% where control charts have not been developed and within the estimated control limited for charted surrogates. Matrix effects may void this as an acceptance criteria. Any recoveries outside these limits will have comment. Water sample Surrogates Spike recoveries are to within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criteria. Any recoveries outside these limits will have comment.
Matrix Spikes	Sample Matrix Spike duplicate recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike.
Laboratory Control Samples	Control standards must be 80-120% of the accepted value. Control standard recoveries are to be within established control limits or as a default 60-140% unless compound specific limits apply.
Laboratory Duplicate Samples	For Inorganics laboratory duplicates RPD to be <15%. For Organics Laboratory duplicates must have a RPD <30%.

Laboratory QA/QC Testing	**Laboratory QA/QC Acceptance Criteria**
Calibration of Chromatography Equipment	The calibration check standards must be within +/-15%. The calibration check blanks must be less than the LOR.

Non-compliances

Exceedances of QAQC results outside the DQO should be thoroughly investigated and discussed with the laboratories concerned, and the outcomes of these investigations should be recorded in the project files.

12 Use and calculation of the 95% UCL for site validation purpose

For environmental services, statistical analysis is performed on data. Validation of a site at the completion of remediation works should comply with the recommendations of the applicable guidelines. For a site to be considered uncontaminated or successfully remediated, the typical minimum requirement is that the 95% upper confidence limit (UCL) of the arithmetic average concentration of the contaminant(s) is less than an acceptable limit, eg the threshold value of an health-based investigation level.

The calculation of the 95% UCL of the arithmetic average concentration method requires that the probable average concentration and standard deviation of the contaminant be known. This method is most applicable for validation sampling, where the mean concentration and the standard deviation can be estimated from sampling results. The 95% UCL is calculated as follows:

$$\mathbf{95\%\ UCL = mean + t_{\propto,n-1}\ \frac{STDEV}{\sqrt{n}}}$$

where

mean arithmetic average of all sample measurements

$t_{\propto,n-1}$ A test statistic (Student's t at an $\propto$ level of significance and n-1 degrees of freedom)

$\propto$ The probability (in that case chosen to be 0.05) that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation

STDEV Standard deviation of the sample measurements

n number of samples measurements

13 COPYRIGHT

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14 ABBREVIATIONS

ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid Sulfate Soil
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
CoC	Chain of Custody
DEC	Department of Conservation (formerly EPA)
DIPNR	Department of Infrastructure Planning and Natural Resources
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure
NHMRC	National Health and Medical Research Council
NSL	No Set Limit
OCP/OPP	Organochlorine Pesticides /Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PASS	Potential Acid Sulfate Soil

PCB	Polychlorinated Biphenyl
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance, Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SVC	Site Validation Criteria
SWL	Standing Water Level
TCLP	Toxicity Characteristics Leaching Procedure
TESA	Targeted Environmental Site Assessment
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
VHC	Volatile Halogenated Compounds
VOC	Volatile Organic Compounds

15 REFERENCES

- ANZECC (1992) – *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites.*
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- Netherlands Ministry of Spatial Planning, Housing and the Environment (1994 rev. 2000) – *Environmental Quality Objectives in the Netherlands.*
- New South Wales Environment Protection Authority (1994) – *Guidelines for Assessing Service Station Sites.*
- New South Wales Environment Protection Authority (1995) – *Sampling Design Guidelines.*
- New South Wales Environment Protection Authority (1997) – *Guidelines for Consultants Reporting on Contaminated Sites.*
- New South Wales Environment Protection Authority (1998) – *Guidelines for the NSW Site Auditor Scheme.*
- New South Wales Department of Environment & Conservation (2006) – *Guidelines for the NSW Site Auditor Scheme (2nd Ed).*
- New South Wales Environment Protection Authority (1999) – *Guidelines on Significant Risk of Harm from contaminated land and the duty to report.*
- New South Wales Environment Protection Authority (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes.*
- New South Wales Environment Protection Authority (2005) – *Guidelines for assessing former orchards and market gardens.*
- QLD Department of Environment (DoE) (1998) – *Draft Guidelines for the Assessment & Management of Contaminated Land in Queensland.*
- QLD EPA – Waste Management Branch, Contaminated Land Section – *Details about investigation thresholds and sampling – sent to Aargus on 14 Nov 2000.*
- Standards Australia AS1726-1993 (1993) – *Geotechnical Site Investigations.*
- Standards Australia AS4482.1-1997 (1997) – *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds.*
- Standards Australia AS5667.11-1998 (1998) – *Water Quality Sampling: Guidance on the Sampling of Groundwaters.*
- Victorian EPA (2000) – *Groundwater Sampling Guidelines*

ATTACHMENTS

Figure 1 Typical Groundwater Monitoring Well Construction Details

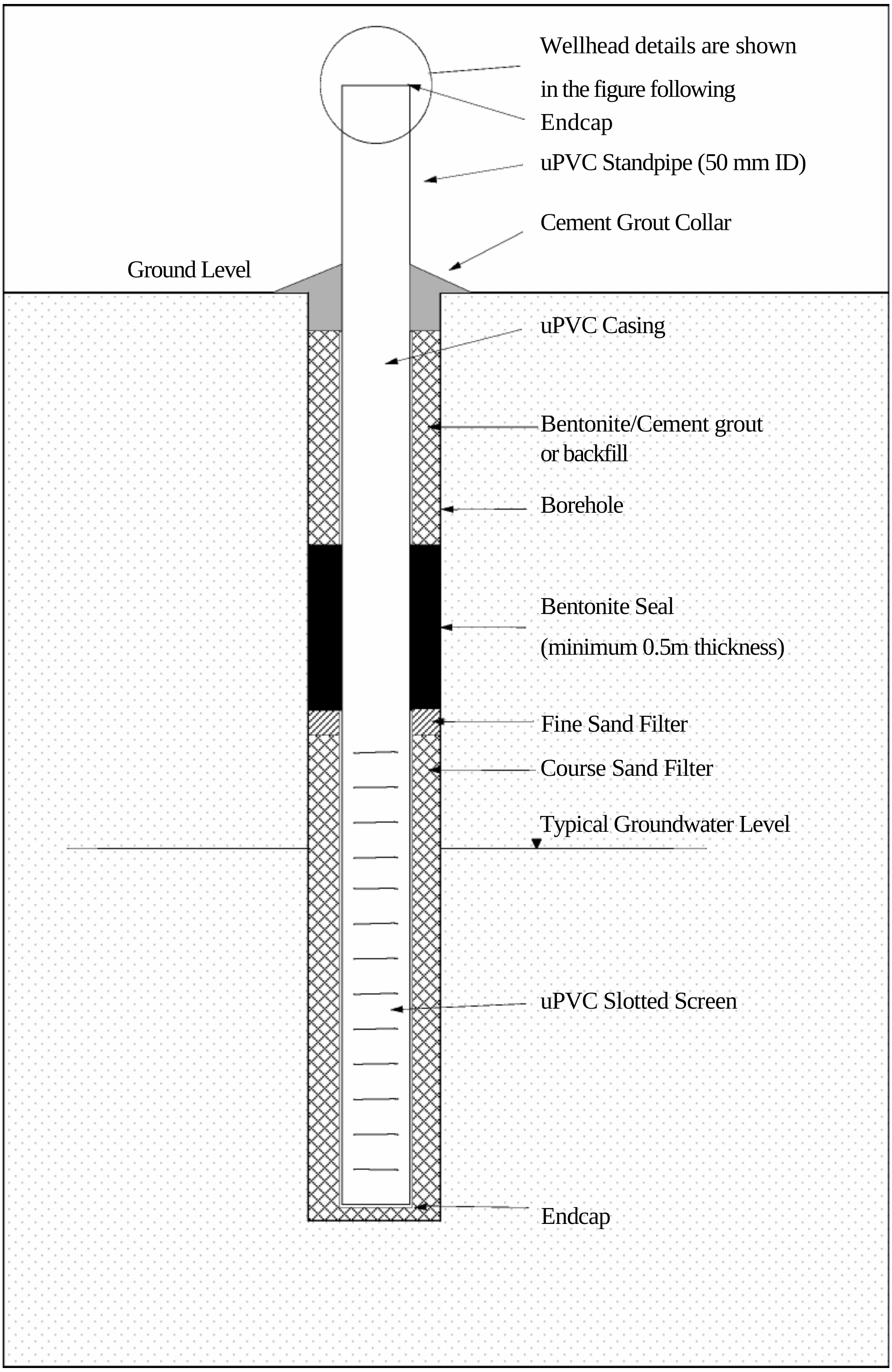
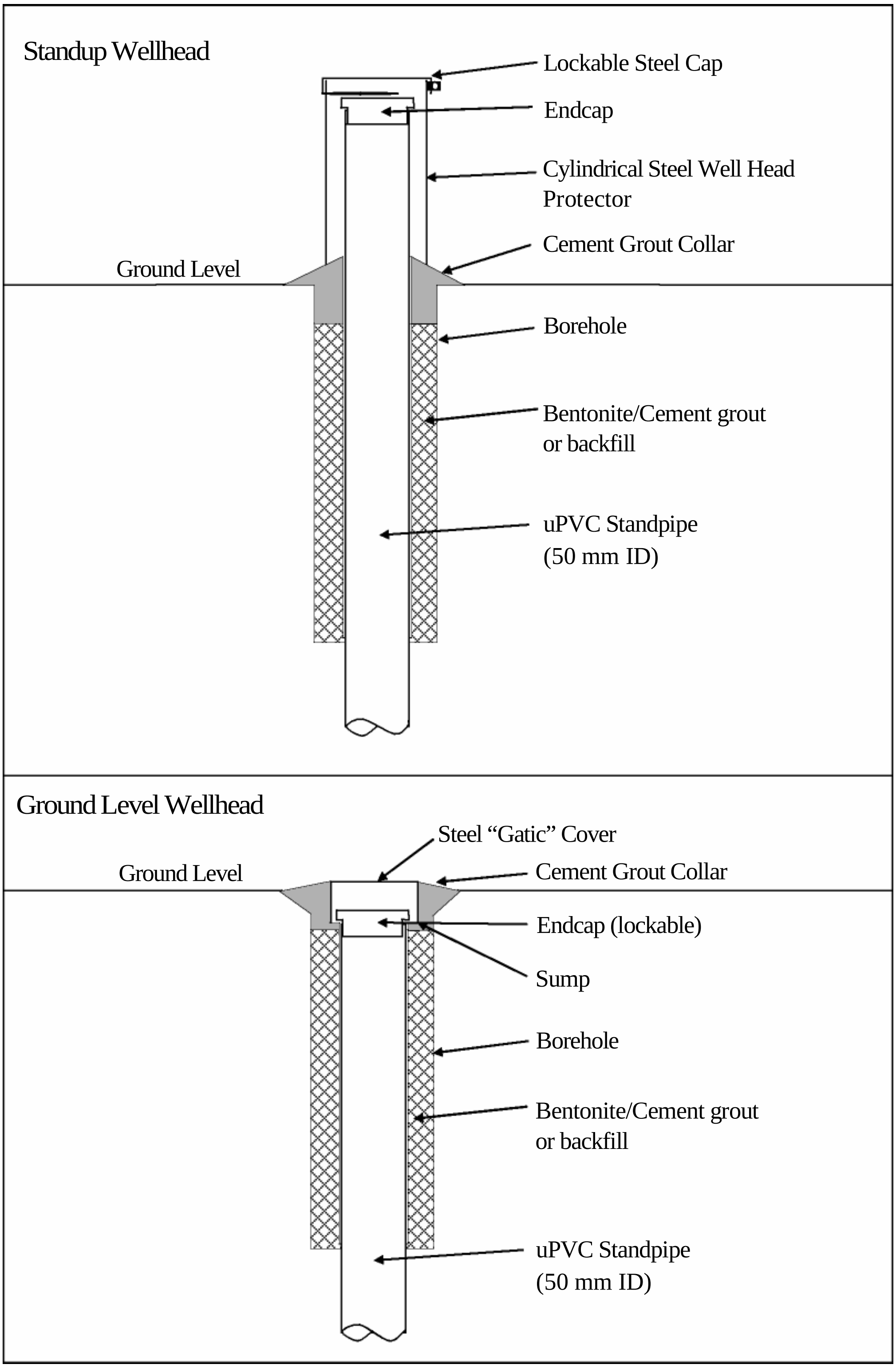


Figure 2 Groundwater Wellhead Construction Details



ASBESTOS RISK ASSESSMENT HAZARD LEVELS

Risk Factor		Description	Rating
Status	Bonded	ACM with Asbestos contained in a stable matrix	1
	Friable	ACM which when dry may become crumbled, pulverised or reduced to powder using hand pressure	4
Condition Risk	Undamaged	No visible signs of damage or deterioration	1
	Fair	Some evidence of damage / deterioration	3
	Poor	ACM which is heavily damaged or deteriorated	5
Management Risk	Satisfactory	ACM which is effectively managed by encapsulation or enclosure	1
	Fair	ACM with limited management	2
	Unsatisfactory	ACM which is not adequately managed	3
Disturbance Potential	Unlikely	Not likely to be disturbed during normal operations	1
	Possible	ACM which may be disturbed during normal operations	3
	Likely	The material is likely to be disturbed during normal operations	5
Location Risk	Low	ACM is present in an open environment (ie. outdoors)	1
	Moderate	ACM is present within a semi-enclosed environment (ie. large factory or wet weather area)	2
	High	ACM is present within an enclosed or indoor environment	3

SEMI-QUALITATIVE RISK ASSESSMENT ALGORITHM

Status + Condition Risk + Management Risk + Disturbance Potential + Location Risk = Risk Score

ASBESTOS RISK ASSESSMENT SCORE SHEET AND ACTION PRIORITY

Risk Score	Risk Description	Action Priority
5-10	**Low Risk** Products or materials that pose a negligible risk of exposure to Asbestos. ACM occurrences in this category are typically in good condition, are unlikely to be disturbed, and will not readily release Asbestos fibres on contact. These materials should be labelled where practicable. The material should not be unnecessarily disturbed.	**Low Priority** Monitor condition annually. Recommend that airborne fibre monitoring is conducted annually.
11-15	**Moderate Risk** Products or materials that may pose a risk of exposure to Asbestos. Bonded ACM occurrences in this category may be in poor condition, and / or be likely to be disturbed, and may readily release Asbestos fibres on contact. This category may also relate to friable ACM which is adequately managed. These materials should be labelled where practicable. The material should not be unnecessarily disturbed.	**Moderate Priority** Conduct management works within 3-6 months. Monitor condition 6-monthly. Airborne fibre monitoring at least 6-monthly.
16-20	**High Risk** Product or materials that pose an elevated risk of exposure to Asbestos. This category would usually relate to friable ACM which is not adequately managed. Management works will be required immediately. These materials and surrounding areas should be clearly signposted. The material should not be unnecessarily disturbed – an exclusion zone of approximately 5m (at least) may be required.	**High Priority** Conduct make-safe management work immediately. Monitor condition daily and/ or monthly. Regular daily and/or monthly airborne fibre monitoring considered essential.

**References: AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines (Standards Australia, 2009), HG 264 Asbestos: The Survey Guide (UK Health and Safety Executive, 2010), NSW Work Health Safety Regulations 2011, and NSW WorkCover Codes of Practice.*

EXTENT

HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

The Scots College, Stevenson Library Major Renovations and Alterations

Historical Archaeological Assessment

Prepared for The Scots College

April 2018

Sydney
Melbourne
Brisbane
Perth

extent.com.au

DOCUMENT CONTROL PAGE

AUTHOR/HERITAGE ADVISOR: Lorna Cooper

CLIENT: The Scots College

PROJECT NAME: The Scots College Stevenson Library Major Renovations and Alterations HAA

REAL PROPERTY DESCRIPTION: Lot 1 DP231713

EXTENT HERITAGE PTY LTD INTERNAL REVIEW/SIGN OFF				
WRITTEN BY	**DATE**	**VERSION**	**REVIEWED**	**APPROVED**
Lorna Cooper Bridget San Miguel	19/03/17	Draft V1	Anita Yousif	28/03/18
Lorna Cooper	9/04/18	Final	Anita Yousif	10/04/18

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EXECUTIVE SUMMARY

The Scots College proposes to undertake major alterations and additions to the Stevenson Library building on their campus (the study area). The proposed development is being assessed as a State Significant Development under Section 89C of the *Environmental Planning and Assessment Act 1979*. The Secretary's Environmental Assessment Requirements for Application Number SSD 8922 require a historical archaeological assessment prepared by a suitably qualified historical archaeologist in accordance with the Heritage Division, Office of Environment and Heritage Guidelines Assessing Significance for Historical Archaeological Sites and 'Relics' 2009.

This report meets those requirements by assessing the potential for relics, their significance, the impact of the proposed development on those resources and further recommendations.

Historical Archaeological Resources and Significance

Overall, the historical archaeological potential of the study area is low to moderate and relates to mid-nineteenth century development at Bellevue Hill. This includes potential relics associated with the construction of Aspinall House (St Killian's), Fairfax House (Ginaghulla) and the development of the Scots College. Relics associated with this phase of development would be of moderate significance at a local level, providing tangible links to the establishment of the Scots College and the beginning of European population growth at Bellevue Hill. They are most likely to include outbuildings, drainage systems, rubbish pits and other unrecorded features associated with late nineteenth century domestic and school related activities.

The archaeological potential of earlier historical phases, including early land grants and contact between Aboriginal Traditional Owners and European settlers, is low. Archaeological resources relating to contact and early settler phases, if they remain, are likely to include property fences and markers, evidence of timber structures and evidence of land cultivation. Later development at the site is likely to have impacted significantly upon these resources. However, any remaining archaeological relics related to these phases would be of high significance at the State level. Historical sources record contact between Aboriginal groups and European settlers in the vicinity of the study area from the late eighteenth century through to the late nineteenth century and evidence of this contact would provide information that cannot be obtained from other sources.

Potential Historical Archaeological Impact

There is unlikely to be a requirement for extensive deep excavation, as no basement levels are proposed and the building will utilise existing services. Deep excavation is likely to be limited to discrete areas only for new features such as lift-wells (which is located in the area of low potential). This excavation may be at least partially contained within introduced fill material. However, where excavation extends beyond fill, these works may result in partial destruction of historical archaeological remains relating to the twentieth-century industrial development and use of the study area. This is unlikely to substantially affect the heritage values of the study area, as the research potential of the potential archaeological resource is low.

Recommended Mitigation

If the proposed redevelopment of the Stevenson Library site is approved as SSD, approval from the Heritage Council of NSW under Section 139 of the Heritage Act will not be required.

However, given the local heritage status of the adjacent Aspinall House and some potential for archaeological relics across the site, it is recommended that following archaeological management be employed:

- Prior to the onsite ground disturbance commencing, the designated project team including all contractors on site should undergo heritage induction, which will include an archaeological awareness component to reinforce the importance of heritage issues and the management measures that will be implemented.
- In the event of an unexpected discovery of archaeological relics during ground disturbance works the Unexpected Find Procedure should be followed. The procedure details the actions to be taken when a previously unidentified and/or potential Aboriginal and/or historical heritage item/object/site is found during construction activities, as follows:

  1. **STOP ALL WORK** in the vicinity of the find and immediately notify the relevant Site Supervisor. The Supervisor will then notify the Project/Site Manager and demark the area to protect the artefact/item/object/site.

  2. The Project/Site Manager is to record the details, take photos of the find and ensure that the area is adequately protected from additional disturbance.

  3. The Project/Site Manager contacts the appointed project archaeologist to notify them of the location of the find.

  4. If the project archaeologist advises that the find **is not** a historical relic 9 or (Aboriginal object), work will recommence in consultation with the Project/Site Manager.

  5. If the project archaeological advises that the find **is** a potential heritage item the Project/Site Manager should undertake the following procedure:

     - Liaise with the project archaeologist to determine the significance of the heritage item; and

     - Implement the appropriate heritage mitigations dependent on the significance of the site, which may include further archaeological excavation and recording.

     - If further archaeological works would be required they would be guided by an archaeological research design, which would provide a research framework for the works and research questions, which at the minimum, would focus on the extent, nature and integrity of archaeological remains and their ability to provide additional information on the history of the site.

     - Any archaeological excavation and recording would be carried out in accordance with best archaeological practice involving: stratigraphic excavation, detailed recording of exposed features and soil contexts using pro-forma context sheets and registers; measured drawings, photographic recording of all archaeological features and works performed; artefact collection in accordance with their provenance and appropriate labelling and bagging.

     - A final report detailing archaeological works and results of such works would need to be prepared at the completion of archaeological onsite works.

If exposed archaeological remains are deemed to be substantial or significant, the Heritage Council of NSW or the Heritage Division as delegate should be notified in accordance with section 146 of the Heritage Act.

If the proposed redevelopment of the Stevenson Library site is not approved as SSD, approval from the Heritage Council of NSW under Section 139 of the Heritage Act will be required to allow for the disturbance or removal of any locally significant relics. An application for a relevant approval would need to be accompanied by an Archaeological Research Design or Work Method Statement.

Any relics assessed to be of state heritage significance would need to be assessed separately and their management, including *in situ* retention, discussed with the Heritage Division and relevant stakeholders.

CONTENTS

1 INTRODUCTION

1.1 Project Background

The Scots College proposes to major alterations and additions to the Stevenson Library Building on their campus at Bellevue Hill. The proposed development is being assessed as State Significant Development (SSD) under Section 89C of the *Environmental Planning and Assessment Act 1979*. The Secretary's Environmental Assessment Requirements (SEARs) for Application Number SSD 8922 include the following, in relation to historical (non-Indigenous) heritage:

11. Heritage

…

The Environmental Impact Statement should include a historical archaeological assessment prepared by a suitably qualified historical archaeologist in accordance with the Heritage Division, Office of Environment and Heritage Guidelines Assessing Significance for Historical Archaeological Sites and 'Relics' 2009. This assessment should identify what relics, if any, are likely to be present, assess their significance and consider the impacts from the proposal on this potential resource. Where harm is likely to occur, it is recommended that the significance of the relics be considered in determining an appropriate mitigation strategy. If harm cannot be avoided in whole or part, an appropriate Research Design and Excavation Methodology should also be prepared to guide any proposed excavations.

Extent Heritage Pty Ltd has been commissioned by Impact Group (on behalf of the Scots College) to undertake a Historical Archaeological Assessment (HAA) of the proposed redevelopment, in order to address this requirement. This report assesses the study area's potential archaeological resources and their significance, any development impacts on such resources and provides recommendations for appropriate mitigation of identified impacts.

1.2 Study Area Location and Identification

The study area is the Stevenson Library Building at The Scots College located in the Victoria Road East Precinct of the College at No's 29-53 Victoria Road, Bellevue Hill. The college is located in the City of Woollahra, Parish of Alexandria, County of Cumberland (Figure 1 and 2). It comprises Lot 1 DP231713 and is centrally located, on the western side overlooking the central oval.

1.3 Approach, Objectives and Limitations

This report was prepared in accordance with the principles and procedures established by the following documents:

- *Archaeological Assessment Guidelines* (NSW Heritage Office, Department of Urban Affairs & Planning 1996)
- *Assessing Significance for Historical Archaeological Sites and Relics* (Heritage Branch 2009).
- *The Australia ICOMOS Charter for Places of Cultural Significance* (The Burra Charter) (Australia ICOMOS, 2013).
- *Historical Archaeology Code of Practice* (Heritage Office 2000).

The terminology used in this report is consistent with the *NSW Heritage Manual* prepared by the NSW Heritage Office (now the Heritage Division, Office of Environment and Heritage) and the Burra Charter.

The objectives of this report are to:

- Identify any potential historical archaeological resources at the study area and assess their significance;
- Assess development impacts and provide appropriate recommendations for mitigation of such impacts.

This report deals with the historical archaeology of the study area only and does not assess the Aboriginal cultural heritage values, or the built and landscape heritage of the study area.

This report provides a general assessment of historical archaeological resources within the entire campus, with the main focus on the Stevenson's Library study area footprint.

The site inspection was undertaken as a visual study only, and no physical investigation was carried out to inform this assessment.

1.4 Author Identification and Acknowledgements

This report was prepared by Lorna Cooper, Heritage Advisor, with the history compiled by Bridget San Miguel, Research Assistant. Specialist input was provided by Graham Wilson and Dr Matthew Kelly, Senior Heritage Advisors and the report was reviewed by Anita Yousif, Senior Associate and Historical Archaeology Team Leader.

We acknowledge the generous assistance of Greg Hastie, Impact Projects and Steven Adam and Danielle Torrisi, the Scots College.

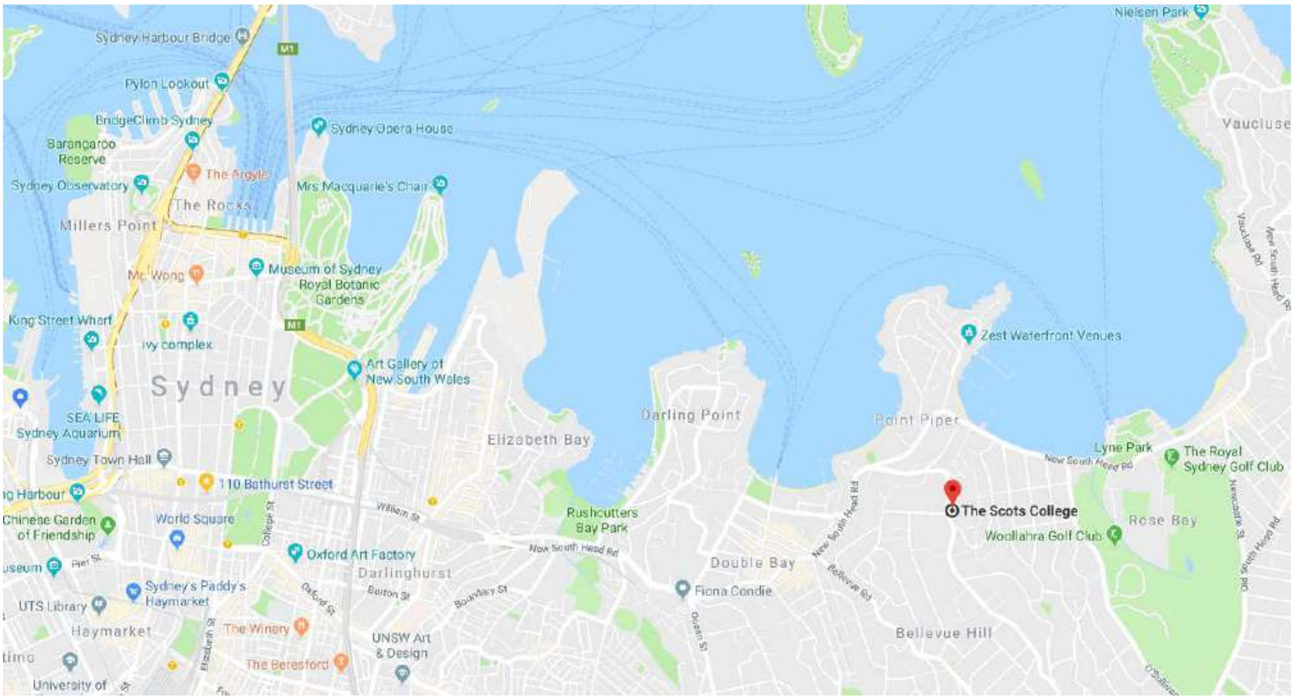

Figure 1. Context map (Source: Google Maps, 2018).

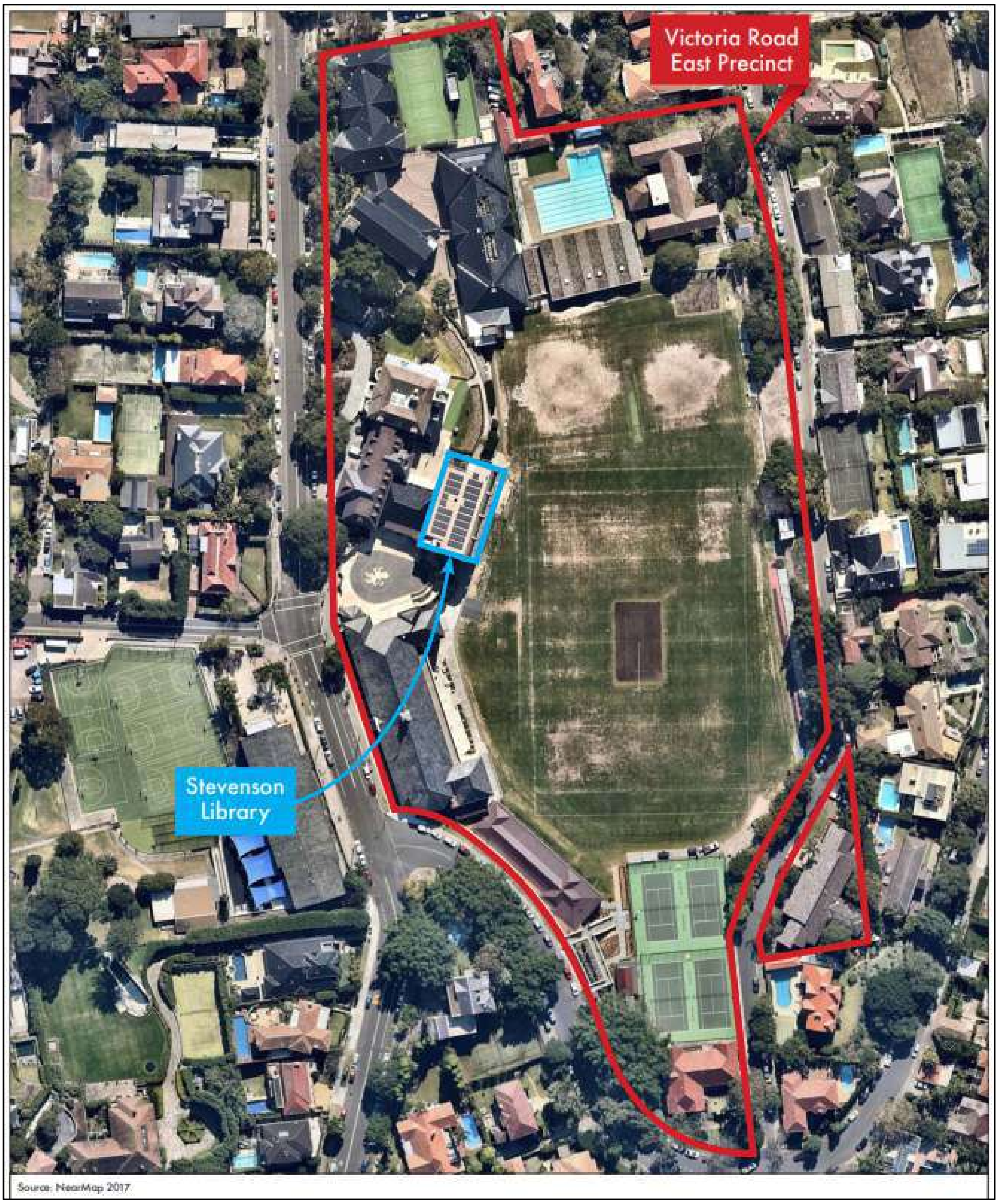

Figure 2. Aerial Imagery of Stevenson Library within The Scots College Campus (Source: BBC Consulting Planners, 2017)

2 STATUTORY CONTEXT AND HERITAGE LISTINGS

Relating to historical archaeology in New South Wales, the study area is subject to the following statutory controls:

- *Environment Planning and Assessment Act 1979* (NSW).

- *Heritage Act 1977* (NSW);
- *Sydney Local Environment Plan 2012;*
- *Sydney Development Planning Control 2012.*

2.1 Statutory Regulations

2.1.1 Environment Planning and Assessment Act 1979

Of the three main elements to the legislative scheme regulating planning and development, the *Environment Planning and Assessment Act 1979* (EP&A Act) sets out the major concepts and principles, including Part 4 which deals with development applications, and regulates SSD projects under Part 4 Division 4.1: major projects of State or regional significance.

2.1.2 NSW Heritage Act 1977

The *Heritage Act 1977* (NSW) (the Heritage Act) is designed to conserve the cultural heritage of New South Wales and regulate development impacts on the state's heritage assets. The Act provides protection to items listed on the State Heritage Register, a list of places and objects of particular importance to the people of NSW. In addition, historical archaeological relics are afforded automatic statutory protection by the 'relics' provisions of the Act. A 'relic' is defined as:

> *any deposit, artefact, object or material evidence that:*
>
> *a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
>
> *b) is of State or local heritage significance.*

In accordance with Section 139(1), it is an offence to disturb or excavate land, where this may affect a relic, without the approval/excavation permit of the Heritage Council of NSW, unless an endorsed 'Exemption' under Section 57(2) or 'Exception' under Section 139(4) of the Heritage Act to disturb or expose and destroy a 'relic' applies. Sites which may contain archaeological relics are usually dealt with under Section 140 and 141 of the Heritage Act. Sites with potential archaeology, listed on the State Heritage Register (SHR), are dealt with under Section 60 and 63 of the Heritage Act.

The requirement to obtain approvals under the Heritage Act does not apply to developments that are approved State Significant Developments, under S89J of the EPA Act. The potential heritage impact is instead managed by the environmental assessment process.

Under Section 170 of the Heritage Act, state government agencies have a requirement to establish a Heritage and Conservation Register for items and places that are under their management.

There are no SHR-listed items within or adjacent to the study area. There are no s170-listed items within or adjacent to the study area. The potential for the presence of relics within the study area is addressed in Sections 5 and 6.

2.1.3 Woollahra Local Environment Plan 2014

Environmental planning instruments made under the *Environmental Planning and Assessment Act 1979* (NSW) (EPA Act) include State Environment Planning Policies (SEPPs), which deal with matters of State or regional environmental planning significance; and Local Environmental Plans (LEPs), which guide planning decisions for local government areas. The site falls within the Woollahra (LGA). The relevant environmental planning instrument is the Woollahra LEP 2014.

The objectives of the Woollahra LEP 2014 with respect to heritage conservation and archaeological sites are provided in clause 5.10 which (amongst other objectives) aims to conserve archaeological sites and requires consent to demolish, move or alter known or potential archaeology. Additionally, it requires that the consent authority must notify the Heritage Council of this development and take into consideration their response.

The study area is listed as a heritage item on Schedule 5 of the Woollahra LEP 2014 as follows:

Suburb	Item	Address	Property Description	Significance	Item no
Bellevue Hill	The Scots College—the building known as "Aspinall House" and interiors, with palm trees, sandstone gateposts (3 sets), gate and fencing to Victoria Road, and the adjoining stone wall surmounted by iron railing; the school building with clock-tower and interiors	29–53 Victoria Road	Lots 10–13, DP 14952; Lot 1, DP 231713; Lot 1, DP 929570; Lot 1, DP 663629; Lot 1, DP 1064059	Local	67
Bellevue Hill	Building and interiors (part of The Scots College, 29–53 Victoria Road)	71 Cranbrook Road	Lot 1, DP 929570	Local	22
Bellevue Hill	"Fairfax House" (part of The Scots College, 29–53 Victoria Road)—building and interiors, remnant north-west gardens, stone works, fountain, 2 Norfolk Island Pines, Kauri Pine, Cook Pine, Hoop Pine, 8 Moreton Bay Figs, 7 Port Jackson Figs	17 Ginahgulla Road	Lot B, DP 109676	Local	37

The Stevenson Library, although not identified as a heritage item, is on the lot and immediately associated with Aspinall House (Figure **3**).

Schedule 5 of the Woollahra LEP 2014 does not list any archaeological items of the study area.

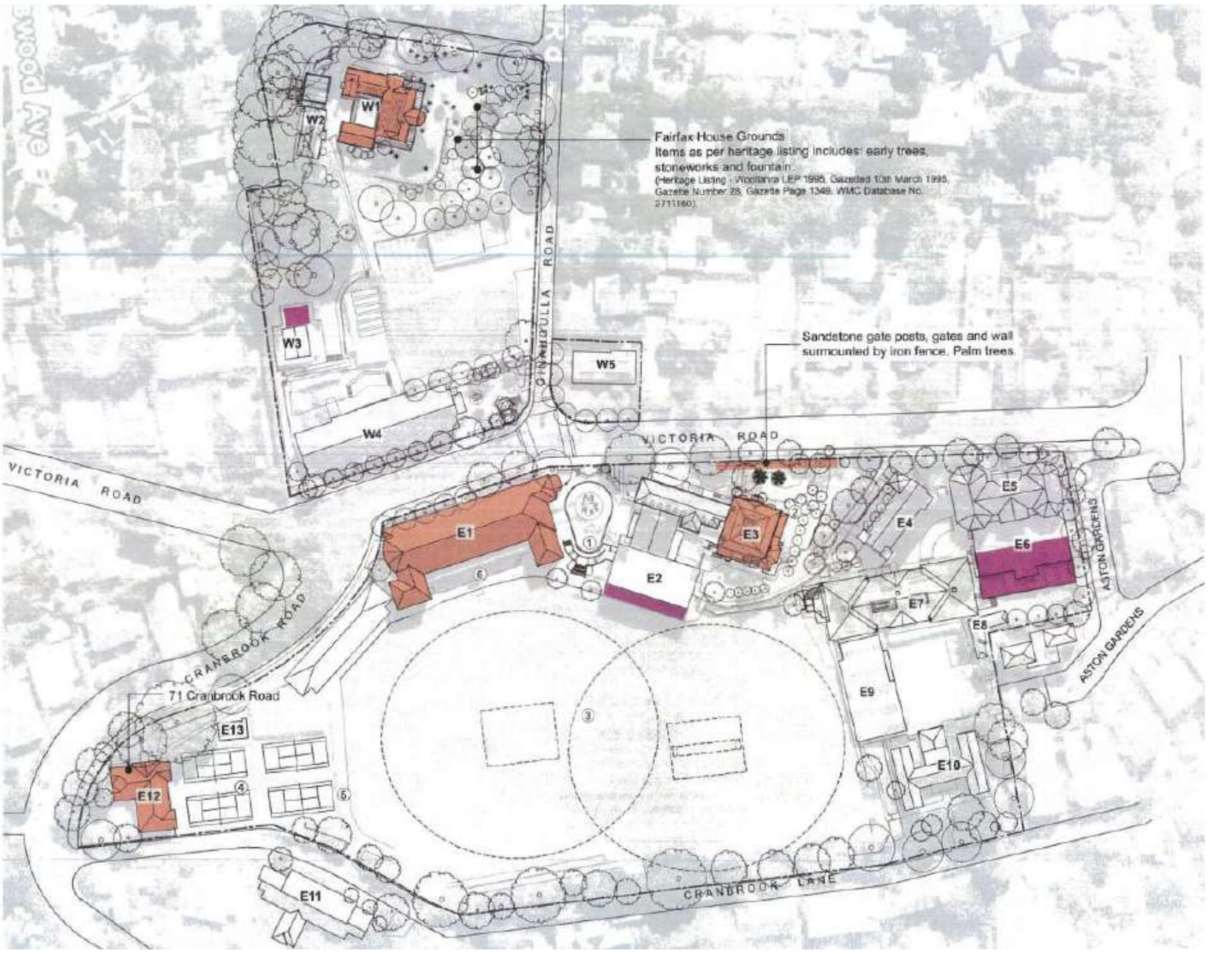

Figure 3. Heritage Buildings – E2 is the current Stevenson Library, E3 is Aspinall House and W1 is Fairfax (Ginaghulla) House (Source: Conybeare Morrison, 2013, 'The Scots College Masterplan 2013' Figure 3)

2.2 Non-Statutory Regulations and Heritage Registers

2.2.1 Woollahra Development Control Plan 2015

The Woollahra Development Control Plan (DCP) 2015 is an advisory document with a non-statutory standing prepared to support the 2014 Woollahra LEP. Clause 11 of the SRD SEPP provides that DCP's do not apply to SSD. Nevertheless, WDCP 2014 contains specific development controls in Chapter F2 for "Educational Establishments" such as the College, the objectives of this clause are addressed by the EIS.

2.2.2 Register of the National Estate

Although the Register of the National Estate (RNE) has no statutory bearing, it is still use to guide decisions on heritage aspects of a place. Aspinall House is listed on RNE.

2.2.3 Register of the National Trust of Australia (NSW)

Aspinall House is listed on the NSW National Trust Register, Item no. 6668. Stevenson Library is not part of this listing.

2.3 Previous Reports and Investigations

No previous archaeological assessments or physical investigations have been undertaken for the study area.

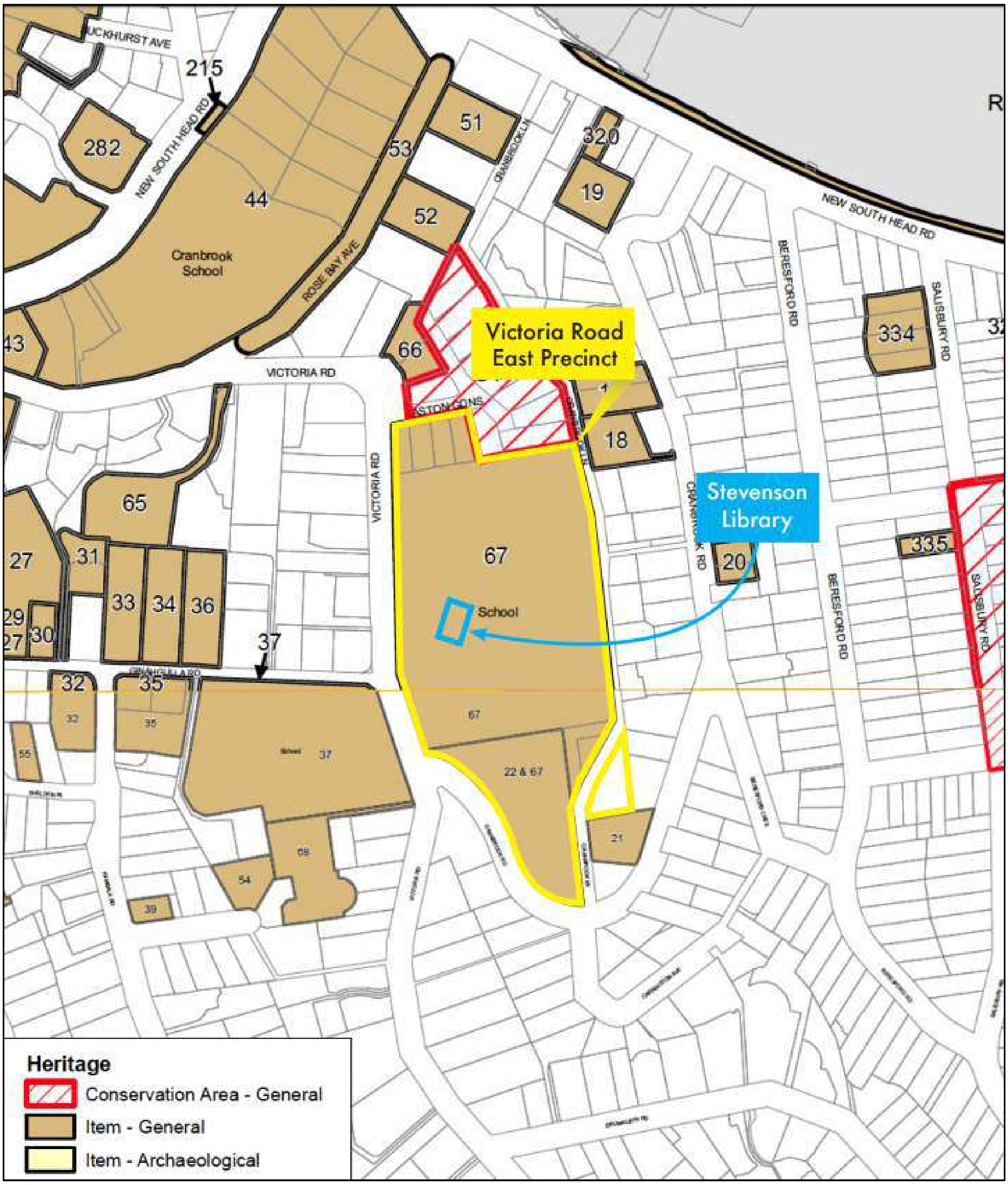

Figure 4. Heritage map showing the study area (outlined in blue) within the Scots College campus (yellow) (Source: BBC Consulting Planners, 2017).

3 HISTORIC CONTEXT

3.1 Introduction

This historic context relies largely on the historical research contained in readily available heritage reports and local history studies. In addition to the review and compilation of these sources, an analysis of historical plans, aerials and photographs was carried out. This section of the report therefore provides a summary of the main historical events relevant to Bellevue Hill, Woollahra and the Scots College rather than a detailed account of historical events.

3.2 History

3.2.1 Early Aboriginal Occupation

Cadigal land extends across Bellevue Hill and Woollahra, becoming Birrabirragal land at South Head. These Aboriginal groups are part of the coastal Dharug language group and are the initial occupants and Traditional Owners of the area.[1] Before European contact, these groups exploited the coastal resources of South Head and Woollahra, fishing, collecting shellfish and managing the local vegetation.[2] Historical records of Aboriginal presence and activities in the surrounds of the subject site are described in Section 3.2.5 below.

3.2.2 Signal Station at South Head: 1790

After the First Fleet arrived in 1788, South Head, northeast of the subject site, played an important role in Aboriginal-European contact. A signal station was established at South Head in 1790 where the newly arrived settlers could watch for ships from England, mainly for the much anticipated Second Fleet. The outpost was extremely isolated. At first, access was available only by boat and was affected by bad weather and navigational difficulties. In addition, the colony was experiencing a lack of resources and needed all boats to remain at the main settlement of Port Jackson, leaving the staff at the signal station without transport to the rest of the colony. The staff were dependent on regular deliveries of supplies from Port Jackson and were otherwise entirely isolated apart from contact with local Aboriginal people.[3]

The sense of isolation for the settlers at South Head would have been exacerbated by often hostile, or at least misunderstood, contact with Aboriginal groups. In 1788 it had been acknowledged by Governor Arthur Philip in a letter to Lord Sydney that, "*they [the Aboriginal people] certainly are not pleased with our remaining amongst them, as they see we deprive them of fish, which is almost their only support*."[4] In 1791, local Aboriginal people stole the flag from the signal station and used it as a cover for their canoes, though as Faro and Wotherspoon point out, it is possible that the gravity of this act was not understood by those involved.[5] For the eleven men at South Head, the removal of the flag eliminated their means of contact with the outside world, both incoming ships from the sea and their fellows at Port Jackson. It was becoming clear that an overland track was needed to reduce the isolation of South Head.

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[1] Woollahra Municipal Council. Nd. *A brief history of Woollahra*.
[2] Wotherspoon, G. 2012. *Bellevue Hill, Dictionary of Sydney*.
[3] Faro, C. and G. Wotherspoon. 2000. *Street Seen: A History of Oxford Street*. Melbourne University Press: Melbourne. 31-32.
[4] Governor Philip to Lord Sydney, 28 September 1788, *HRA,* S. 1, Vol. 1, p. 77. In Faro, C. and G. Wotherspoon. 2000. *Op. cit.* 31.
[5] Wotherspoon. 2012. *Op. cit. 32.*

3.2.3 Tracks across Woollahra and Bellevue Hill: Early 1800s-1815

Early paths between the signal station and the main settlement would have passed through Woollahra and Bellevue Hill, following existing Aboriginal tracks. A bush track was established by the early 1800s, however it was only suitable for those on foot or horseback. An attempt to improve this track for vehicle access was unsuccessful in 1803 due to disputes over funding. By 1809, however, the track was well enough established to be used as a boundary for land grants and was known as South Head Road. It is likely that William Roberts, whose land bounded the road to its south at the time, made some improvements to the track although they do not seem to have been substantial. [6]

It was in 1811 that South Head Road was finally constructed, during the time of Governor Lachlan Macquarie.[7] Despite resistance from his superiors in England, Macquarie argued that the road was an important investment as a vantage point for defending the colony. For the European settlers however, the road became a popular route for weekend drives. Throughout the 1810s it was a place to socialise, watch passing ships and display their wealth to others.[8] Bellevue Hill, south of the subject site and the namesake of the current suburb, was a popular resting place halfway along the road to South Head.[9]

3.2.4 Early Land Grants and the Point Piper Estate: 1815-1826

Bellevue Hill has a history of settlement by non-English colonists. It was originally named Vinegar Hill by Irish convicts, after the location of a rebellion against England in Ireland, which was soon changed to Bellevue Hill by Governor Macquarie to avoid 'vulgar' associations. The area has been occupied throughout its history by a significant number of Scottish immigrants, an association which continued through to the establishment of the Scots College;[10] however, the subject site is situated upon a land grant belonging first to Lieutenant John Piper and then to Daniel Cooper, both of whom were English.[11]

John Piper arrived in Australia in 1792 as a New South Wales Corps member and spent some time in New South Wales before returning to England for two years' leave. In 1799 he returned to Sydney before taking up a position as commandant of Norfolk Island from 1805-1810. After another short time in England, he became Sydney's Naval Officer. The first land grants at Point Piper were made in 1815 to a number of colonists, none of whom seem to have occupied their grants. John Piper's high-paying position allowed him to live at Henrietta Villa at Point Piper from 1816-1826. He was granted the surrounding land in 1820. He then amalgamated the individual grants into his own large grant of 190 acres across Point Piper, which extended across the point from Double Bay to the area between New South Head Road and Old South Head Road.[12] However, an investigation into his public dealings in 1826 found that he owed the government £17,000. Piper had to sell his properties in Sydney in order to repay the debt and sold Point Piper to Daniel Cooper and Solomon Levey for £6,000. The estate remained largely undeveloped at the time of the sale. In 1827, Piper was removed from his office.[13]

The earliest available map of the Point Piper Estate is estimated to date to 1844 and was probably drawn by Major Thomas Mitchell, who built and extended a large number of the colony's roads. This trigonometric survey of the Estate shows New South Head and Old South Head roads as being in use, and Victoria Road running adjacent to the current site of the Scots College as a new road cleared of bushes and levelled. The subject site is situated upon Lot 19 on the map, as shown in **Figure 5**, and is surrounded by the undeveloped land forming the majority of the estate.

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[6] Faro, C. and G. Wotherspoon. 2000. *Op. cit.* 33.
[7] Faro, C. and G. Wotherspoon. 2000. *Op. cit.* 37.
[8] Faro, C. and G. Wotherspoon. 2000. *Op. cit.* 41-42.
[9] Jervis, J. and V. Kelly (ed.). 1960. *The History of Woollahra: A record of events from 1788 to 1960 and a centenary of local government.* The Municipal Council of Woollahra. Halstead Press: Sydney. 71.
[10] Wotherspoon, G. 2012. *Op. cit.*, Prentis, M. 2008. *Scots, Dictionary of Sydney*.
[11] Jervis, J. and V. Kelly (ed.). 1960. *Op. cit.* 56-57.
[12] *Ibid.* 56.
[13] Thorp, W. 1999. *Heritage Assessment. Statement of Heritage Impact. "Rothsay", 3 Cranbrook Road, Bellevue Hill.* Cultural Resources Management for Woollahra Municipal Council. 7.

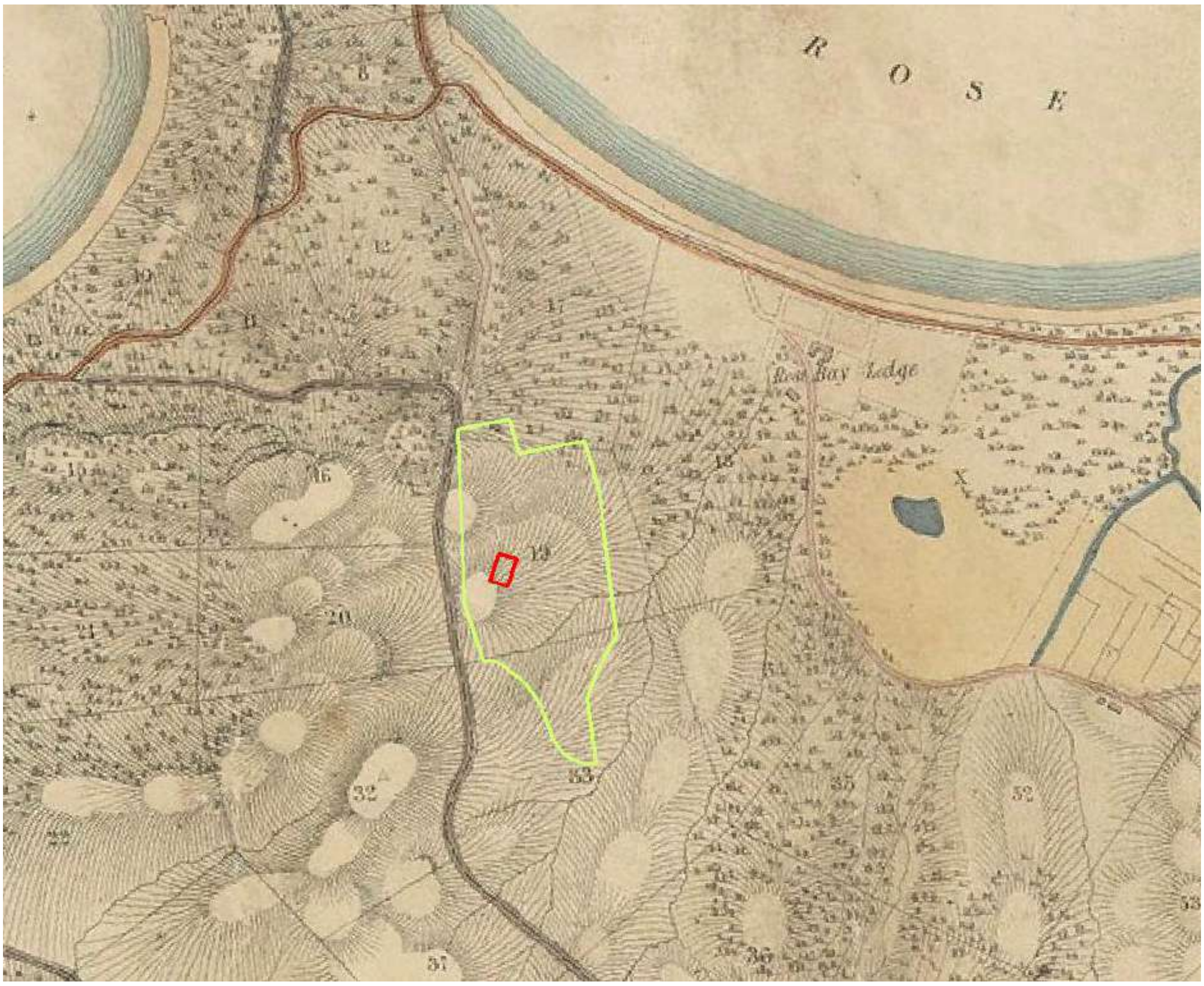

Figure 5. Point Piper c. 1844, showing roads in use (orange), newly marked roads (grey), roads to be marked (pink), with the Scots College main campus outlined in yellow and the subject site outlined in red. Rose Bay Lodge is located northeast of the subject site. (Source: State Library of NSW, FL4472211[14])

3.2.5 Cooper and Levey and the Cooper Estate: 1826-1888

Daniel Cooper and Solomon Levey were successful businessmen who worked in trading, imports and shipping after Cooper's arrival in Australia in 1816.[15] Seven years after Cooper and Levey acquired Piper's land, in 1833, Levey passed away and left his estate to his son John Levey. Due to complications with the inheritance left by Levey's father and a number of debts owed by his estate, Cooper assisted John Levey by paying £42,000 to settle claims against Solomon's will. Later, when John Levey was affected by the depression of the 1840s, Cooper again assisted him by agreeing to take over his properties and in return pay Levey £500 per year for the rest of his life. This agreement continued until Levey's death in Paris in the 1880s.[16] Cooper's generous agreement with his friend's son resulted in the Cooper-Levey lands becoming the Cooper Estate, entirely owned by the family until it was subdivided in 1888. Though Daniel Cooper died in 1853, the estate passed on to his nephew's son, also Daniel, who lived at Rose Bay Lodge until he returned to England in 1861[17] (Figures 6 and 7). The younger Daniel Cooper was an important figure in colonial Australia, receiving a knighthood and a

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[14] *The Estate of Point Piper, surveyed trigonometrically and divided into allotments.* 1844?. State Library of NSW, FL4472211.
[15] Jervis, J. and V. Kelly (ed.). 1960. *Op. cit.* 105.
[16] Thorp, W. 1999. *Op. cit.* 9.
[17] *Ibid.* 9.

baronetcy, becoming president of the Bank of New South Wales and returning to Australia after his time in England in the 1860s to act as Agent-General for New South Wales from 1897-1899. Sir Daniel Cooper died in England in June 1902.[18]

As under Piper's ownership, the land surrounding the subject site also remained largely undeveloped during the time of the Cooper Estate. In 1852, A. B. Greaves stated that, "*The Cooper estate…ran with a frontage of about three miles towards South Head, past what is now the Tea Gardens and Bondi Junction. A two rail split fence defined the estate and this fence was overrun with lizards and Botany Bay bugs. On the estate thick scrub covered the surface of the ground…red gravel was plentiful in many places on the surface in the vicinity of the road*."[19] The situation was similar in the 1860s, when J. A. Dowling described, "*the whole of Bellevue Hill, with the exception of a few dwellings abutting on or overlooking Double and Rose Bays was covered with dense bush.*"[20] The undeveloped nature of the subject site in 1853 is demonstrated in **Figure 6**.

Figure 6. Mitchell's 1853 Trigonometric Survey of Sydney, showing the lack of European structures in the vicinity of the subject site. (Source: National Library of Australia, Object #231444014[21])

Though the majority of the estate remained intact until the 1880s, small changes occurred throughout the 1850s and 1860s which led to the establishment of the Woollahra Local Government Area in 1860 (**Figure 7**).[22] In 1849, two portions of land were marked out at Double Bay as an addition to the Cooper Estate, to replace the park at Bellevue Hill which was returned to the Crown to ensure the popular spot would remain accessible to the public. Other small parcels of land were released from the 1850s onwards and developed into large houses and gardens.[23] These developments occurred after 1853, as Mitchell's trigonometric survey of Sydney shows no structures in the vicinity of the subject site at the

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18 Jervis, J. and V. Kelly (ed.). 1960. *Op. cit.* 106.
19 *Ibid.* 57.
20 *Ibid.* 73.
21 Mitchell, T. 1853. *Trigonometrical survey of Port Jackson: commenced as a military survey by order of General Darling and continued as civil duties permitted or required.* T. & W. Boone, New Bond Street: London.
22 Woollahra Municipal Council. Nd. *A brief history of Woollahra*.
23 *Ibid.* 46, 57.

time of publication (Figure 7&8).[24] One of the houses built in the late 1850s was Ginahgulla (now called Fairfax House), on the property leased by John Fairfax in 1858, which is now part of the Scots College and heritage listed on the Woollahra LEP 2014.[25] **Figure 7** (below) records the Ginahgulla property in 1863.

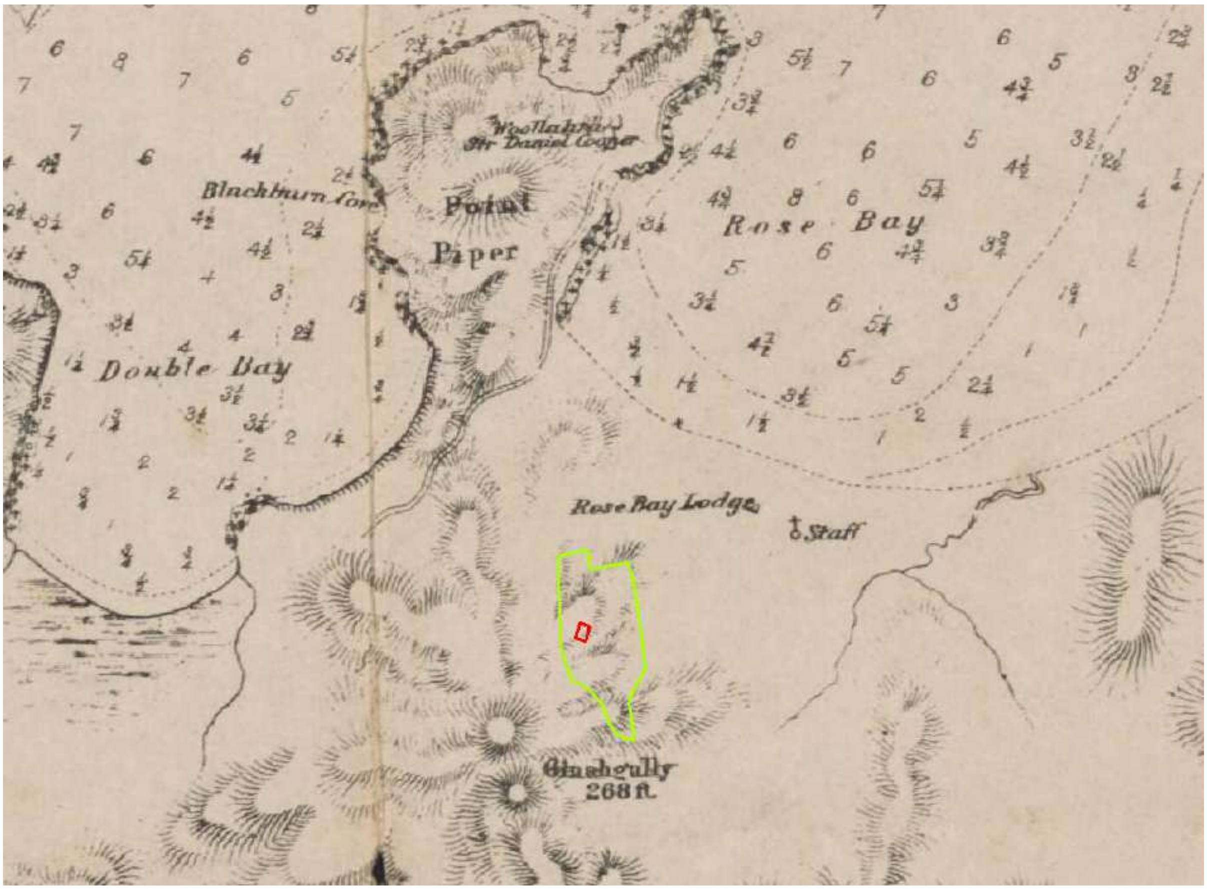

Figure 7. Detail from E.W. Ward 1863 Plan of Port Jackson, showing the Woollahra and the Point Piper Estate with Sir Daniel Cooper as land owner. Nearby points include Ginaguhully (sic) peak and Rose Bay Lodge with very little other development (Source: National Library of Australia, Object #231473218[26])

Early photographs depict the sparse colonial population of Bellevue Hill, which retained much of its coastal bushland until well after the establishment of the Scots College in 1895. Aboriginal communities continued to live alongside European settlers in the area throughout the time of the Cooper Estate, as discussed in Section 3.2.6, below. **Figure 8** overlooks Seven Shillings beach and surrounding bushland, one of the historically recorded areas of Aboriginal occupation at Bellevue Hill, and demonstrates the lack of European occupation in the area at the time.

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[24] Mitchell, T. 1853. *Trigonometrical survey of Port Jackson: commenced as a military survey by order of General Darling and continued as civil duties permitted or required.* T. & W. Boone, New Bond Street: London.

[25] Wotherspoon, G. 2012. *Op. cit.*

[26] Ward, E. W. 1863. *Plan of portion of Port Jackson to illustrate Report on the Defences [of the City of Sydney] dated 3rd January 1863.* NSW Parliament Legislative Assembly: Select Committee on Harbour Defences.

Figure 8. Double Bay in 1857 or 1858, looking northwest from near the current site of the Scots College. The photograph overlooks Seven Shillings Beach, where historical sources record Aboriginal fishing activity. (Source: The Rylands Collection, University of Manchester: Image #JRL023251tr[27])

The final break-up of the Cooper Estate began in the 1880s, with the first major land sale taking place in 1883.[28] **Figure 9** depicts the estate, labelled the Piper Estate, in 1882 shortly before this sale. Judge Joshua Josephson took ownership of the subject site at this time, building St Killian's (later known as Aspinall House, the main school building in the early days of the Scots College) in 1883. [29] **Figure 10** shows St Killian's soon after its construction.

The 1883 sale was followed by further sales in 1885, 1902, 1903 and then various subdivisions from the early 1900s to 1925. **Figure 11** demonstrates the increased residential occupation surrounding Point Piper throughout this period. The Scots College was established at Bellevue Hill in 1895. [30]

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[27] Jevons, William Stanley. 1857-1858. Print 157: Rose Bay, Port Jackson, looking north, head of Broken Bay just visible. In *Photographic scrap-book; commenced November 26th 1857, Double Bay, near Sydney, New South Wales*. The Rylands Collection, courtesy of the University of Manchester.

[28] Thorp, W. 1999. *Op. cit.* 9.

[29] Sherington, G. and M. Prentis. 1993. *Scots to the fore: a history of the Scots College, Sydney: 1893-1993.* Hale & Iremonger: Sydney. 44.

[30] Sherington, G. and M. Prentis. 1993. *Scots to the fore: a history of the Scots College, Sydney: 1893-1993.* Hale & Iremonger: Sydney. 44.

Suburban homes began to develop more rapidly in the area from 1910 onwards.[31] Mass development occurred after 1914, when the tram service from the city was extended to Bondi Beach.[32]

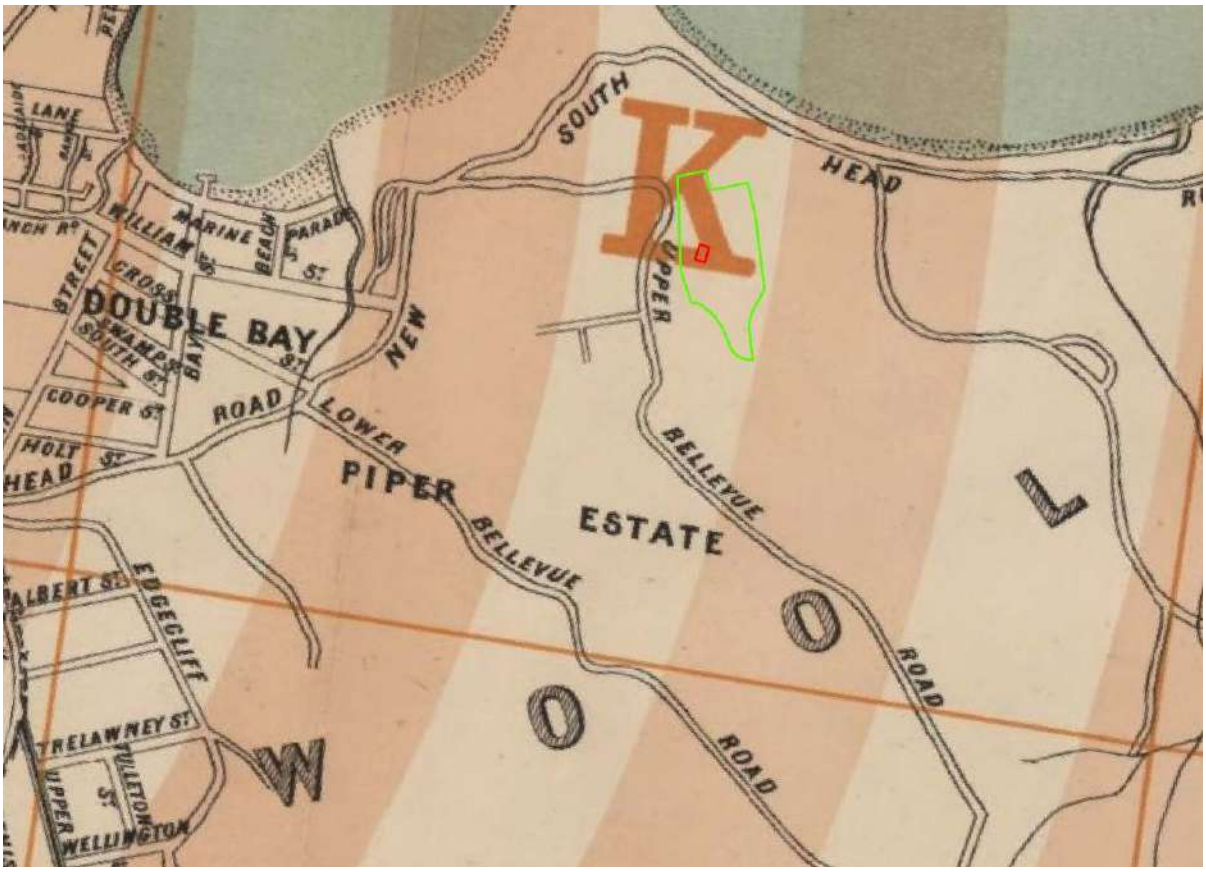

Figure 9. An 1882 map indicating the extent of the Point Piper Estate in the vicinity of the subject site, outlined in red, and the Scots College main campus, outlined in yellow. (Source: National Library of Australia, Object #229933743[33])

[31] Jervis, J. and V. Kelly (ed.). 1960. *Op. cit.* 73.
[32] Wotherspoon, G. 2012. *Op. cit.*
[33] Gibbs, Shallard & Co. 1882. *Gibbs, Shallard and Co.'s map of the City of Sydney and suburbs*. Gibbs, Shallard & Co.: Sydney.

Figure 10. St Killian's (later Aspinall House), date unknown, c.1883. There is no visible development on subject site and a lawn is visible to the east of the house. (Source: TSC Archives 0015, courtesy Danielle Torrisi)

Figure 11. Rose Bay c.1890-1898. This photograph was taken from southeast of the subject site and depicts the view of Rose Bay the Scots College would have had when it was relocated in 1895. (Source: Australian National Maritime Museum, Object #0034781[34])

3.2.6 Historical Records of Aboriginal Activity at Bellevue Hill

Aboriginal communities remained in the area throughout the days of the Cooper Estate and have been recorded in a number of historical sources. In 1845, approximately twenty Aboriginal people were living at Double Bay, adjacent to Point Piper. Populations in the Sydney region lived in gunyahs (huts), rock overhangs, tents, wooden structures and other shelters depending on the availability of building materials[35] and it is likely that some of those structures were present in the Cooper Estate. Double Bay in the 1840s was still regularly used as a fishing place, especially as central Sydney was urbanised throughout the decade.[36] Aboriginal people also maintained relationships with landowners at Point Piper, helping to control a bushfire at the Point in 1845 and attending to a convict who had been bitten by a snake.[37] European families on the Cooper Estate were interested in Aboriginal ethnology, hired them as workers and understood their language.[38]

In the 1860s, thirty to forty “blacks” were described as a source of annoyance to the European residents of Redleaf, northwest of the subject site, as they were camping in the bush opposite the property.[39] One of them was known as Gurrah, from whom the owner of Redleaf bought the tribe’s fishing rights for seven shillings. That fishing place is now known as Seven Shillings Beach. The tribe then relocated to Rona Garden, to the west of the subject site.[40] Another significant Aboriginal local was William Warral, who was known to the groundskeeper of the Cooper Estate since the 1820s.[41] He was provided with an area of land at the intersection of Norwich Road and New South Head Road[42] and lived there until his death in 1863.[43] Positive relationships with European settlers meant that Aboriginal people lived on private land on the Cooper Estate until the 1890s.[44] These historically recorded places of Aboriginal activity are shown in **Figure 12**, below. It should also be noted that **Figure 13** depicts waterways across Bellevue Hill c.1883, which may be associated with areas of Aboriginal archaeological potential.

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34 ‘View of Rose Bay to Vaucluse, taken from Bellevue Hill in Sydney, 1890-1898’. Samuel J. Hood Studio Collection: Australian National Maritime Museum.

35 Irish, P. 2017. *Hidden in Plain View: The Aboriginal People of Coastal Sydney.* New South Publishing: Sydney. 33.

36 *Ibid.* 41, 45.

37 *Ibid*. 69.

38 *Ibid*. 71.

39 Jervis, J. and V. Kelly (ed.). 1960. *Op. cit.* 52.

40 *Ibid*. 44.

41 Irish, P. 2017. *Op. cit.* 70.

42 *Ibid*. 70.

43 Russell, E. 1980. *Woollahra: a history in pictures*. John Ferguson: Sydney. 88.

44 Irish, P. 2017. *Op. cit.* 71, 72.

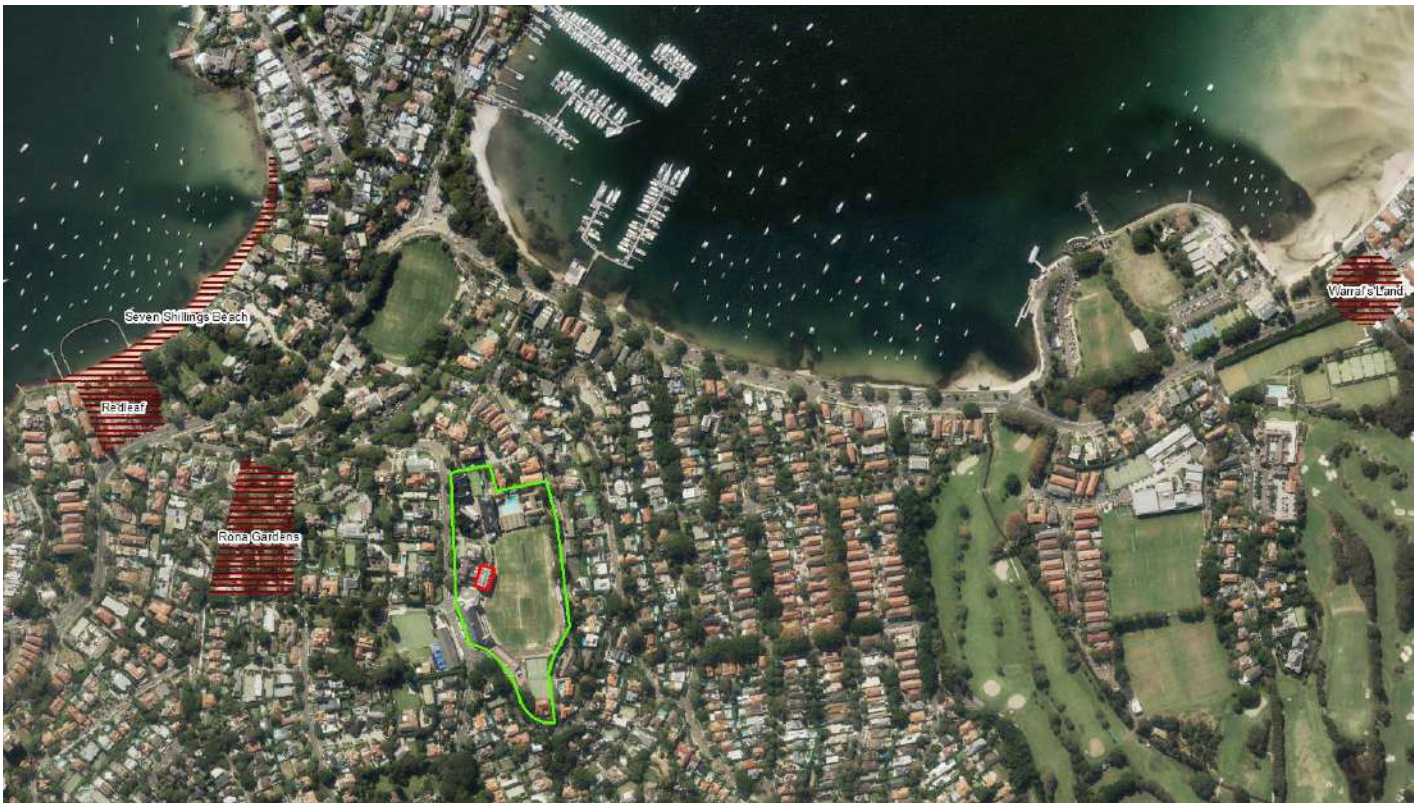

Figure 12. Historically recorded Aboriginal presence, shaded red, in the vicinity of the subject site. (Source: LPI SIXmaps 2018)

3.2.7 Joshua Josephson and the St Killian's Estate: 1883-1893

Joshua (Joseph) Josephson was a musician, solicitor and Justice of the Peace, as well a founding member of the University of Sydney and a successful businessman and property owner in the Sydney region. [45] He obtained the property that later became The Scots College from the Cooper Estate on a 99-year lease during the land sale in 1883 (shown in **Figure 13**). He constructed his residence, St Killian's (later Aspinall House), from materials salvaged from his recently demolished Enmore House, which he owned from 1876-1883.[46] The development of Bellevue Hill at the time continued to grow. On 28 August 1882, *The Sydney Morning Herald* reported on a Woollahra Council meeting during which Josephson and other property owners on Bellevue Hill had applied for gas lighting along upper Bellevue Road, which was granted for the new year with the option of property owners paying a fee to have it installed earlier. [47] In the same Council statement, a letter from Josephson referred to damage at his property from a drain carrying storm water from Fairfax's neighbouring property. The cost of repairs was given to the Cooper Estate, as they had constructed the drain before Woollahra Council was formed in 1860.[48]

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[45] McCormack, T. 2010. *Josephson, Joshua Frey, Dictionary of Sydney*; 'Late Ex-Judge Josephson'. *The Armidale Express and New England General Advertiser.* 5 July 1892. 7.

[46] Sherington, G. and M. Prentis. 1993. *Op. cit.* 44.

[47] 'Borough Councils'. *The Sydney Morning Herald*. 28 Aug 1882. 9; Woollahra Council Minutes. 8 Aug 1882. Woollahra Council Documents Archive. File #010/010043. Page 97-98.

[48] 'Borough Councils'. *The Sydney Morning Herald*. 28 Aug 1882. 9; Woollahra Council Minutes. 8 Aug 1882. Woollahra Council Documents Archive. File #010/010043. Page 97-98.

Josephson died at St Killian's on 26 January 1892 and left the 99-year lease for his estate at Bellevue Hill entrusted his surviving family.[49] Soon after his death, in 1893, Josephson's freehold was valued to £174,530.[50] In 1895 the Reverend Arthur Aspinall, first principal of the Scots College, leased part of the estate, comprising of the St Killian's residence and two acres of surrounding land, when the school moved to its current location at Bellevue Hill after its original location in Brighton-Le-Sands became unsuitable. [51]

Figure 13. The 99-year lease held by Josephson, dated to 1855 by SLNSW, however Josephson took ownership of the property from 1883. Note the waterways recorded in the vicinity of the subject site. (Source: SLNSW FL3738407[52])

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[49] McCormack, T. 2010. *Op. Cit.*; 'Late Ex-Judge Josephson'. *The Armidale Express and New England General Advertiser.* 5 July 1892. 7.

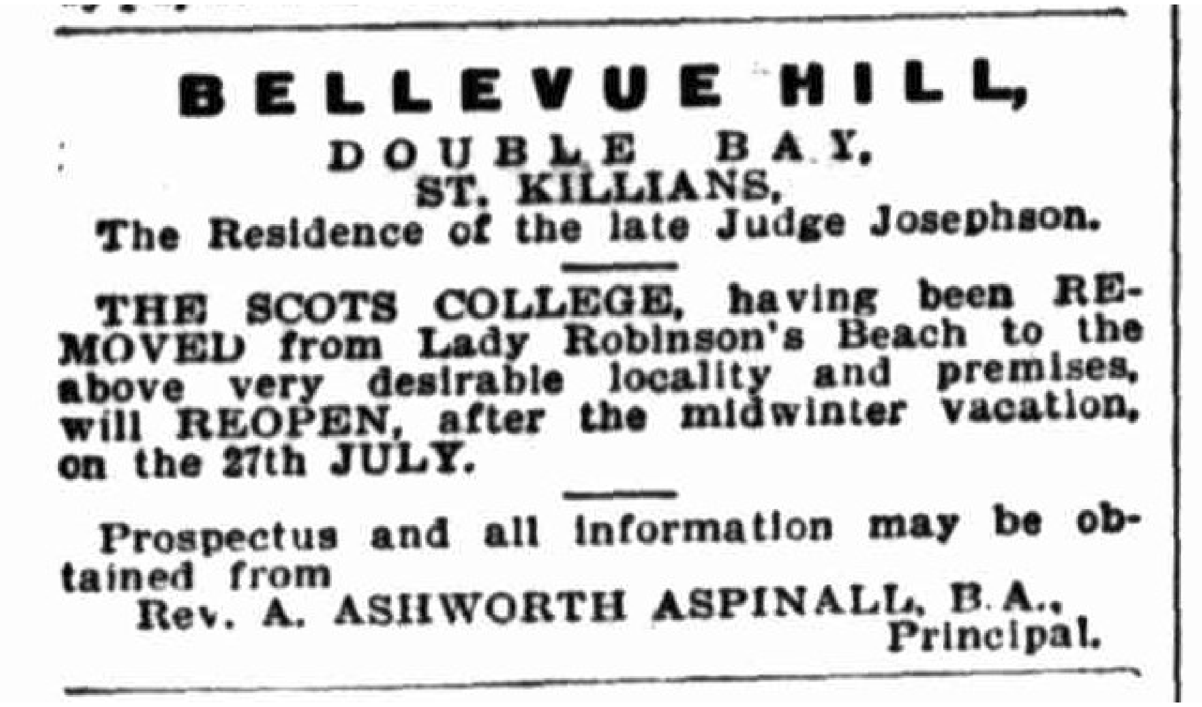
[50] *Brisbane Courier*. 13 July 1893. 5.

[51] Sherington, G. and M. Prentis. 1993. *Op. cit.* 44.

[52] *Point Piper Estate*. 1855. State Library of NSW, FL3738407.

3.2.8 Aspinall House and early days of The Scots College: 1895-1913

The Scots College opened at its new location on 27 July 1895, as advertised by the College's first principal Arthur Aspinall (**Figure 14**).[53]



BELLEVUE HILL,
DOUBLE BAY,
ST. KILLIANS,
The Residence of the late Judge Josephson.

THE SCOTS COLLEGE, having been REMOVED from Lady Robinson's Beach to the above very desirable locality and premises, will REOPEN, after the midwinter vacation, on the 27th JULY.

Prospectus and all information may be obtained from
Rev. A. ASHWORTH ASPINALL, B.A., Principal.

Figure 14: Advertisement for the new location of The Scots College. (Source: Australian Town and Country Journal 30 November 1895[54])

Josephson's residence at St Killian's became known as Aspinall House (**Figure 15**) and was the principal's residence and the school's boarding house. The 'school proper' was constructed a short distance away and contained seven classrooms and a gymnasium. The new building was fairly extravagant, with an expensive stained-glass window in the entrance hall which doubled as a chapel and large dining and reading rooms. Orchards, gardens, lawns and other horticultural features were also established on the grounds.[55]

In 1902, Aspinall expanded the school's facilities. A new building was constructed with a new gymnasium, a laboratory, and an armoury, carpenter's shop, bathroom, speech room and classroom.[56] See **Figure 15** for potential structures dating to 1902. In the same year, Aspinall also bought the lease for the area of St Killian's Estate now occupied by the school for £5,500.[57] In 1905, Aspinall wished to divest himself financially from the College and the Church eventually bought the school grounds and buildings for £7,000, assuming full control in January 1907.[58] A small hospital was also built in that year. Aspinall eventually retired in 1913.[59]

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[53] 'Bellevue Hill, Double Bay. St. Killians'. *Australian Town and Country Journal*. 30 Nov 1895. 4.
[54] *Ibid.*
[55] Sherington, G. and M. Prentis. 1993. *Op. cit.* 46.
[56] *Ibid.* 47.
[57] *Ibid.* 49.
[58] *Ibid.* 49-50.
[59] *Ibid.* 56.

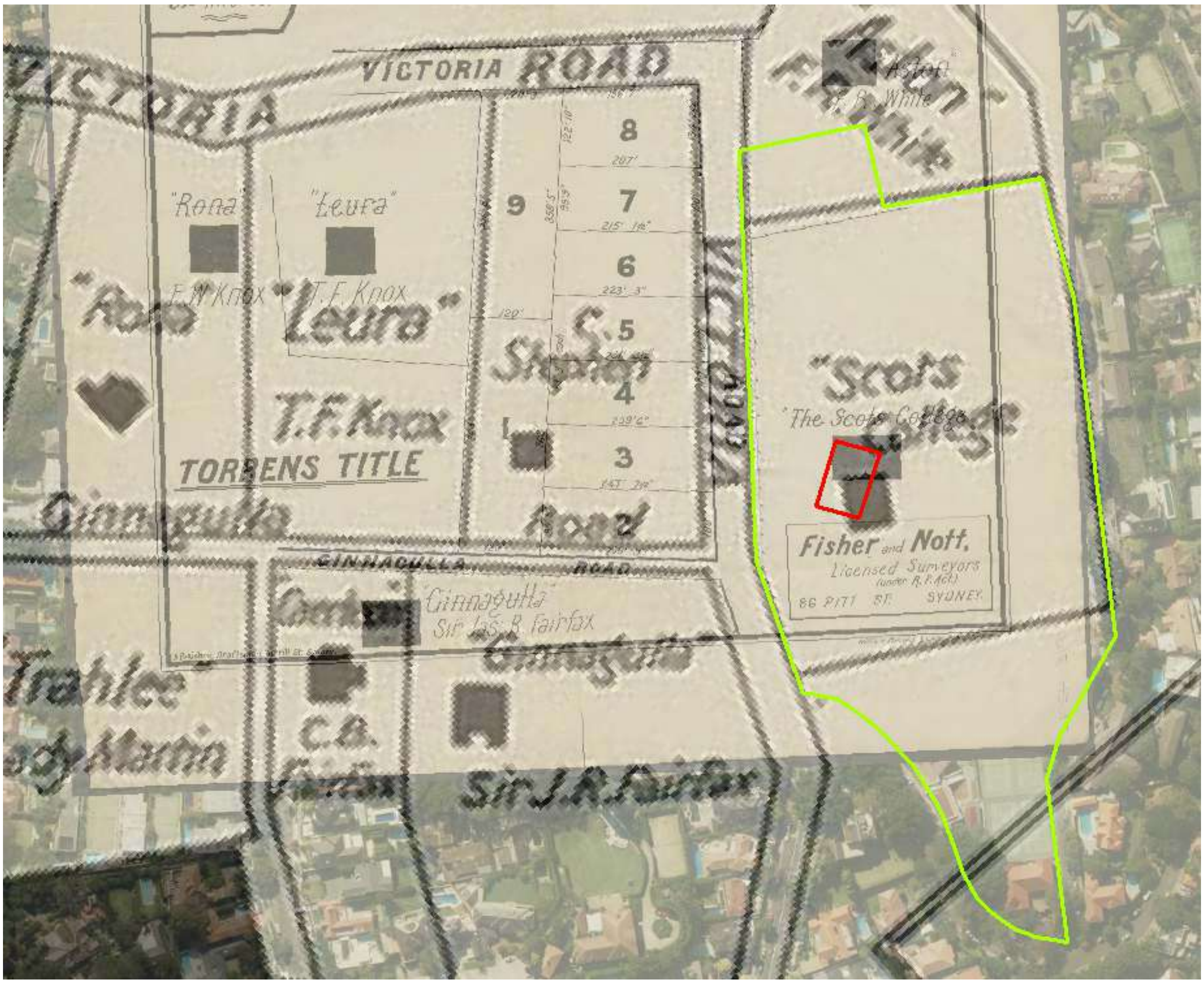

Figure 15. 1902 Bellevue Hill Subdivision maps overlaid onto current aerial photograph. These show Aspinall House within the area of the Stevenson Library, suggesting the 1902 plan is likely to be inaccurate, or not to scale. (Source: LPI SIXmaps 2018, National Library of Australia Object #230552944[60], National Library of Australia Object #230553392[61])

3.2.9 Growth and expansion: 1914-1950

After Aspinall's retirement, the College Council appointed James Bee as the new principal in 1914.[62] The new principal identified the need for improvements to the existing school buildings and to expand the school's facilities and outlined these requirements in his first annual report.[63] As a result, a new three-storey classroom block overlooking the school's playing fields was constructed and opened on 23 July 1915. It had a balcony on its eastern side for sports spectators and two of its classrooms were temporarily used as dormitories while the search began for a new boarding house. The playing fields were also expanded at the time to accommodate increased enrolments at the school.[64]

The increase in enrolments coincided with the development of the nearby suburbs of Rose Bay and Vaucluse after the sale of the Cooper Estate. The newly available land allowed the College to apply to

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[60] Raine & Horne and Fisher & Nott. 1902. *Bellevue Hill, Woollahra Mr. W. O. Gilchrist's property.* William Brooks & Co.: Sydney.

[61] Raine & Horne and Fisher & Nott. 1902. *Bellevue Estate, on the heights of Woollahra, overlooking Double Bay sale on the ground at 3 p.m. Saturday September 20th 1902.* William Brooks & Co., Macnamara & Smith, H.E.C. Robinson Ltd.: Sydney.

[62] *Ibid.* 60.

[63] *Ibid.* 61.

[64] *Ibid.* 61, 62.

purchase eight more acres for its grounds in 1914. This transaction was completed in 1918, when the College also paid for a temporary boarding building and expanded further to Kambala Road where a permanent boarding house would be built on two and a half acres of land. This house, Macintyre House, opened in 1919.[65]

The majority of development throughout the 1920s related to expanding and improving the boarding houses. The land for the Scots Preparatory School was also purchased early in the decade, over 1920 to 1921, at the homestead Kambala on Mansion Road. The land surrounding Macintyre House was sold in 1923 to fund the Preparatory School purchase. In 1926 Kirkland House opened, with six dormitories to accommodate the senior boys. This finally replaced the temporary boarding house of 1918.[66] In 1929, one dormitory in each of Kirkland and Macintyre Houses was converted to a common room.[67]

Further development took place late in the 1930s with of the construction of a new wing for the school's main classroom block which opened in 1939, housing the school's first library. This major extension also included an Assembly Hall, refectory, art room, clock tower, science laboratories, a woodwork and wool classing room, masters' common room and a classroom.[68] Later that year, Royle House on Kambala Road was leased to accommodate thirty-four boarders.[69] In the 1940s, World War II affected the school's development. The only changes occurred between 1941 and 1942, when air raid shelters were constructed in the basement of Aspinall House, the cellars of Kirkland House, the top floors of the school's hospital and Macintyre House and in the corridors of the main school.[70] The aerial photograph of the subject site dating to 1943 (**Figure 16**) depicts structures present throughout this period.

65 *Ibid*. 63.
66 *Ibid*. 66.
67 *Ibid*. 84.
68 *Ibid*. 89.
69 *Ibid*. 86.
70 *Ibid*. 96.

Figure 16. 1943 Aerial detail of Aspinall House showing the Stevenson Library in outlined in red and the boundary of the Scots College main campus in yellow (Source: LPI SIXmaps 2018)

3.2.10 Post-war and modern development: 1950-present

After World War II there was a lack of building materials available, however enrolment at Scots continued to expand It was at this time, in 1950, that Ginahgulla (Fairfax House) - built much earlier in 1858 - was purchased and became the school's newest boarding house (Figure 17). Minor developments were made to construct a domestic staff block, a cottage for the School Sergeant Major, a room for the Pipe Band and two extra classrooms in Fairfax's old billiard room and garages.[71] In 1953 the foundation stone was laid for the school's War Memorial Chapel, which was still being constructed in 1954.[72] Other, smaller developments continued. In 1957 the principal's office was moved from Aspinall House to the Bursar's quarters in the main school and the Bursar's quarters were moved to an annex between the Dining Hall and Aspinall House. A new staffroom and interviewing room were established.[73] Other works included constructing additional toilet blocks from 1957-1959.[74] In 1959, the property of Coote House was purchased and extra cubicles were installed in Kirkland House.[75] The Stevenson Library opened in 1964 as part of development on the western side of the senior campus, as described below in Section 3.2.11 (Figure 18).

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[71] *Ibid*. 113.
[72] *Ibid*. 116.
[73] *Ibid*. 128.
[74] *Ibid*. 130.
[75] *Ibid*. 130.

Figure 17. 1951 aerial photograph, with the Scots College main campus outlined in yellow and the subject site outlined in red. The study area was not subject to any new development since 1943. (Source: A. Brill 2013[76])

Other modern developments at The Scots College include the rebuilding of the Preparatory School in 1969 and the gymnasium and pool in 1972, and the general modernisation of the boarding houses throughout the 1970s. Agricultural laboratories were constructed in 1976. On 3 June 1975, a fire damaged the old Middle School buildings. These were repaired, with an improved auditorium, by 1977.[77]

In the 1980s, various repairs were conducted on the boarding houses and a new building was constructed in 1988 to house the Stevenson Library at its current location, as described below.

3.2.11 The Stevenson Library: 1964-present

The school's first library was opened as part of the major extensions to the main school building in 1939. In 1964, the facility was renamed the Stevenson Library when it was opened within a new three-storey senior classroom block containing ten classrooms, five laboratories, a wool classing room and a lecture room, the library and offices on the corner of Victoria Road and Ginahgulla Road.[78] This building is now

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[76] *Rose Bay 1951 – Sydney airphoto*. Aerial photographs of Sydney taken in 1951. Made available by Brill, A. 2013. Aerial photos of Sydney.
[77] *Ibid*. 146.
[78] *Ibid*. 130.

the Ginahgulla Centre.[79] The principal at the time, Allen McLucas, thought that the block left "a little to be desired" and stated that, "I appear to be the only person concerned about such matters".[80]

The Stevenson Library was expanded in 1988 when the school's new Resources Centre was opened. The Centre incorporates the library, an audio-visual centre, classrooms, a book-room, a tuckshop, prefects' rooms, a changing room and a meeting room (Figure 19).[81]

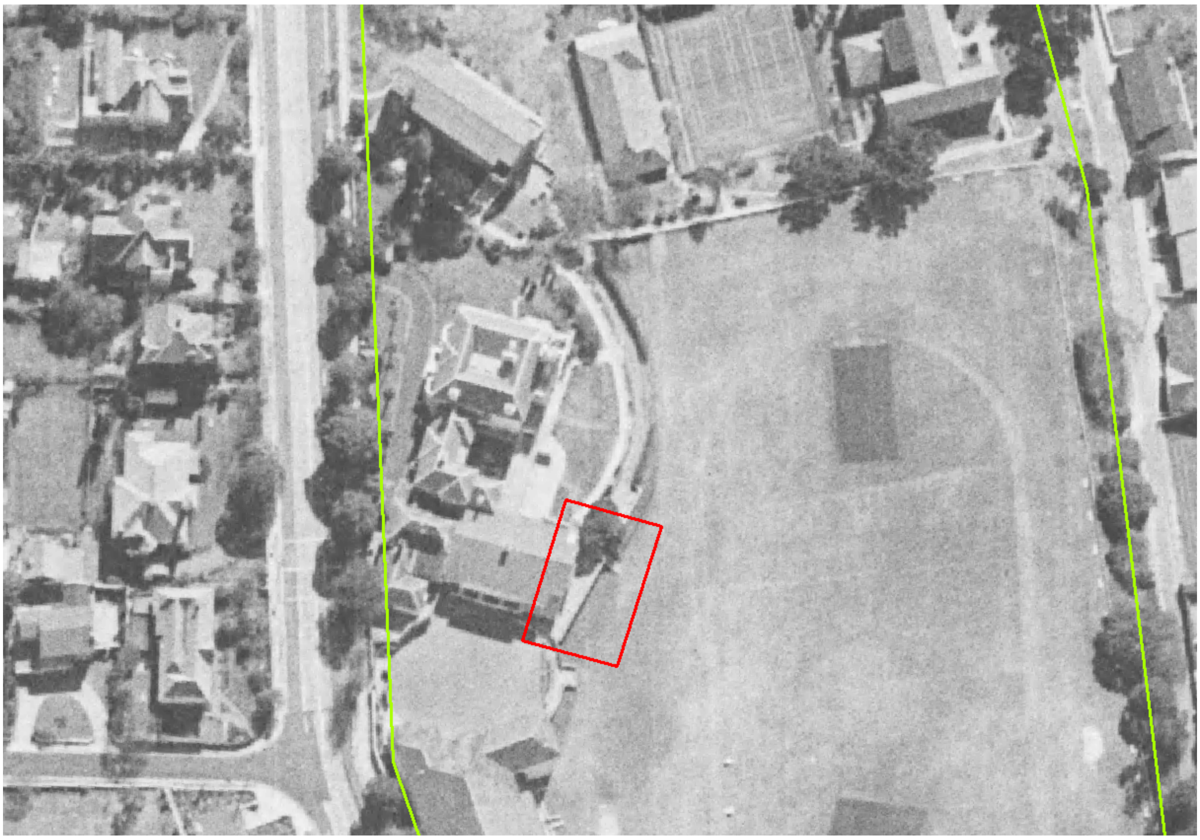

Figure 18. Detail of 1965 Aerial Imagery showing the expansion within the Aspinall House Complex. (Source: LPI)

[79] Danielle Torrisi (Archival Technician at The Scots College), pers. comm. 5 Feb 2018.
[80] *Ibid*. 130.
[81] *Ibid*. 170.

Figure 19. Scots College in 1991 after the complete of the Stevenson Library. (Source: LPI)

3.3 Summary of Development in the Study Area

Date	Event
1790	Signal station established at South Head
Early 1800s	A bush track runs between South Head and Port Jackson
1803	Attempt to build a better track to South Head is unsuccessful
1809	The track is known as South Head Road

1811	South Head Road constructed by Governor Macquarie
1815	Several land grants made but not occupied
1820	190 acres granted to John Piper at Point Piper
1826	Cooper and Levey purchase the Point Piper Estate
1860	Woollahra LGA is established
1883	St Killian's (later Aspinall House) constructed
1895	The Scots College moves to Bellevue Hill Aspinall House converted to principal's residence and student boarding house First school building constructed near Aspinall House
1902	New school building constructed with gymnasium, laboratory, armoury, carpenter's shop, bathroom, speech room and classroom
1907	School hospital constructed
1915	Three-storey classroom block constructed, overlooking playing fields Playing fields expanded
1919	Macintyre House opened
1921	Preparatory School established on Mansion Road
1923	Land near Macintyre House sold
1926	Kirkland House opened
1929	Common room established in both Macintyre and Kirkland House
1939	Major extensions to the main school including the school's first library, an Assembly Hall, refectory, art room, clock tower, science laboratories, woodwork and wool classing room, masters' common room and classrooms Royle House leased for thirty-four boarders
1941-1942	Air raid shelters constructed
1950	Ginahgulla (Fairfax House) purchased and converted to a boarding house
1953	Foundation stone laid for the War Memorial Chapel
1957	Principal's office moved to Bursar's quarters Bursar moved to an annex between the Dining Hall and Aspinall House New staffroom and interviewing room established
1957-1959	Additional toilet blocks constructed
1959	Coote House purchased Cubicles added to Kirkland House
1964	Stevenson Library opened in current Ginahgulla Centre. On 8th February a three-floor senior classroom block opened including ten classrooms, five labs, a wool classing room, lecture room, library and offices. The finished block left "a little to be desired"
1969	Preparatory School rebuilt
1972	Gymnasium and pool rebuilt
1970s	Modernisation of boarding houses
1975	Fire damaged Middle School on 3 June
1976	Agricultural laboratories constructed
1977	Middle School buildings repaired with improved auditorium
1980s	Various repairs to boarding houses
1988	Resources Centre, currently housing the Stevenson Library, expanded

4 PHYSICAL DESCRIPTION

4.1 General

The study area was inspected by Lorna Cooper, Archaeologist (Extent Heritage), accompanied by Greg Hastie (Impact Projects) on 30 January 2018. The study area was inspected for evidence of potential historical archaeology. Inspection covered the external portion of the study area, with a focus given to areas providing good ground exposure, to determine the presence of archaeological relics and/or disturbance levels.

The study area is currently a functioning school with existing buildings over the western edge of the school ovals. The Stevenson Library is centrally located, overlooking the oval and dominates the view of the college from the harbour. The building is surrounded by concrete paving and is tied to Aspinall House through the boarding house Dining Hall.

Topography of the subject site comprises relatively flat elevated terrain. The immediately adjoining properties consist of the college campus buildings and residential structures.

No evidence of earlier standing structures remains on the surface immediately surrounding the building or on the grass ovals. Subsurface features may be present. A cut for a water drain (Figure 25) and services (Figure 23) were evident in the concrete paving and drain pipes are sunk below the ground surface (Figure 21). These services installed for the Stevenson Library are likely to have impacted sub surface features.

Figure 20. Library within school skyline looking north from Cranbrook Rd, towards Sydney Harbour

Figure 21. Stevenson Library

Figure 22. Frontage of Library, southern end

Figure 23. Steps on Northern side of Stevenson Library, leading to Aspinall House

Figure 24. Looking south across the oval showing relation of Stevenson Library to school buildings

Figure 25. Detail of concrete paving in front of Stevenson Library

Figure 26. Dining Hall connecting rear of Stevenson Library to Aspinall House

Figure 27. Southern end of Stevenson Library, and adjacent Dining Hall from Quadrangle

Figure 28. Courtyard behind Stevenson Library (right), with Aspinall House on left

4.2 Geotechnical and Environmental Investigations

JCA Architects (Cockings 2017) has provided a summary of local geotechnical conditions drawn from three previous excavations:

> *Construction of the Business Studies Centre – completed 2016*
>
> *Boreholes indicated that the site area was largely sand with a relatively thin layer of [mixed] fill across the surface. Bedrock was apparent below the sand though fell away quite rapidly to the south of the site. Piling was socketed into rock at the north end of the site, adjacent to the Middle School Building, but were embedded in sand to the south.* (Cockings 2017, p1)
>
> *Proposed Additions to the MSB*
>
> *An earlier report by Jeffrey & Katauskas dated April 2005 confirmed that bedrock appeared on the borehole log at approx. RL52.00 around the [future Business Studies Centre] site, while the log for those further north closer to Library, including one in front of the Quadrangle, show the borehole depth terminating at RL 48.25 in sand, i.e. no rock.* (Cockings 2017, p1)
>
> *Excavation Works on the Oval*
>
> *The recent installation of an onsite detention tank to the south east perimeter of the Oval saw an excavation wholly in sand, approx. 4.5m deep, down to RL49.50. No rock was encountered.* (Cockings 2017, p1)

Evidence from bore holing indicates that historical fills are ephemeral and interspersed with sand and other mixed fills. The sands and other soils are likely to contain any potential archaeological evidence but may also represent modern fills deposited onsite to level for the current structures shown by the changes in aerial photographs from the mid twentieth century.

5 HISTORICAL ARCHAEOLOGICAL POTENTIAL

5.1 Introduction

This section of the report discusses the site's potential to contain historical archaeological evidence of the previous phases of occupation. The potential for the archaeological resource to reveal useful information about the previous uses or activities that shaped its history depends on its extent, nature and level of intactness. Disturbed archaeological features and deposits in the form of fragmentary structural remains and random artefacts may be evidence of previous occupation, but their use or value in reconstructing the past though providing meaningful information is limited. This is because such features and deposits are disassociated from the stratigraphic sequence that establishes their provenance and secure date of deposition.

This section identifies where intact archaeological evidence is likely to be found at the site, and to what extent it may be preserved. The level of significance of archaeological evidence (known or potential) is discussed in Section 6.

5.2 Site Formation Processes and Archaeological Potential

Based on the historical research the following broad historical phases of site development and use can be identified:

- Phase 1: European Occupation and Early Land Grants (1790-1850)
- Phase 2: Development of Bellevue Hill – changing from rural to suburban occupation (1850-1895)
- Phase 3: The Scots College (1895 – present)

Disturbance and development during each phase is likely to have had a significant impact on the survival of archaeological evidence associated with the occupation and use of the study area during earlier phases. The potential historical archaeological remains associated with each phase are outlined below and summarised in **Table 1**.

Phase 1: European Occupation and Early Land Grants (1790-1850)

During the period of the earliest land grants there is limited evidence of development beyond initial land clearing. Development during this period is likely to have been fairly small-scale at best, possibly associated features such as property fences or markers. Other archaeological features, such as evidence of simple timber structures, or land cultivation, are unlikely as historical records indicate the study areas was mainly undeveloped at this phase of the site occupation. In general, the historical archaeological potential from this phase is considered to be low, given the scale of the subsequent development of the study area that involved significant ground disturbance required for the construction of a number of buildings with associated landscaping, infrastructure and sport grounds.

Phase 2: Development of Bellevue Hill (1850-1895)

The second phase relates to the development of Bellevue Hill, changing from a rural estate to suburb. With the sale of the Cooper Estate, development and occupational patterns changed in the area, beginning with the building of Ginaghulla House in the late 1850s. In 1883 J.F. Josephson rebuilt his Enmore house on land purchased from the Cooper Estate, which later became part of the Scots College. Houses were still sparsely spread across the wider area well after the initial development of the school.

The historical archaeological potential from this phase would be associated with the late 1850's Ginahgulla House (later Fairfax House on the western portion of The Scots College) and J.F. Josephson's 1883 residence, St Kilian's (later Aspinall House). Given that both buildings are extant, the potential archaeological remains would include underground services (pipes and cisterns), elements of the original landscaping (e.g.: paths, garden beds, garden furniture, enclosures), original driveway and yard surfaces and any additional structural elements such as garden sheds, fences, scattered artefacts, etc. Archaeological potential for any underfloor deposits within extant Aspinall would be considered to be very low as the house would be furnished with tongue and groove floor boards (and floor coverings), which leave little or no possibility for artefacts to fall through the cracks of spaced or loose floorboards. In general, there would be a limited number of archaeological features still present at the site, as the known structures in the study area remain standing. The subsequent upgrades of the site would have resulted in major disturbance or complete removal of shallow elements at the site. However, deep features such as service pipes, cisterns, wells, rubbish pits or artefacts in disturbed contexts may still exist. Cumulatively, archaeological potential for this phase of the site development would be considered to be low to moderate.

Phase 3: The Scots College (1895-present)

In 1895, Aspinall purchased the land and home of J. F. Josephson to move his school, Scot's College, to. This building still stands and is utilised as a boarding house now, over the subsequent 123 years building have been added, and developed, however major restructuring of layouts appears to have been limited and many buildings still exist on site. This phase of development is likely to have involved the removal of vegetation, grading and introduction of additional fill, in order to level the study area, in particular the playing fields and clearing of previous garden areas apparent in aerial photographs.

The historical archaeological potential from this phase is considered to be low, as most of the structures remain standing and the surrounding areas being subject to significant alterations. There is some limited potential for the presence of remains of superseded or replaced structures or landscaping that have been removed in the period 1895-2017.

5.3 Summary of Historical Archaeological Potential

Table 1 below lists the potential remains from all three phases of historical development of the site. Their likelihood of survival is graded in accordance with the following classification: Nil, Low, Moderate, High and Extant. The graphic representation of the site's archaeological potential is provided in Figure 29.

Table 1. Summary of historical archaeological potential.

Phase	Site Features	Potential Remains	Archaeological potential
1: European Occupation and Early Land Grants (1790-1850)	Land clearing Possible fences or markers Scattered artefacts	Postholes, tree boles, evidence of burning, soil profile, less likely: simple wooden structures, contact archaeology	Low
2: Development of Bellevue Hill (1850-1895)	Structures Driveway Yard surfaces or paths Subsurface services (pipes, drains including a stormwater drain from Fairfax's neighbouring property, cisterns, rubbish pits) Scattered or isolated artefacts Fill	Structural remains, construction cuts and fills, services (pipes and cisterns), driveways, yard surfaces, fencing, drainage, artefact scatters	Low – Moderate

3: The Scots College (1895-present)	Earlier school buildings Landscaping Yard surfaces Subsurface services Fill	Structural remains, construction cuts and fills, services, removal of vegetation, grading/introduction of fills	Low

The study area has generally low potential to contain archaeological remains associated with the European occupation of the site. The development of the study area did not commence prior to the second half of the nineteenth century. Prior to this, the site was dense bushland with a small potential for simple tracks. Development was slow to take hold and began in the area with first Ginaghulla House in the 1850s then St Killians' in 1883, with several other properties in the area, archaeological potential is likely to relate to the early development of large properties.

By 1895 Scots College had taken up a prime position and expansion of the facilities took place to accommodate various needs of the growing school complex. Given the level of redevelopment of the site over the last 120 years, some fragmentary evidence of earlier phases of occupation across the site is possible. The footprint of the extant Stevenson Library and its immediate surrounds are unlikely to contain substantial archaeological remains associated with the 1883 St Killians (later Aspinall) building.

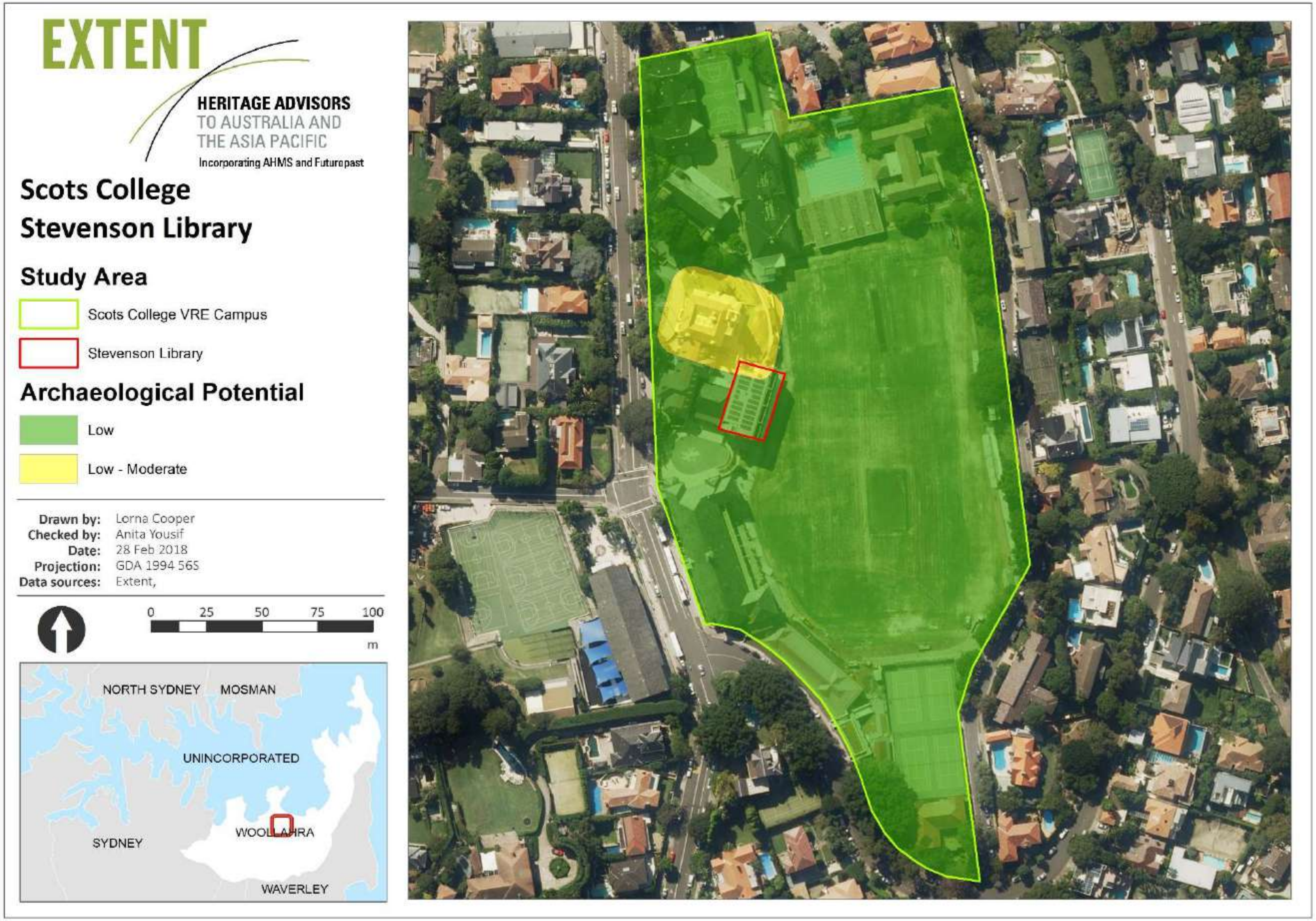

Figure 29. Demonstrating the Archaeological potential relating to the Scots College (Victoria Road East Campus) with the Stevenson Library highlighted in red

6 ASSESSMENT OF HISTORICAL ARCHAEOLOGICAL SIGNIFICANCE

6.1 Basis for Assessment

Archaeological significance refers to the heritage significance of known or potential archaeological remains. While they remain an integral component of the overall significance of a place, it is necessary to assess the archaeological resources of a site independently from above-ground and other heritage elements. Assessment of archaeological significance can be more challenging as the extent and nature of the archaeological features is often unknown and judgment is usually formulated on the basis of expected or potential attributes.

The following significance assessment of the study area's historical archaeological resource is carried out by applying criteria expressed in the publication 'Assessing Significance for Historical Archaeological Sites and 'Relics', prepared by the Heritage Branch, formerly Department of Planning (NSW) (now the Heritage Division, Office of Heritage and Environment) in December 2009.

6.2 NSW Heritage Criteria for Assessing Significance Related to Archaeological Sites and Relics

6.2.1 Archaeological Research Potential (NSW Heritage Criterion E)

The development of the suburb and school, second and third phases of the occupation of the study area, are well represented in the documentary historical record. Although there is higher potential for the presence of archaeological remains from the St Kilian's (Aspinall House) building phase, it is unlikely that these remains would provide substantial additional historical information. Archaeological evidence associated with the J.F. Josephson's St Kilian's residence that later became the original school building would have the ability to provide some information about the origins of the building complex and as such would be considered significant at a local level.

There is much less documentary evidence relating to the earlier, initial European ownership and continued Aboriginal use of the study area and their interaction with the Europeans. Any evidence of the contact between the groups would have high research potential. However, the potential for the presence of archaeological remains from this phase is low.

6.2.2 Associations with individuals, events or groups of historical importance (NSW Heritage Criteria A, B & D)

Early Aboriginal interactions with Europeans who claimed ownership of the general area of the study area are in evidence within the historical record; the earliest roads would have been based on older tracks created through the bush and there are records of the housing, economic interactions and general use of the area.

The whole Point Piper peninsula was divided early into land grants and European ownership was marked by land clearing however there is no indication of structures or fencing, any evidence of this earliest period would relate to Piper, Cooper and Levey.

From the earliest times, the study area has been owned by notable figures in the colony, who to a lesser or greater extent left their mark on the study area, of these J.F. Josephson and A. Aspinall are locally significant.

6.2.3 Aesthetic or technical significance (NSW Heritage Criterion C)

The land adjacent to the east of Aspinall House, has apparently been used as a lawn area to situate the hose in its landscape from its earliest development and continued through the mid twentieth century as shown in aerial images. Potential archaeology may demonstrate evidence of earlier landscaping; however, it is unlikely that such remains would provide any substantive information that could not otherwise be gleaned from other sources, in particular historical archives.

6.2.4 Ability to demonstrate the past through archaeological remains (Criteria A, C, F & G)

This criterion primarily depends on the nature and level of preservation of the potential archaeological resources within the study area. Given that such aspects are expected to be fragmentary their ability to demonstrate certain characteristics of the area's late nineteenth-century residential development is limited.

The historical archaeological remains that are most likely to be present on the study area relate to the building and use of Aspinall House (St Kilian's), and representative of residential development which has been well documented in the suburban areas of Sydney in the late nineteenth century and the subsequent development of the Scots College. It is unlikely that such archaeological remains would provide any substantive historical information that could not be obtained from other sources, and in particular the documentary record.

6.2.5 Bickford and Sullivan's Questions

The above assessment criteria are supplemented by the established assessment framework that has been developed by Anne Bickford and Sharon Sullivan, who set three fundamental questions to assist in determining the research potential of an archaeological site.[82] These questions are as follows.

Can the site contribute knowledge that no other resource can?

The late nineteenth century development of the study area is well understood from documentary sources, and the archaeological remains that are probably present are unlikely to provide substantial additional historical information.

Can the site contribute knowledge that no other site can?

Initial occupation by J.F. Josephson which contribute little as many other properties in the surrounding area have a similar history of development and use, and would have similar archaeological potential, but as redevelopment continues rapidly, the remaining stock of such sites is reduced. The study area is associated with the Scots College from the late nineteenth century, and in that sense any associated archaeological remains would be specific to this particular site. However, as many of the structures are still extant, the potential archaeological remains are likely to be limited to construction cuts and fills, services and prior landscaping and overall would not be considered significant.

Is this knowledge relevant to general questions about human history or other substantive questions relating to Australian history, or does it contribute to other major research questions?

---

[82] Bickford, A and S Sullivan 1984, 'Assessing the Research Significance of Historic Sites', in Sullivan, S and S Bowdler (eds) *Site Surveys and Significance Assessment in Australian Archaeology* (Proceedings of the 1981 Springwood Conference on Australian Prehistory), Department of Prehistory, Research School of Pacific Studies, The Australian National University, Canberra, pp 19–26.

The historical information that could be derived from the potential archaeological resource relates to the general occupation and usage development of the site in particular as a home then a school, and the local area in general. The relevance of the information to an understanding of the history of the area is limited by the probable nature of the evidence, which is likely to consist largely of construction cuts, fills and service remains.

6.3 Summary Statement of Significance

The potential historical archaeological resource relates largely to the occupation of the study area in the nineteenth century. The first phase relates largely to the Aboriginal occupation of the study area during the historic period of the initial land grants and resales (1790-1850) interspersed with evidence of European ownership; archaeological remains from either the nineteenth-century Aboriginal use of European ownership of the study area are unlikely to be present. However, substantial and tell telling remains of the contact between the local Aboriginal groups and Europeans would have high research potential and would be of state heritage significance. The first site phase relates to evidence of land grants and resales (1790-1850), with no evidence of European occupation or cultivation in the historic record. Any remains are likely to be limited to land clearing and possible fencing or markers and as such would be of local heritage significance.

The second phase contains evidence of the development of Bellevue, changing from a rural estate to suburb, evidence would most likely be in the form of infrastructure. This phase of the history of the study area is of local significance, as it relates to the development and changing face of the local area.

The third and final phase of historical archaeological evidence from the site relates to the development of the Scots College over time, the archaeological evidence is unlikely to provide substantial historical information that cannot be obtained from other sources, and overall not considered to be of heritage significance.

In summary, the archaeological evidence associated with the historical development of the Scot's College site would have limited ability to contribute to a better understanding of the late nineteenth century historical development in New South Wales. Any potential relics would have limited research potential to tell the and as such would be significant at a local level.

7 POTENTIAL HISTORICAL ARCHAEOLOGICAL IMPACT

7.1 Proposed Development

The proposal involves major alterations and additions to the Stevenson Library building including partial demolition, extensions to existing floor slabs, creation of an atrium void, addition of a new upper storey, complete interior refitting, and complete recladding of the exterior in a Scottish Baronial architectural style. It includes the creation of a new main entrance from the College Quadrangle as well as new entrances directly off the College oval.

7.2 Potential Archaeological Impact

Based on the information that is presently available, the proposed development will involve demolition of internal and external walls but retention of the slab. The elevations illustrated in **Figure 30** demonstrate how the works will use the existing structure as a skeleton without requiring deep excavation.

The footprint of the new building will be 214m^2 larger than the existing footprint and will involve trenching to extend the slab and to create an atrium and lift well as detailed in **Figure 31**. There is unlikely to be a requirement for extensive deep excavation, as no basement levels are proposed. Deep excavation is likely to be limited to discrete areas, for footings, subsurface services, and features such as lift-wells and stormwater detention basins.

This excavation may be at least partially contained within introduced fill material. However, where excavation extends beyond fill, these works may result in partial disturbance or destruction of subsurface historical archaeological remains relating to Aspinall House as shown in Figure 29.

This is unlikely to substantially affect the potential archaeological resources of the study area, as the archaeological potential in the impact zone is considered to be generally low.

Figure 30. Existing vs Proposed Elevation – indicating no deep excavation. (JCA Architects, Drawing No. SSD1.02/17-201, Scale 1:200 @ A3)

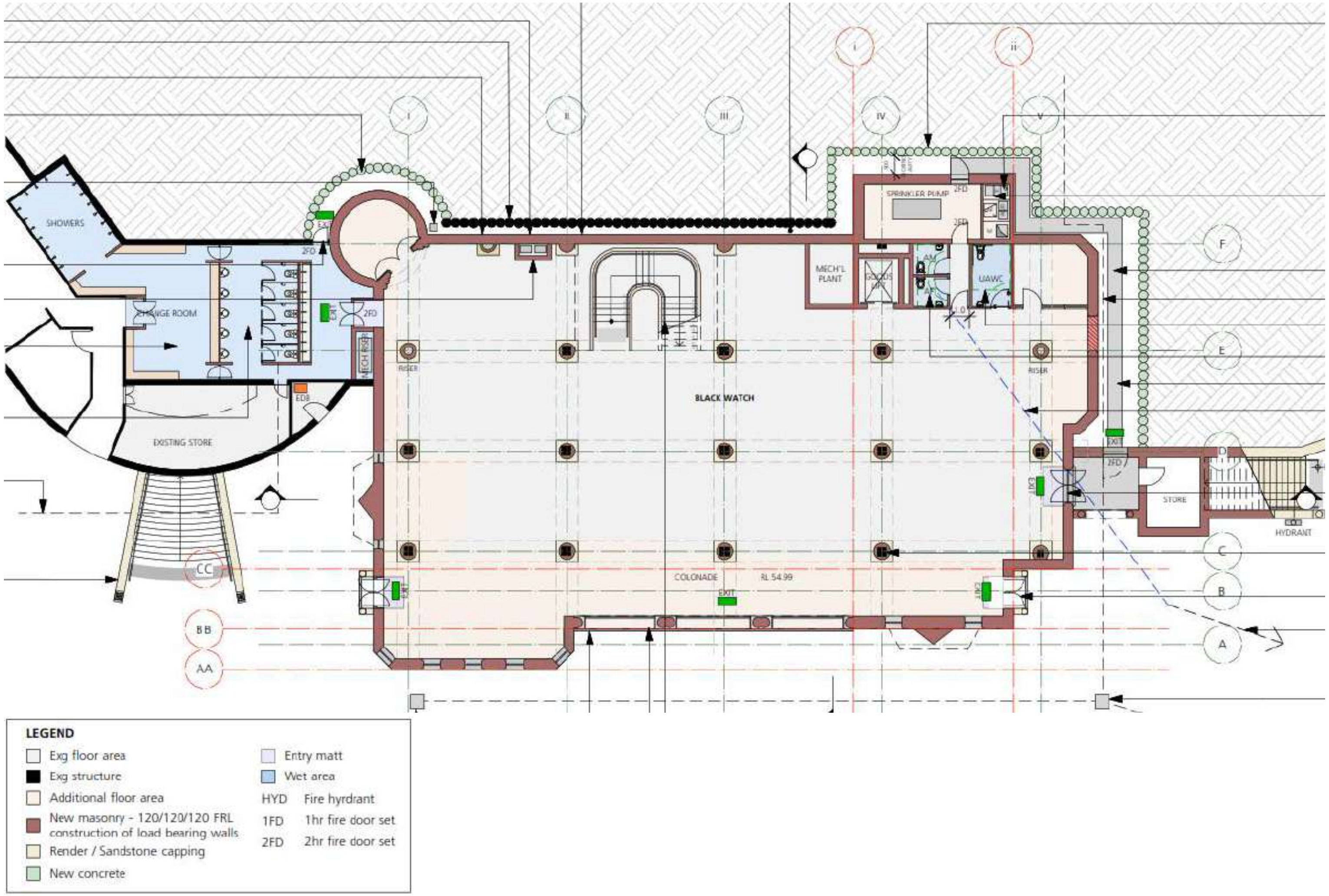

Figure 31. Proposed Ground Floor Level – note the additional flooring at the edge of the existing structure. (Source: JCA Architects, Drawing No. SSD1.02/17-201, Scale 1:200 @ A3)

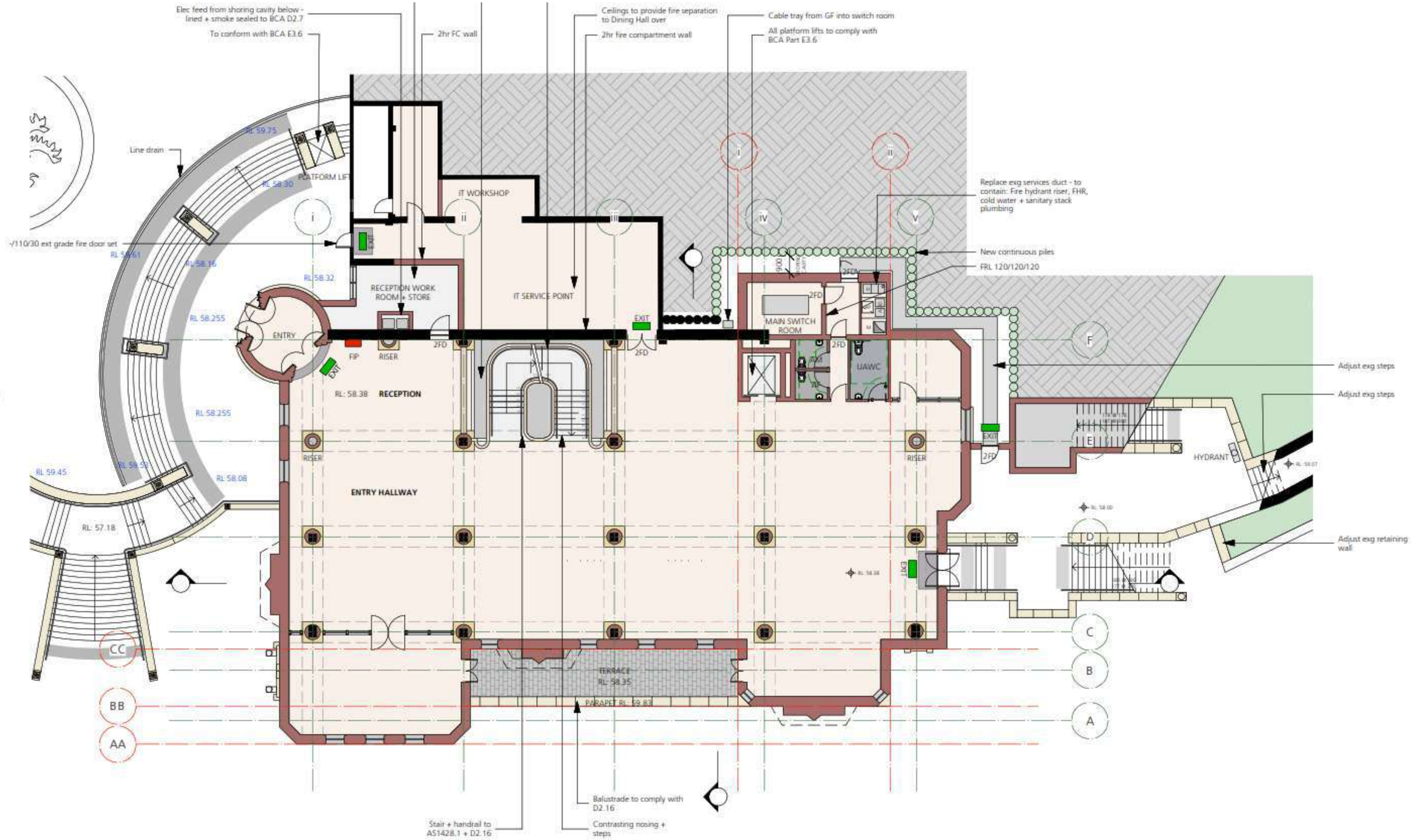

Figure 32. Proposed first floor plan. (Source: JCA Architects, Drawing No. SSD1.02/17-202, Scale 1:200 @ A3)

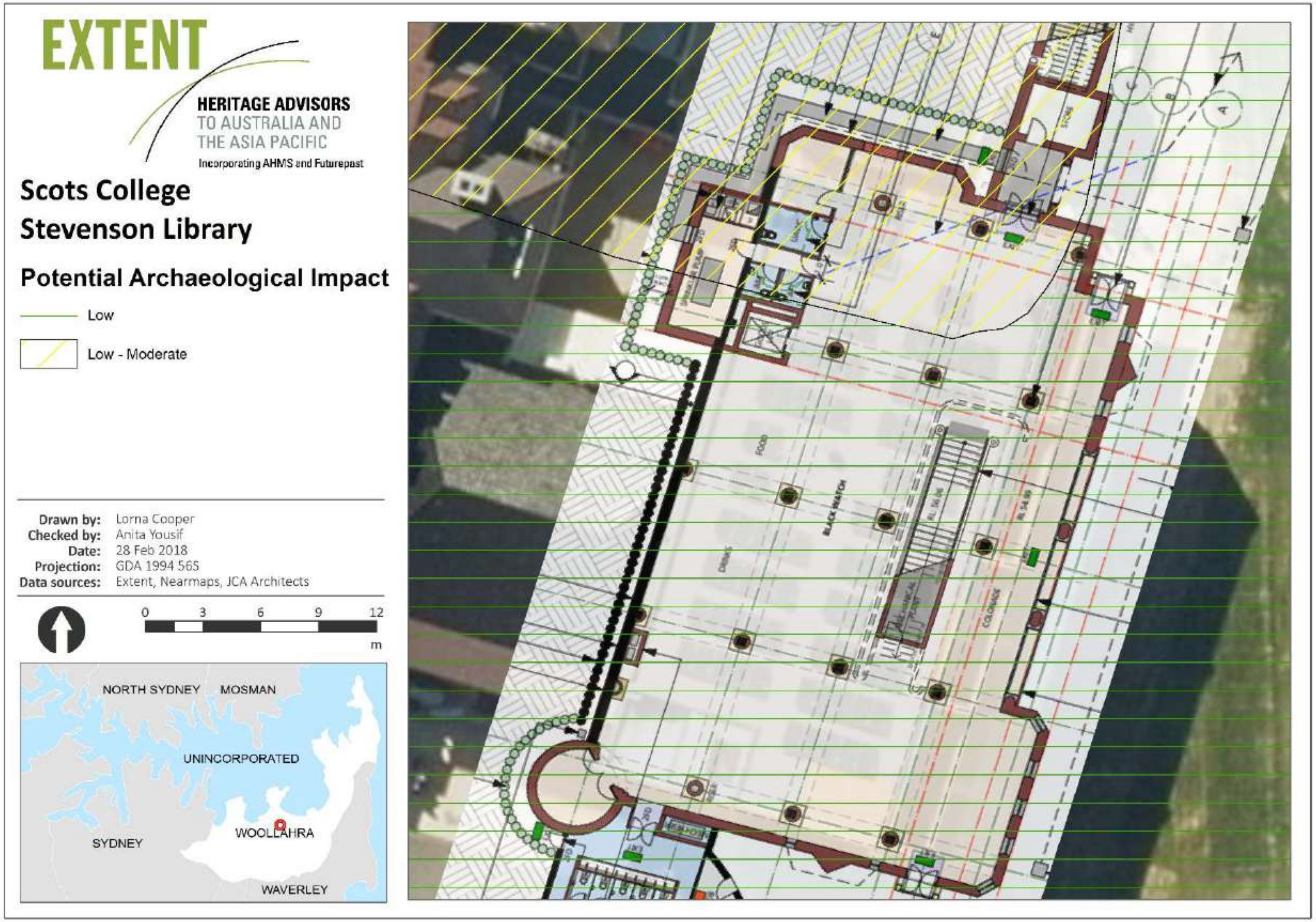

Figure 33.Potential Archaeological Impact indicated by hashed yellow and green overlay.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The development of the study area did not commence prior to the second half of the nineteenth century. The first recorded development in the area began with Ginaghulla House in the 1850s followed by St Killians' in 1883, which later became the Scots College.

The site has been assessed to have generally low potential for historical archaeological remains associated with nineteenth century development. Archaeological evidence is likely to relate to the mid to late nineteenth century development of Bellevue Hill including still extant structures St Killians' (later Aspinall House) and Ginaghulla (later Fairfax house) and the later development of the Scots College.

The archaeological significance of the nineteenth century archaeological potential is considered to be at a local level.

Historical records document the Aboriginal presence and interaction with landowners well into the mid nineteenth century. However, given substantial ground disturbances associated with the continuous development of the site since the mid nineteenth century, evidence of Aboriginal occupation and interaction with Europeans is considered to be low.

Any substantial archaeological evidence of the contact period between the local Aboriginal people and European landholders would be considered significant at a State level.

The footprint of the Stevenson Library is by and large located in the area of the low archaeological potential with the northern end potentially encroaching the area of low-moderate potential associated with historic Aspinall House.

The proposed redevelopment of the Stevenson Library does not involve extensive deep excavation, as no basement levels are proposed and the building will utilise existing services. Deep excavation is likely to be limited to discrete areas only for new features such as a piling trench, lift-wells (which is located in the area of low potential) and at least partially contained within introduced fill material.

The discrete areas of excavation mainly contained in the zone of low archaeological potential is considered to be of negligible adverse impact onto the site's potential areological resources.

The proposed redevelopment of the Stevenson Library is being assessed as SSD under Section 89C of the EP&A Act. Once approved it will be outside the ambit of the Heritage Act.

8.2 Recommendations

If the proposed redevelopment of the Stevenson Library site is approved as SSD, approval from the Heritage Council of NSW under Section 139 of the Heritage Act will not be required.

However, given the local heritage status of the adjacent Aspinall House and some potential for archaeological relics across the site, it is recommended that following archaeological management be employed:

- Prior to the onsite ground disturbance commencing, the designated project team including all contractors on site should undergo heritage induction, which will include an archaeological awareness component to reinforce the importance of heritage issues and the management measures that will be implemented.

- In the event of an unexpected discovery of archaeological relics during ground disturbance works the Unexpected Find Procedure should be followed. The procedure details the actions to be taken when a previously unidentified and/or potential Aboriginal and/or historical heritage item/object/site is found during construction activities, as follows:

  1. **STOP ALL WORK** in the vicinity of the find and immediately notify the relevant Site Supervisor. The Supervisor will then notify the Project/Site Manager and demark the area to protect the artefact/item/object/site.

  2. The Project/Site Manager is to record the details, take photos of the find and ensure that the area is adequately protected from additional disturbance.

  3. The Project/Site Manager contacts the appointed project archaeologist to notify them of the location of the find.

  4. If the project archaeologist advises that the find **is not** a historical relic 9 or (Aboriginal object), work will recommence in consultation with the Project/Site Manager.

  5. If the project archaeological advises that the find **is** a potential heritage item the Project/Site Manager should undertake the following procedure:

     - Liaise with the project archaeologist to determine the significance of the heritage item; and

     - Implement the appropriate heritage mitigations dependent on the significance of the site, which may include further archaeological excavation and recording.

     - If further archaeological works would be required they would be guided by an archaeological research design, which would provide a research framework for the works and research questions, which at the minimum, would focus on the extent, nature and integrity of archaeological remains and their ability to provide additional information on the history of the site.

     - Any archaeological excavation and recording would be carried out in accordance with best archaeological practice involving: stratigraphic excavation, detailed recording of exposed features and soil contexts using pro-forma context sheets and registers; measured drawings, photographic recording of all archaeological features and works performed; artefact collection in accordance with their provenance and appropriate labelling and bagging.

     - A final report detailing archaeological works and results of such works would need to be prepared at the completion of archaeological onsite works.

If exposed archaeological remains are deemed to be substantial or significant, the Heritage Council of NSW or the Heritage Division as delegate should be notified in accordance with section 146 of the Heritage Act.

If the proposed redevelopment of the Stevenson Library site is not approved as SSD, approval from the Heritage Council of NSW under Section 139 of the Heritage Act will be required to allow for the disturbance or removal of any locally significant relics. An application for a relevant approval would need to be accompanied by an Archaeological Research Design or Work Method Statement.

Any relics assessed to be of state heritage significance would need to be assessed separately and their management, including *in situ* retention, discussed with the Heritage Division and relevant stakeholders.

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Aargus

Environmental - Remediation - Engineering - Laboratories - Drilling

DETAILED SITE INVESTIGATION

TSC Stevenson Library, The Scots College
29-53 Victoria Road,
Bellevue Hill NSW

Prepared for

The Scots College C/- Impact Group Pty Ltd

28th March2018

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DOCUMENT HISTORY

Document No.	Revision No.	Issue Date	Description
ES7155/2	0	28/03/2018	Initial Issue

Approved for release by: Mark Kelly

Mark Kelly
Environmental Manager

Date: 28th March 2018

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ABBREVIATIONS

AIP	Australian Institute of Petroleum Ltd
ADWG	Australian Drinking Water Guidelines
AEC	Areas of Environmental Concern
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Aboveground Storage Tank
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
COC	Contaminants of Concern
DQOs	Data Quality Objectives
DSI	Detailed Site Investigation
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
PSH	Phase Separated Hydrocarbon
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance / Quality Control
RAC	Remediation Acceptance Criteria
RAP	Site Remediation Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SMP	Site Management Plan
SVC	Site Validation Criteria
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VHC	Volatile Halogenated Compounds

EXECUTIVE SUMMARY

Aargus Pty Ltd (‘Aargus’) was appointed by Impact Group Pty Ltd on behalf of The Scots College (the ‘client’) to undertake a Detailed Site Investigation (DSI) beneath the TSC Stevenson Library building within The Scots College located at 29-53 Victoria Road, Bellevue Hill NSW (the ‘site’). The site is proposed to be refurbished, with partial internal demolition and renovation to take place. The building will continue to be used as a ground floor café with library on the upper levels.

At the time of the inspection (11th March 2018), the site was a café on the ground floor with a library on the upper levels. The site was fully covered by concrete pavement.

The land title information provided suggested that the site was owned by Presbyterian Church (New South Wales) Property Trust since at least 1920s. This was consistent with the aerial photography which appeared to show the land use of the site within a school area since at least the 1920s.

A summary of the soil results for this assessment are provided below:

- All of heavy metals concentrations from the samples analysed met their respective assessment criteria under the HIL ‘B’.
- The TRH, BTEX, naphthalene and/or benzo(a)pyrene concentrations from the samples met their respective HSLs, and/or Management Limits.
- The benzo(a)pyrene (as TEQ), Total PAH, OCP & PCB concentrations were below the Health Investigation Level (HIL) for residential with minimal opportunities for soil access, that being the HIL ‘B’.
- Asbestos results in all samples were either not detected or below their assessment criteria.

Based on the results of this investigation it is considered that the risks to human health and the environment associated with soil contamination at the site are negligible within the context of the proposed use of the site to be refurbished, with partial internal demolition and renovation to take place. The building will continue to be used as a ground floor café with library on the upper levels. . The site is therefore considered to be suitable for the proposed use.

Any soils requiring removal from the site, as part of future site works, should be classified in accordance with the "Waste Classification Guidelines, Part 1: Classifying Waste" NSW EPA (2014).

1 INTRODUCTION

1.1 Background

Aargus Pty Ltd ('Aargus') was appointed by Impact Group Pty Ltd on behalf of The Scots College (the 'client') to undertake a Detailed Site Investigation (DSI) beneath the TSC Stevenson Library building within The Scots College located at 29-53 Victoria Road, Bellevue Hill NSW (the 'site'). The location of the property is presented in Figure 1 of Appendix A.

The site is proposed to be refurbished, with partial internal demolition and renovation to take place. The building will continue to be used as a ground floor café with library on the upper levels. The proposed development plans can be found in Appendix B.

A site investigation was requested by City of Woollahra to determine the potential for onsite contamination as part of the Development Application (DA).

1.2 Objective

The primary objectives of this DSI are as follows:

- Identify potential areas where contamination may have occurred from current and historical activities;
- Identify potential contaminants associated with potentially contaminating activities;
- Assess the potential for soils to have been impacted by current and historical activities; and
- Assess the suitability of the site to be refurbished renovated based on its current condition and the findings of this investigation.

1.3 Scope of Works

The scope of works for this DSI includes:

- Review of the physical site setting and site conditions based on a site inspection, including research of the location of sewers, drains, holding tanks and pits, spills, patches of discoloured vegetation, etc. (where applicable);
- Research and review of the information available, including previous environmental investigations, current and historical titles information, review of aerial photographs, groundwater bore searches, Section 149 Certificates, EPA notices, Council records, anecdotal evidence, site survey and site records on waste management practices;
- Development of a preliminary Conceptual Site Model (CSM) to demonstrate the interactions between potential sources of contamination, exposure pathways and human/ecological receptors identified;
- A targeted soil boring/sampling investigative study – formulating and conducting a sampling plan and borehole investigation;
- Laboratory analysis and results from sample analysis – findings and comparison to regulatory guidelines;
- Field and laboratory Quality Assurance/Quality Control (QA/QC); and
- Recommendations for additional investigations should any data gaps be identified or possible strategies for the management of the site, where relevant.

This report was prepared with reference to the NSW Environment Protection Authority (EPA) "*Guidelines for Consultants Reporting on Contaminated Sites*" (2011).

2 SITE IDENTIFICATION AND DESCRIPTION

2.1 Site Identification

Site identification information and land use is summarised in the table below.

Table 1: Site Identification

Lot and DP Number (Address)	Part Lot 1 in DP231713 (29-53 Victoria Road, Bellevue Hills NSW)
Coordinates*	(SE Corner) Latitude: -33.874933, Longitude: 151.253322 (SW Corner) Latitude: -33.874868, Longitude: 151.25319 (NW Corner) Latitude: -33.874599, Longitude: 151.253311 (NE Corner) Latitude: -33.874639, Longitude: 151.253469
Approx. Site Area	620m^2
Local Government Area	City of Woollahra
Parish	Alexandria
County	Cumberland
Current Land Zoning**	SP2 – Infrastructure: Education Establishment
Proposed Land Use	Educational facility with café and library
Current Site Owner	Presbyterian Church (New South Wales) Property Trust
Site End Users	Students, teachers , visitors, workers

Notes: * refer to http://maps.six.nsw.gov.au/
** refer to https://www.planningportal.nsw.gov.au/find-a-property/property/3925804_38_Atchison_Street_1_Wollongong_DP1202226/38_atchison_street,_wollongong,_2500

The site boundary and Lot and DP numbers are presented in Figure 2 of Appendix A. A survey plan provided by the client is included in Appendix B.

2.2 Site Inspection

A site visit was carried out on Sunday 11th March 2018 by an Aargus field scientist to inspect the site for any potential sources of contamination and document any observations made regarding the current site conditions. At the time of the site inspection, the following observations were made:

- The site was used as a café on the ground floor.
- A library was present on the upper levels.
- The site was fully covered by concrete pavement with no visible cracks.
- The site was flat.
- The site was bounded by a concrete pathway then grass covered playground to the east, garden bed area to the north, brick buildings to the west and a concrete courtyard to the south.
- Grass observed in the garden area outside the site was generally healthy with no visible signs of stress.
- No surface standing water was noticed at the site.

The site features are presented in Figure 3 of Appendix A. Site photographs are included in Appendix C.

2.3 Topography and Surface Water Drainage

The following observations were made during the site inspection carried out on the Sunday 11th March 2018:

- The site topography is generally flat.
- Stormwater runoff from the site is expected to flow in a north-easterly direction.

2.4 Surrounding Land Uses

The surrounding land uses identified are described in the table below:

Table 2: Surrounding Land Uses

Orientation	Description
North	Garden bed area, then Buildings for Educational facility
East	Concrete pathway and then playground covered by grass
South	Concrete courtyard
West	Buildings for Educational facility

3 SITE HISTORY

3.1 Land Titles

A review of historical documents held at the NSW Department of Lands offices was undertaken to identify the current and previous land owners, and potential land uses. The results of the title search are summarised in the following table.

Table 3: Land Title Information

Year	**Lot 1 in 231713 (29- 53 Victoria Road, Bellevue Hills NSW)**
1987-Current	Presbyterian Church (New South Wales) Property Trust
2002-2038 (Lease)	Ausgrid of substation No.6228 together with right of way and easement for electricity purposes
2017-2038 (Sub-lease)	Blue Asset Partner Pty Ltd, Eric Alpha Asset Corporation 1 Pty Ltd, Eric Alpha Asset Corporation 2 Pty Ltd, Eric Alpha Asset Corporation 3 Pty Ltd & Eric Alpha Asset Corporation 4 Pty Ltd
2017-2038 (Sub-lease)	Blue Op Partner Pty Ltd, Eric Alpha Asset Corporation 1 Pty Ltd, Eric Alpha Asset Corporation 2 Pty Ltd, Eric Alpha Asset Corporation 3 Pty Ltd & Eric Alpha Asset Corporation 4 Pty Ltd
	Prior: Vol 10739 Fol 128
1968-1987	Presbyterian Church (New South Wales) Property Trust
1929-1968	Dame Harriet Cooper, T. R. Raine, Trustees of the Presbyterian Church of Australia in the state of New South Wales

In summary, the land title information provided suggested that the site was owned by Presbyterian Church (New South Wales) Property Trust since at least 1920s.

The Lot has also been leased or sub-leased for use as an electrical substation, however, this was not located near the site nor observed near the site during the site inspection.

A copy of the historical land titles information obtained by Aargus can be found in Appendix D.

3.2 Aerial Photographs

Selected aerial photographs obtained from the NSW Department of Lands were reviewed to describe the site features and surrounding areas at various timelines. A summary of the review is presented in the table below.

Table 4: Summary of Historical Aerial Photos

Year	Site	Surrounding areas
1943	The site was vacant land covered by grass.	N: Open grass and tree covered area S: Pathway and trees E: Open vacant lands W: Open grass area then buildings
1961	The site was occupied by a building.	No apparent changes were observed from the previous photo with the exception of: S: A courtyard W: A building
1972	The layout of the structures appeared to be similar to that observed in the 1961 photo.	No apparent changes were observed from the previous photo.
1994	The site was occupied by a new building; however, the resolution was very poor.	No apparent changes were observed from the previous photo.
2002	The resolution was very poor and the site appeared to be similar to that observed in the 1994 photo.	No apparent changes were observed from the previous photo.
2017	The site layout appeared to be similar to that observed in the 2002 photo.	No apparent changes were observed from the previous photo.

In summary, land use of the site appeared to have been vacant from at least 1943, thereafter, between 1943 and 1961 the site and its adjacent land was occupied by a building with tile roof. A new building was constructed at some stage prior to 1994.
The general land use of the adjacent properties were all part of the school, with either buildings and/or playing fields evident.

Copies of current and historical aerial photographs are presented in Appendix E.

3.3 EPA Records

3.3.1 CLM Act 1997

The NSW EPA publishes records of contaminated sites under Section 58 of the Contaminated Land Management (CLM) Act 1997. The notices relate to investigation and/or remediation of site contamination considered to pose a significant risk of harm under the definition in the CLM Act. However, it should be noted that the EPA record of Notices for Contaminated Land does not provide a record of all contaminated land in NSW.

A search of the EPA database revealed that the suburb Bellevue Hill is not listed.

Copies of the EPA records are included in Appendix F.

3.3.2 POEO Register

A search of the POEO Register revealed that the site was not listed. A copy of the POEO register search is included in Appendix F.

3.3.3 List of NSW contaminated sites notified to EPA

A search of NSW contaminated sites notified to EPA revealed that the site was not listed.

3.4 Council Search Records

A search request for Council documents related to the site was submitted to Woollahra Council on 23rd March 2018. The results of the search request are summarised below:

- BA 260/96 – Approval for alterations and additions for storeroom to main stair at levels 1 & 2 at existing library building in 1996.
- DA 947/2002/1 – Approval for adding new partition wall, enclosing two sides of the undercroft area of library building and upgrading steps to main auditorium in 2002.

3.5 Section 149 Certificates

The Planning Certificate – Section 149 (2) of the Environmental Planning & Assessment Act 1979 for the site was obtained by the client and provided to Aargus for review. A summary of the information pertaining to the site is provided below:

- The site is zoned SP2 – Infrastructure under the provision of the *Woollahra Local Environmental Plan 2014.*
- Roads development may be carried out within the zone without development consent.
- The land does not include or comprise 'critical habitat' under the provisions of the local environmental plan.
- The land is not located in a heritage conservation area, but there is an item of environmental heritage situated on the land under the provisions of the LEP.
- The land is not affected by the operation of Section 38 or 39 of the *Coastal Protection Act 1979*.
- The land is not within a proclaimed mine subsidence district.
- The land is not affected by flood related development controls.
- The land is not biodiversity certified land.
- The property is not affected by a road widening or road realignment under the Roads Act.
- The land is not reserved for acquisition.
- The land is not recorded as bushfire prone land.
- The land is not affected by Property Vegetation Plans issued under the Native Vegetation Act 2003.
- The land is not affected by State Environmental Planning Policy (House for seniors or people with a disability, Infrastructure, Affordable rental housing).
- The land is not affected by one of the matters prescribed by Section 59 (2) of the *Contaminated Land Management Act 1997*.

Copies of the certificates are included in Appendix G.

3.6 Industrial Processes / Products Manufactured

At the time of inspection and based on historical information, the site comprised a café and library which has been within The Scots College since 1990s. No visible signs of industrial processes and/or products manufactured were observed and/or were likely to have occurred at the site.

3.7 Former Chemical Storage / Transfer Areas

No visible signs of chemical storage and transfer areas were observed at the site.

3.8 Product Spill & Loss History

It was indicated by the client, that to their knowledge no serious land or water contamination had occurred.

The site is currently occupied by sealed surfaces. At the time of the inspections, the sealed surfaces were in generally good condition with only minor cracks observed. In addition, there were no visible signs of oil and/or chemical staining, indicating that any surface spills (if they did occur at all) were cleaned up immediately and did not appear to penetrate the existing slab.

3.9 Historical Use of Adjacent Land

It was indicated by the client that to their knowledge, the adjacent lands to the site have been used primarily for commercial developments.

3.10 Discussion and Summary of Site History

Based on available information, the site historical usage is summarised as follows:

- The land title information provided suggested that the site was owned by Presbyterian Church (New South Wales) Property Trust since at least the 1920s.
- The aerial photography indicates that the land use of the site appeared to have been vacant from at least 1943, thereafter, between 1943 and 1961 the site was occupied by a building. At least from 1994 until now the site was occupied by a new building.
- The general land use of the adjacent properties to the west has been changed from vacant land to buildings before 1961. The land to the east of the site has always been vacant.
- A search of the EPA database revealed that the suburb Bellevue Hills is not listed.
- The land is not affected by one of the matters prescribed by Section 59 (2) of the *Contaminated Land Management Act 1997*.

4 ENVIRONMENTAL SETTING

4.1 Sensitive Environmental Receptors

The nearest down-gradient watercourse is Rose Bay, approximately 500m north of the site. The nearest recreation area is Woollahra Golf Course, located approximately 300m east of the site.

4.2 Geology

The Geological Map of Sydney (Geological Series Sheet 9130, Scale 1:100,000, 1983), published by the Department of Mineral Resources indicates the residual soils within the site to be underlain by Quaternary Age soils consisting of medium to fine grained "marine" sand with podsols.

4.3 Acid Sulfate Soils

To determine whether there is a potential for acid sulphate soils to be present at the site, reference was made to the NSW Department of Land & Water Conservation (DLWC) *Acid Sulphate Soil Risk Maps* (Edition Two, December 1997, Scale 1:250,000), specifically Map No. 94 – "Bondi". A review of the map indicated that there is "no known occurrence" of acid sulphate soil materials at the site, and the presence of acid sulphate soils was considered to be unlikely.

4.4 Hydrogeology

Based on available information, our desktop study indicates that groundwater from site is likely to be flowing towards Rose Bay, approximately 500m north of the site, that eventually discharges into the ocean.

A search of the Department of Primary Industry (DPI) borehole database information revealed thirty-five (35) groundwater bores within a 500m radius of the site.

A summary of the five closet groundwater bores information provided by the registered groundwater bore record search is provided in the following table:

Table 5: Summary of Registered Groundwater Bore Records

GW Bore ID	Intended Purpose	Construction date	Depth (m bgl)	Standing Water Level (m bgl)
GW109378	Recreation	02/10/2008	150.00	68.00
GW109248	Domestic	20/08/2008	-	-
GW106478	Domestic	26/10/2004	6.00	2.00
GW107058	Domestic	25/02/2005	7.00	3.00
GW107613	Domestic	10/01/2005	7.00	3.00

A copy of the groundwater bore search records can be found in Appendix H.

4.5 Summary of Local Meteorology

The monthly rainfall of the local area can be represented by the data collected by Bureau of Meteorology (BOM) from the rainfall gauge located in Rose Bay (Royal Sydney Golf Club), which is located approximately 1km east of the site. Records indicate that the total monthly rainfall for December 2017 was 51.4 mm and that the annual mean since 1928 is 1223.7 mm.

Reference can be made to Appendix I – Local Meteorology.

5 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

Based on the site inspection, site history, previous reports and review of available information from the desktop study, the potential Areas of Environmental Concern (AEC) and their associated Contaminants of Concern (CoC) for the site were identified. These are summarised in the following table.

Table 6: Summary of Potential Areas and Contaminants of Concern

Potential AEC	Potentially contaminating activity	Potential CoCs	Likelihood of Site Impact	Justification
Entire site	Importation of fill material from unknown origin	Metals, TPH, BTEX, PAH, OCP, PCB, Asbestos	Low	The site was observed to be fully sealed by concrete pavement with minimal fill likely.
Metal degradation	Degradation of metal features	Metals	Low	The site was currently observed to be fully sealed by concrete pavement, however, the site was previously open, so if degradation occurred, it would likely be restricted to the surface soils.
Pesticide	Pesticide use	OCP	Low	Pesticide use would likely be restricted to beneath existing slabs.
Former Building Structures	Potential Asbestos/Fibro Features	Asbestos	Low	If present, these will be removed by licensed contractors.

6 DATA QUALITY OBJECTIVES

6.1 Step 1 – State the Problem

6.1.1 Problem Statement

The site is proposed to be refurbished, with partial internal demolition and renovation to take place. The building will continue to be used as a ground floor café with library on the upper levels. As part of the DA application, it is a Council requirement that a site investigation report be prepared by a consultant to assess whether the site is suitable for the proposed development.

However, the desktop study identified some areas of potential environmental concern, in relation to imported fill of unknown origin, metal degradation, pesticide uses, and former asbestos based building products, which may pose risks to human and environmental receptors.

6.1.2 Objectives

The objectives of the DSI are:

- To assess the potential for the soils to have been impacted by current and historically contaminating activities; and
- To assess the suitability of the site to be refurbished renovated as part of Council's requirements for the DA.

6.1.3 Project Team

The nominated core project team and their responsibilities are listed in the table below.

Table 7: Project Team and Responsibilities

Project Team Member	Responsibilities
Mark Kelly – Environmental Manager	Project Director and Technical Review
Setareh Kazemi – Environmental Scientist	Field Representative
Lance Chen – Environmental Scientist	Field Representative and Report Author

6.2 Step 2 - Identify the Decisions of the Study

The decisions required to address the contamination problem are as follows:

- Is soil contamination present within the areas of potential environmental concern identified?
- Is soil contamination likely to present an unacceptable risk of harm to humans or the environments?
- Is the site currently suitable for the proposed land use that being a café and library within a secondary school?
- Is there a potential for onsite/offsite migration issues?
- If not, does the site require further investigation and/or remediation works?

6.3 Step 3 - Identify Information Inputs

The following information is required for input into the decisions identified in Step 2:

- Identification of potential areas and contaminants of concern as detailed in Section 5 of this report;
- Selection of soil assessment criteria from appropriate guidelines as detailed in Section 8 of this report;
- Collection of soil samples from site;
- Headspace analysis for screening of VOCs present within soils using a PID; and
- Comparison and interpretation of results again the adopted soil assessment criteria.

6.4 Step 4 – Define the Study Boundaries

The spatial and temporal aspects of the investigation area that the data must represent to support the decisions identified in Step 2 are as follows:

- The lateral extent of the study boundary is defined by the site boundaries as shown in the Site Location Plans (refer to Figure 1).
- The vertical extent of the study boundary is defined by the maximum depth of 1.0m BGL in BH1 .

6.5 Step 5 – Develop the Analytical Approach

The acceptable limits for laboratory QA/QC parameters are shown in the table below and are based upon the laboratory reported acceptable limits and those stated within the NEPM 2013 Guidelines.

Table 8: Acceptable Limits for QC Samples

Type of QC Sample	Control Limit
FIELD	
Rinsate Blanks	Analytes <LOR
Intra-Laboratory Duplicates	RPD's <50%
Inter-Laboratory Duplicates	RPD's <50%
Trip Blanks	Volatiles <LOR
Trip Spike Recovery	>70%
LABORATORY	
Method Blanks	< Laboratory LOR
Matrix Spike	Recovery targets: • Metals: 70% to 130% • Organics: 60% to 140%
Laboratory Duplicate	RPD's <30%
Laboratory Control Samples	70% to 130%
Surrogate Spike	60% to 140%

The following conditions should be adopted:

- If the control limits are exceeded, then an assessment of the significance of the results should be carried out;
- If the results of the DQI assessment indicate that the data set is reliable, then the data set will be deemed to be acceptable for the purposes of the investigation; and
- If the measured concentrations of soil samples analysed meet their respective validation criteria, then no additional assessment is required is required.

6.6 Step 6 - Specify Limits on Decision Errors

There are two types of decision errors:

- **Sampling errors**, which occur when the samples collected are not representative of the conditions within the investigation area; and
- **Measurement errors**, which occur during sample collection, handling, preparation, analysis and data reduction.

These errors may lead to following (null hypothesis):

- Deciding that the site is not suitable for the proposed development when it actually is (Type I error);
- Deciding that the site is suitable for the proposed development when it is actually not (Type II error);

A 5% significance level has been selected for Type I errors on the basis that 95% of the data set will satisfy the DQIs. Therefore, the acceptable limit of the decision errors is based on a 5% probability of the hypothesis being incorrect.

An assessment will be made as to the likelihood of a decision error being made based on:

- The acceptable limits for inter/intra laboratory duplicate sample comparisons as specified in Step 5 of the DQOs; and
- The acceptable limits for laboratory QA/QC parameters are based upon the laboratory reported acceptable limits and those stated within the NEPM Guidelines.

If the concentration of a particular contaminant of concern exceeds its assessment criteria, then a further assessment is required to address the significance of the result. Statistical analysis based on 95% UCL may be used to assess the significance of the data provided the following conditions are met:

- the arithmetic mean of the data set must be less than its respective threshold level; that is, it is acceptable for individual results to exceed its respective threshold level, but the cumulative mean of the data set of soil sample results must not exceed the threshold level;
- the standard deviation of the data set is less than 50% of the relevant threshold level; and
- no individual sample result should be greater than 250% of the relevant threshold level.

6.7 Step 7 - Optimise the Design for Obtaining Data

The optimum design for obtaining data in order to achieve the Data Quality Objectives is as follows:

- Only NATA-accredited environmental testing laboratories will be commissioned to analyse soil samples and will implement a quality control plan conforming to the NEPM (Assessment of Site Contamination) Measure Schedule B(3) Guidelines for Analysis of Potentially Contaminated Soils;
- Review of previous contaminated land reports (if available) relevant to the site and the surrounding area;
- An assessment of the Data Quality Indicators to determine if the field procedures and laboratory analytical results are reliable;
- The investigation will be carried out by an experienced and qualified Environmental Scientist, who is trained in sampling at contaminated sites in accordance with Aargus protocols based on best practice industry standards;
- Collection of QA/QC samples at frequencies prescribed in the NEPM Guidelines; and
- In accordance with the NSW EPA “Sampling Design Guidelines” (September 1995) a minimum of six (6) sampling points for a site area of 620m^2 will be adopted to provide general site coverage.

7 DATA QUALITY INDICATORS

7.1 General

The five Data Quality Indicators (DQIs) comprising completeness; comparability; representativeness; precision and accuracy provide an assessment of the reliability of field procedures and laboratory analytical results in accordance with the 'Guidelines for the NSW Site Auditor Scheme (2nd Edition), 2006. These are addressed in the following sub-sections.

7.2 Completeness

Data Completeness is a measure of the amount of useable data (expressed as %) from a data collection activity. The completeness is equal to the percentage of valid quality assurance and quality control results.

The assessment should address the following:

Table 9: Data Completeness

Field	Laboratory
• All critical locations are sampled; • All samples collected from critical grids and depths; • Consistency in the use of standard operating procedures, equipment, sampler; • Completion and correctness of field documentation.	• All critical samples and analytes are analysed in accordance with the DQOs; • Appropriateness of laboratory methods and PQLs.

The minimum target frequency for each type of QA/QC sample should be carried out in accordance with the following tables:

Table 10: QA/QC Requirements

Field QA/QC Sample	Frequency
Intra-Laboratory Duplicate	1 in 20 samples
Inter-Laboratory Duplicate	1 in 20 samples
Field Blanks	1 per day (rinsate)
Trip Blank	1 per sample batch
Trip Spike	1 per sample batch

Where any of the above objectives are not achieved for particular samples, steps will be taken to rectify the non-conformance, if possible. Alternatively, data qualifiers detailing the nature of the quality problem will be documented in the report and attached to relevant data in the result summary tables.

The target for overall completeness for each data set is a minimum of 95%. A data completeness of less than 95% may be accepted where it can be justified that the non-conformance does not have a significant effect on the outcome of the results.

7.3 Comparability

Data Comparability is the confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event.

The qualitative assessment should address the following:

Table 11: Data Comparability

Field	Laboratory
• Consistency in the use of standard operating procedures, equipment, sampler • Consistency in the method of sample collection for each media • Quantification of influence by climatic conditions	• Consistency of analytical methods and limits of reporting (LOR) for each analyte • Whether laboratory limits of reporting are set at < 20% of the adopted site criteria value for each analyte • Consistent use of one primary and one secondary laboratory

7.4 Representativeness

Data Representativeness is the confidence (expressed qualitatively) that data are representative of each media present on the site.

The qualitative assessment should address the following:

Table 12: Data Representativeness

Field	Laboratory
• Samples are collected in accordance with the proposal • Receipt of samples within holding times • Receipt of intact samples • Receipt of adequately preserved samples	• All samples are extracted and analysed within their respective holding times

7.5 Precision

Data Precision is a quantitative measure of the variability (or reproducibility) of data.

Intra-laboratory or Inter-laboratory Duplicate Samples (B) results are compared with Primary Sample (A) results using Relative Percentage Differences (RPDs) according to the following formula:

$$\%RPD = \left|\frac{\mathrm{A} - \mathrm{B}}{\mathrm{A} + \mathrm{B}}\right| \times 200$$

Duplicate sampling rates for this assessment (**for each separate sample batch**) are to be tested for all the same analytes as the primary sample:

Table 13: Data Precision

Type of QC Sample	Control Limit
Field Intra-Laboratory Duplicate (Blind)	RPD < +/- 50%
Field Inter-Laboratory Duplicate (Split)	RPD < +/- 50%

Where the laboratory has reported results for a particular analyte below the limit of reporting for either the primary sample or a duplicate sample, the RPD is reported as ‘Not Calculable’ or NC. A discussion should be made as to which sample should be adopted and compared against the relevant assessment criteria. However, no discussion is required where both the primary sample and the duplicate sample for a particular analyte are below the limit of reporting.

7.6 Accuracy

Data Accuracy is a quantitative measure of the closeness of reported data to the true value. Laboratory measured recovery of analytes in lab control samples with known concentrations. Laboratory QA/QC testing is to include:

Table 14: Data Accuracy

Laboratory QA/QC Sample	Frequency
Method Blank	1 per 20 samples
Matrix Spike	1 per 20 samples
Laboratory Duplicate	Laboratory defined
Laboratory Control	Laboratory defined
Surrogate Spike	All organic samples

8 SITE INVESTIGATION AND SCREENING LEVELS

8.1 General

The selection of appropriate human health and ecological site assessment criteria were based on the "National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)", NEPC (2013).

Full details of the site investigation and screening levels for each potential contaminant of concern in soils identified in Section 5 are presented in Appendix L.

8.2 Soils Investigation and Screening Levels

8.2.1 Health Investigation Levels (HILs)

The NEPM presents Tier 1 Health Investigation Levels (HILs) for a broad range of chemicals such as metals, inorganics, PAHs, phenols, pesticides and other organics. The HILs are applicable to generic land uses such as residential, commercial/industrial or public open space and all soil types, generally within the first 3 metres of soil below ground level. The HILs have been applied to assess human health risks via all relevant pathways of exposure.

Based on the proposed development, soil investigation results within the site will be assessed against the **HIL 'B' -** *Residential use with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.*

8.2.2 Health Screening Levels (HSLs)

The NEPM presents Tier 1 Health Screening Levels (HSLs) for the following petroleum compounds and fractions:

- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Naphthalene; and
- TPH C6-C10 and TPH >C10-C16 fractions

The HSLs are applicable to generic land uses such as residential, commercial/industrial or recreational/public open space and different soil types between the ground surface and soils >4 metres below ground level. The HILs have been applied to assess human health risks via the inhalation and direct contact pathways of exposure.

8.2.3 Petroleum Hydrocarbon Management Limits

Table 1B (7) of the NEPM presents petroleum hydrocarbon management limits for application to TPH fractions C_6-C_{10}, >C_{10}-C_{16}, >C_{16}-C_{34} and >C_{34}-C_{40}. The management limits are applicable for coarse or fine soils in residential, parkland, public open space or commercial/industrial land uses following consideration of relevant ESLs and HSLs.

8.2.4 Asbestos

Health screening for asbestos in soil, which are based on scenario-specific likely exposure levels, are adopted from the WA DoH guidelines and are referred in Table 7 in Schedule B1.

Table 15 Health screening levels for asbestos contamination in soil

	Health Screening Level (w/w)			
Form of asbestos	**Residential A[1]**	**Residential B[2]**	**Recreational C[3]**	**Commercial/ Industrial D[4]**
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[5] (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

1. Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
2. Residential B with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
3. Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
4. Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.
5. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures (refer Section 4.10). This screening level is not applicable to free fibres.

8.3 Export of Waste

To assess the waste classification of materials to be disposed of off-site, the NSW EPA refers to the NSW EPA (2014) "*Waste Classification Guidelines, Part 1: Classifying Waste*".

9 SOIL INVESTIGATION

9.1 General Methodology

The soil investigation was carried out on 11th March 2018 and was designed to meet the Data Quality Objectives. The fieldwork procedures adopted were carried out in general accordance with the Aargus fieldwork protocols, which are based on industry standard practice as prescribed in the NEPM.

Prior to the commencement of the intrusive investigation, a Dial-Before-You-Dig (DBYD) search was carried out and a professional services locator was engaged to clear the proposed sampling locations for underground services.

Each borehole was drilled using a concrete corer and hand auger. The boreholes were backfilled with clean spoil or clean sand/gravel.

A description of sub-surface conditions observed during drilling are presented in borehole logs included in Appendix J.

9.2 Sampling Design Rationale

Six boreholes (BH1 to BH6) were drilled by adopting a targeted sampling pattern across the site to provide general site coverage with consideration given to access.

It is considered that the number of sampling points adopted meets the minimum requirements of the NSW EPA "Sampling Design Guidelines" (1995) for a site area of 620m^2 and to detect a hotspot diameter of 15.2m. The borehole locations are shown in Figure 4 of Appendix A.

9.3 Sampling Density and Sampling Depth

Boreholes were advanced through fill material and terminated at least 0.5m into natural soils to allow for the collection of fill and natural soil samples.

9.4 Sampling Methodology

Soil sampling was carried out in general accordance with Aargus Fieldwork Protocols. In summary:

- Soil samples were collected using a hand auger from each soil type or change in lithology and approximately every 1 metre depth where no change in material was apparent.
- Samples were transferred into clean laboratory supplied containers using a hand trowel.
- In general, each soil sample was divided into two sub-samples. One of the sub-samples was placed into a laboratory-supplied container and a second sub-sample was placed in a separate zip-lock bag for field headspace screening using a PID.
- A minimum 500ml sample from each sample location was recovered for asbestos analysis.

9.5 Field Tests

A calibrated Photo-ionisation Detector (PID) meter was used to obtain the following field measurements:

- Background concentrations of ionisable volatile organic compounds (VOCs) in the ambient air taken approximately 5 to 10 metres upwind of the general work area; and
- Headspace analysis of bagged soil samples collected to detect the presence of ionisable VOCs.

The PID readings were observed before and after each measurement of a sample to ensure that the PID was operating correctly. The procedures followed in performing field headspace on soil samples can be found in the Aargus Field Protocols.

Readings of PID maximums, fluctuations and general comments of observation were recorded in Aargus field record forms included in Appendix K. The PID calibration certificate can be found in Appendix K.

9.6 Soil Laboratory Analysis

Soil samples were submitted to their respective laboratories as specified in Section 10.2. The schedules of analysis for each sampling batch are presented in Appendix P.

10 QUALITY ASSURANCE / QUALITY CONTROL

10.1 Field QA/QC

10.1.1 General

The frequency required for each field quality assurance / quality control (QA/QC) sample is presented in the table below.

Table 16: QA/QC Sampling Frequency

	Intra-Lab Duplicates	Inter-Lab Duplicates	Rinsates	Trip Blanks	Trip Spikes
Sampling Frequency	1 in 20 primary samples	1 in 20 primary samples	1 / Day	1 / Day	1 / Day

10.1.2 Field Duplicates

Duplicates of primary samples were collected to enable the assessment of variability in analyte concentrations between samples collected from the same sampling point. The table below list the duplicate soil samples collected with their corresponding primary samples.

Table 17: Soil Field Duplicate Samples

Primary Sample ID	Sample Depth (m bgl)	Blind Duplicate ID	Split Duplicate ID	Date Sampled
BH4	0.2 – 0.3	D1	SS1	11 March 2018

10.1.3 Rinsates

Rinsate samples recovered for each day in which sampling took place to identify possible cross contamination between the sampling locations are listed in the table below.

Table 18: Rinsate Samples

Sample ID	Equipment Type	Sample Media	Date Collected
R1	Hand Auger	Soil	11 March 2018

10.1.4 Trip Blanks / Spikes

Trip spike and trip blank samples were collected to assess the effect of sample handling on volatile concentrations in the samples collected and are listed in the table below.

Table 19: Trip Blank/Trip Spikes

Sample ID	QC Sample Type	Media	Date Collected
TB1	Trip Blank	Soil	11 March 2018
TS1	Trip Spike	Soil	11 March 2018

10.1.5 Sample Handling, Storage and Transport

The following sampling handling, storage and transport procedures were adopted to ensure sample integrity:

- Samples were collected in laboratory supplied containers. A list of sample preservation methods and the types of sample containers used are attached in Appendix M.
- Soil sample containers were placed immediately into a chilled cooler box and dispatched to their respective analytical laboratories on the same day. If this was not possible, samples were temporarily held overnight in the Aargus office refrigerator at a temperature of no greater than 4 ºC and dispatched the following day.
- A Chain of Custody form (COC) was completed for all samples collected and included with the samples for transport to their respective laboratories for chemical analysis. Copies of COCs are included in Appendix N.
- All glass bottles were individually bubble wrapped for protection and insulated containers/coolers were used for sample shipment.
- Disposable nitrile gloves were used for OH&S purposes and were changed between every sample location.

10.1.6 Decontamination Procedures

The decontamination of non-dedicated sampling equipment was achieved by washing with phosphate-free detergent and tap water, followed by a final rinse with distilled water. Decontamination was conducted after the collection of samples at each sample location. A clean pair of disposable gloves was used when handling each sample.

10.1.7 Calibration of Equipment

The 10.6eV lamp of the PID was calibrated with isobutylene gas at 100ppm prior to commencement of fieldwork and prior to commencement of each day’s fieldwork. The battery in the PID unit was recharged after every day’s use in the field.

Copies of calibration records for each relevant item of equipment used can be found in Appendix M.

10.2 Laboratory QA/QC

10.2.1 Laboratories Used

The following NATA-accredited laboratories were commissioned to carry out laboratory analysis of soil samples collected:

- Primary Laboratory – ALS Sydney
- Secondary Laboratory – ALS Melbourne
- Australian Safer Environmental & Technology (ASET) was commissioned to carry out all asbestos analysis of soil samples

These laboratories also operate Quality Systems that are designed to comply with ISO/IEC 17025.

All primary samples, blind duplicates, rinsate samples, trip blank/spikes were dispatched to the primary laboratory. All split samples were dispatched to the secondary laboratory.

Laboratory Certificates of Analysis are included in Appendix N.

10.2.2 Holding Times

The holding times for chemicals analysed are presented in Appendix P and were based on USEPA methods, Standard Methods for the Examination of Water and Wastewater (APHA).

10.2.3 Test Methods and Practical Quantitation Limits

The test methods adopted by the laboratories are listed in Appendix M and Practical Quantitation Limits (PQLs) adopted are specified within the Laboratory Certificates of Analysis included in Appendix N.

The methods used by the laboratories generally comply with those listed in the NEPM and the Australian and New Zealand Environment and Conservation Council (ANZECC)-1996 "*Guidelines for the Laboratory Analysis of Contaminated Soils*". Alternate methods used by the laboratories (i.e. not identified in the NEPM and ANZECC guidelines) have been validated by the laboratories, as recommended in the NEPM and ANZECC guidelines, and endorsed by NATA.

10.3 QA/QC Data Evaluation

A full evaluation of the Data Quality Indicators (DQIs) for both fieldwork and laboratory procedures is presented in Appendix O. These were assessed with reference to Appendix S of the NEPM and Guidelines for the NSW Site Auditor Scheme (2nd ed.), 2006. In summary, the findings of the QA/QC evaluation indicated the following:

- Data Completeness – The data set is considered to be adequately complete.
- Data Comparability – The data set is considered to be adequately comparable.
- Data Representativeness – The data set is considered to be adequately representative.
- Data Precision – The data set is considered to be adequately precise.
- Data Accuracy – The data set is considered to be adequately accurate. However, the following minor non-conformances were identified:
    - Matrix spike were within control limits, with the exception of Total Recoverable Mercury by FIMS in SS1. Given that the majority of matix spike were within control limits, the data set is considered to be adequately accurate.

The sampling methods (including sample preservation, transport and decontamination procedures) and laboratory methods followed during this investigation works were consistent with Aargus protocols and were found to meet the DQOs for this project.

It is therefore considered that the data is sufficiently reliable and that the results can be used for the purpose of this project.

11 FIELD OBSERVATIONS

11.1 Geology

Based on surface and sub-surface conditions observed during the intrusive investigation, the surface and sub-surface profile across the site is summarised in the table below.

Table 20: Summary of Geological Observations

Geological Unit	Lithological Description	Depth Ranges: Top to Base (m bgl)
Concrete	Concrete	0.0m to 0.2m (BH3 to BH6) 0.0m to 0.4m (BH1 & BH2)
Fill	Sand, fine to medium grained, brown / light grey	0.2m to 0.4 m(BH3 to BH6) 0.4m to 0.6m (BH1 & BH2)
Natural	Sand, medium grained, yellow	0.4m to 1.0m (BH3 to BH6) 0.6m to 1.0m (BH1 & BH2)

The following additional observations were made:

- No hydrocarbon odour or staining was observed within any of the borehole locations.
- No fibre-containing fragments or sheeting were observed in any of the borehole samples.

We recommend that this section be read in conjunction with Figure 4 (Borehole Location Plan) in Appendix A, the Daily Work Sheets in Appendix K and the borehole logs in Appendix J.

11.2 Field Headspace Results

Ionisable VOC detections in PID readings taken from soil samples subjected to field headspace analysis are listed in the following table.

Table 21: Summary of PID Results

Sample ID	Depth Range (m bgl)	PID Readings	Stratum
BH1	0.4-0.5	<0.1 ppm	Fill
BH1	0.6-0.7	<0.1 ppm	Natural
BH2	0.4-0.5	<0.1 ppm	Fill
BH2	0.6-0.7	<0.1 ppm	Natural
BH3	0.2-0.3	<0.1 ppm	Fill
BH3	0.4-0.5	<0.1 ppm	Natural
BH4	0.2-0.3	<0.1 ppm	Fill
BH4	0.4-0.5	<0.1 ppm	Natural
BH5	0.2-0.3	<0.1 ppm	Fill
BH5	0.4-0.5	<0.1 ppm	Natural
BH6	0.2-0.3	<0.1 ppm	Fill
BH6	0.4-0.5	<0.1 ppm	Natural
D1	-	<0.1 ppm	Fill
SS1	-	<0.1 ppm	Fill

The PID field record forms can be found in Appendix K

12 LABORATORY RESULTS

12.1 General

A comparison of soil laboratory results against their respective assessment criteria (as specified in Section 8) are presented in the summary tables in Appendix P. Certificates of laboratory analysis are attached in Appendix N. A discussion of the results is presented in the following sub-sections.

12.2 Soil Results

12.2.1 Heavy Metals

12.2.1.1 Health Investigation Levels (HILs)

As indicated in Table A, the concentrations of the discrete heavy metals were below the Health Investigation Level (HIL) for residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high rise buildings and apartments., that being the HIL ‘B’.

12.2.2 TRH, BTEX & NAPHTHALENE

12.2.2.1 Health Screening Levels (HSLs)

As indicated in Table B, the F1 (C_6-C_{10}), F2 (>C_{10}-C_{16}), benzene, toluene, ethyl benzene, xylenes and naphthalene concentrations were below the HSL ‘A’ & HSL ‘B’ for a sand soil profile for all sampled source depths.

12.2.2.2 Management Limits

As indicated in Table C, the F1 (C_6-C_{10}), F2 (>C_{10}-C_{16}), F3 (C_{16}-C_{34}), F4 (C_{34}-C_{40}) concentrations were below the Management Limits for a coarse grained soil texture in a “residential parkland and public open space” environment.

12.2.3 PAH, OCP, PCB

12.2.3.1 Health Investigation Levels (HILs)

As indicated in Table D, the concentrations of the benzo(a)pyrene (as TEQ), Total PAH, OCP & PCB were below the Health Investigation Level (HIL) for residential with minimal opportunities for soil access, that being the HIL 'B'.

12.2.4 Asbestos

As indicated in Table E, asbestos was not detected in the samples analysed.

13 DISCUSSION OF RESULTS

13.1 Soil Quality

A summary of the soil results for this assessment are provided below:

- All of heavy metals concentrations from the samples analysed met their respective assessment criteria under the HIL ‘B’, EILs.
- The TRH, BTEX, naphthalene and/or benzo(a)pyrene concentrations from the samples met their respective HSLs, and/or Management Limits.
- The benzo(a)pyrene (as TEQ), Total PAH, OCP, PCB, Phenols & Cyanide concentrations were below the Health Investigation Level (HIL) for residential with minimal opportunities for soil access, that being the HIL ‘B’.
- Asbestos results in all samples were either not detected or below their assessment criteria.

14 CONCLUSION AND RECOMMENDATIONS

Based on the results of this investigation it is considered that the risks to human health and the environment associated with soil contamination at the site are negligible within the context of the proposed use of the site to be refurbished, with partial internal demolition and renovation to take place. The building will continue to be used as a ground floor café with library on the upper levels. .The site is therefore considered to be suitable for the proposed use.

Any soils requiring removal from the site, as part of future site works, should be classified in accordance with the "Waste Classification Guidelines, Part 1: Classifying Waste" NSW EPA (2014).

Thank you for the opportunity to undertake this work. We would be pleased to provide further information on any aspects of this report.

For and on behalf of

Aargus Pty Ltd

Written by: **Reviewed By:**

Lancel Mark Kelly

Lance Chen
Environmental Scientist

Mark Kelly
Environmental Manager

LIMITATIONS

The Aargus assessment is based on the result of limited site investigations and sample testing. Neither Aargus, nor any other reputable consultant, can provide unqualified warranties nor does Aargus assume any liability for site conditions not observed or accessible during the time of the investigations.

Despite all reasonable care and diligence, the materials encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. There is always some disparity in subsurface conditions across a site that cannot be fully defined by investigation. Hence it is unlikely that measurements and values obtained from sampling and testing during environmental works carried out at a site will characterise the extremes of conditions that exist within the site. In addition, site characteristics may change at any time in response to variations in natural conditions, chemical reactions, truck movement or contractor movement of soils and other events, e.g. groundwater movement and or spillages of contaminating substances. These changes may occur subsequent to Aargus investigations and assessment.

This report and associated documentation and the information herein have been prepared solely for the use of the client and interested parties at the time or writing the report and is valid (for the purposes of management or transport of material) for a period of one month only from the date of issue. Any other reliance assumed by third parties on this report shall be at such parties' own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to Aargus.

Whilst this report provides a review of site conditions encountered at sampling locations within the investigation, it should be noted that if materials are proposed to moved from site - Part 5.6, Section 143 of the Protection of the Environment Operations (POEO) Act 1997 states that is an offence for waste to be transported to a place that cannot lawfully be used as a facility to accept that waste. It is the duty of the owner and transporter of the waste to ensure that all material removed from a site must be accompanied by an appropriate waste classification report and materials are disposed of appropriately. An environmental or validation report does not constitute a waste classification report and results are treated differently. Aargus accepts no liability for the unlawful disposal of waste materials from any site. Aargus does not accept any responsibility for the material tracking, loading, management, transport or disposal of waste from the site. If material is to be removed from a site, before disposal of any material to a licensed landfill is undertaken, the site owner must ensure an appropriate waste classification exists for all materials on the site planning to be removed, the waste producer will need to obtain prior consent from the licensed landfill/recycler. The receiving site should check to ensure that the material received matches the description provided in the report.

Opinions are judgements, which are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.

Appendix Q – Important information about your environmental site report should also be read in conjunction with this report.

REFERENCES

This report was prepared with reference to the following guiding documents:

- ANZECC/NHMRC (1992) – “Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites”. Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council, Canberra.
- Department of Urban Affairs and Planning – EPA (1998) “Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land”.
- National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1).
- NSW DEC “Guidelines for the NSW Site Auditor Scheme” (2006, 2nd edition). NSW Environment Protection Authority, Sydney.
- NSW EPA (2014) – “Waste Classification Guidelines, Part 1: Classifying Waste”.
- NSW EPA “Guidelines for Consultants Reporting on Contaminated Sites” (2011). NSW Environment Protection Authority, Sydney.
- NSW EPA “Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997” (2009). NSW Environment Protection Authority, Sydney.
- NSW EPA “Sampling Design Guidelines” (1995). NSW Environment Protection Authority, Sydney.

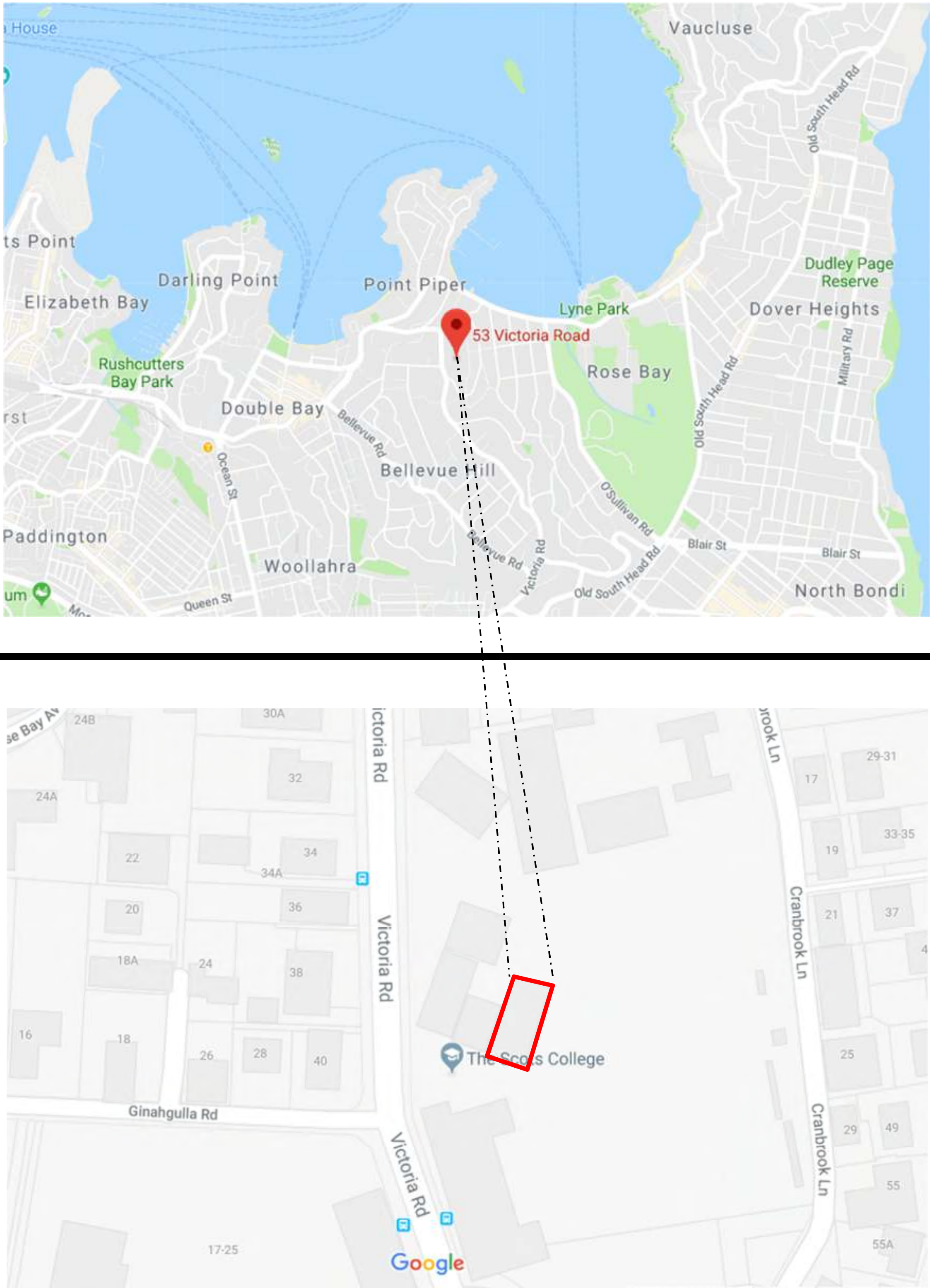
APPENDIX A

SITE PLANS

Aargus

SITE LOCALITY MAP

N



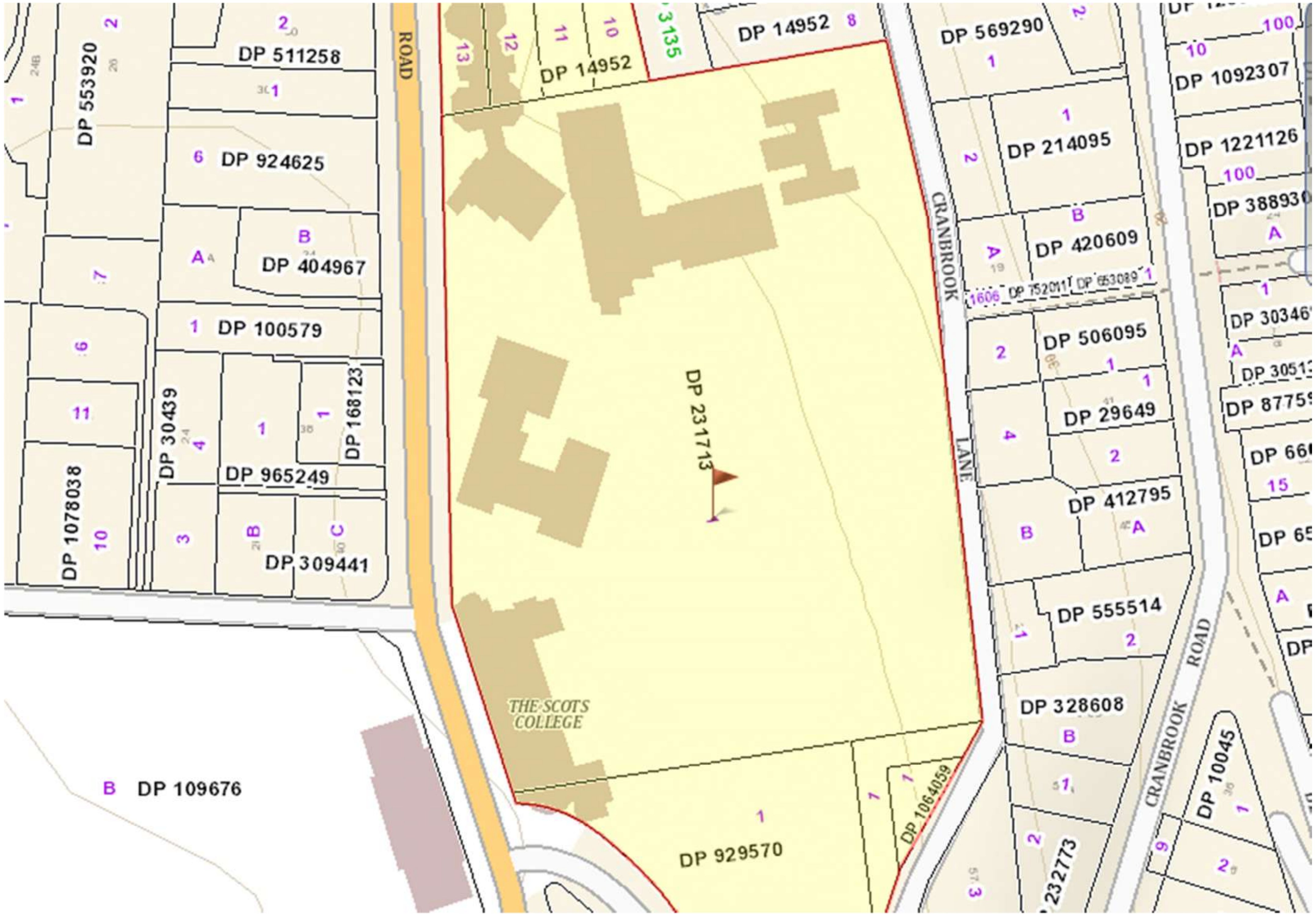
Source: http://maps.google.com.au

PROJECT DETAILS	
Project Title	Detailed Site Investigation
Project No.	ES7155/2
Client	Impact Group Pty Ltd on behalf of The Scots College
Site Address	29-53 Victoria Road, Bellevue Hill NSW

Aargus

DRAWING DETAILS			
Figure No.	1	**Rev No.**	0
Scale	As above	**Size**	A4
Drawn by	LC	**Date**	29.01.18
Approved by	MK	**Date**	27.03.18

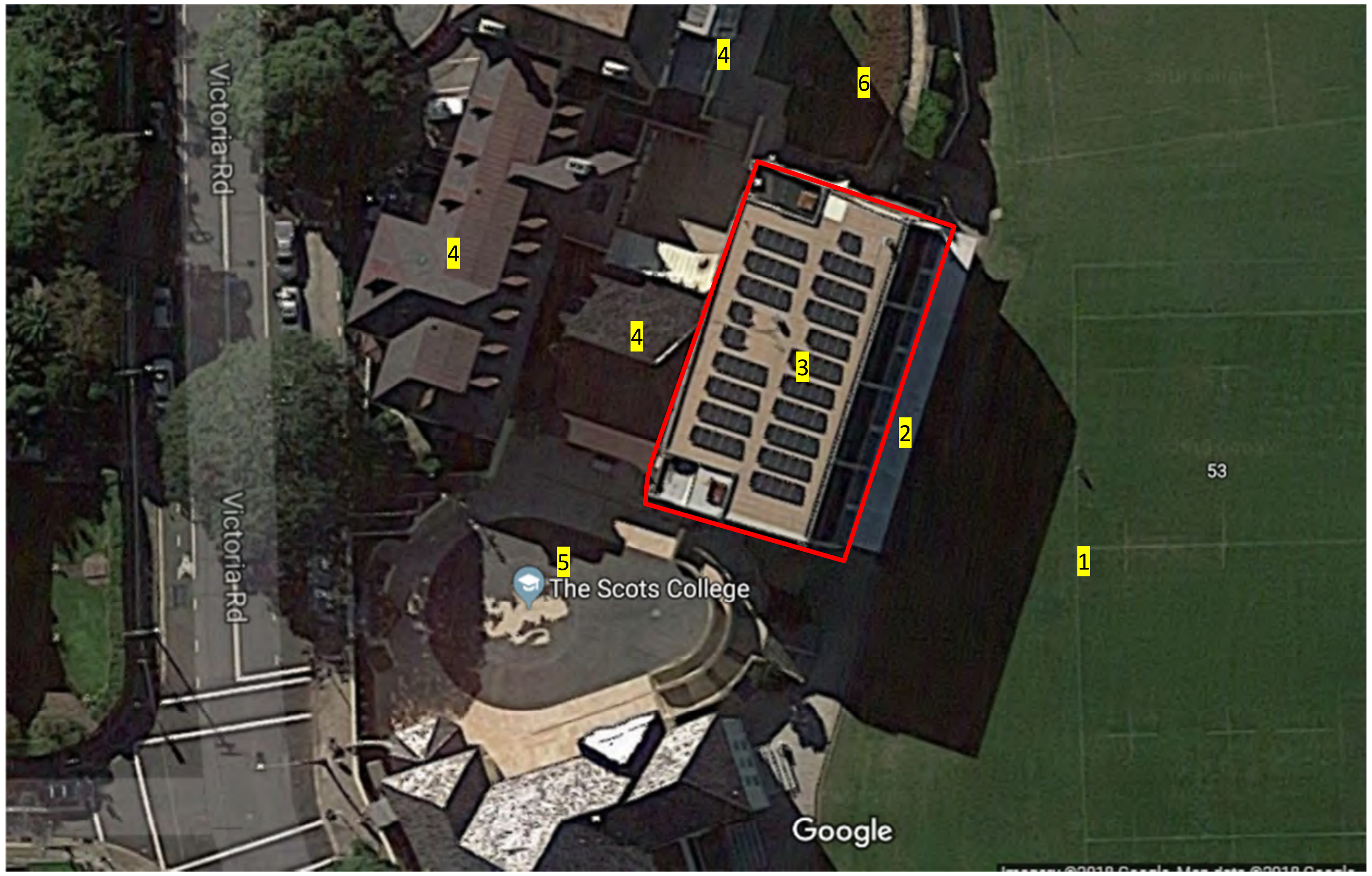
SITE LOT & DP PLAN



N

Drawn by	LC	Date	29.01.18	Project title	Detailed Site Investigation	Aargus	Figure No.2	Revision No.
Approved by	MK	Date	27.03.18	Client	Impact Group Pty Ltd on behalf of The Scots College		Source	Six Maps
Approx. scale	As Above			Site address	29-53 Victoria Road, Bellevue Hill NSW		Project number	ES7155/2

SITE FEATURES



1. Grass covered playground
2. Concrete pathway
3. Café (ground floor) and Library (upper levels)
4. Brick Building with tile roof
5. Concrete courtyard
6. Garden bed area

Site Boundary

N

Drawn by	LC	Date	29.01.18	Project title	Detailed Site Investigation	Figure No.3	Revision No.
Approved by	MK	Date	27.03.18	Client	Impact Group Pty Ltd on behalf of The Scots College	Source	Google Maps
Approx. scale	As above			Site address	29-53 Victoria Road, Bellevue Hill NSW	Project number	ES7155/2

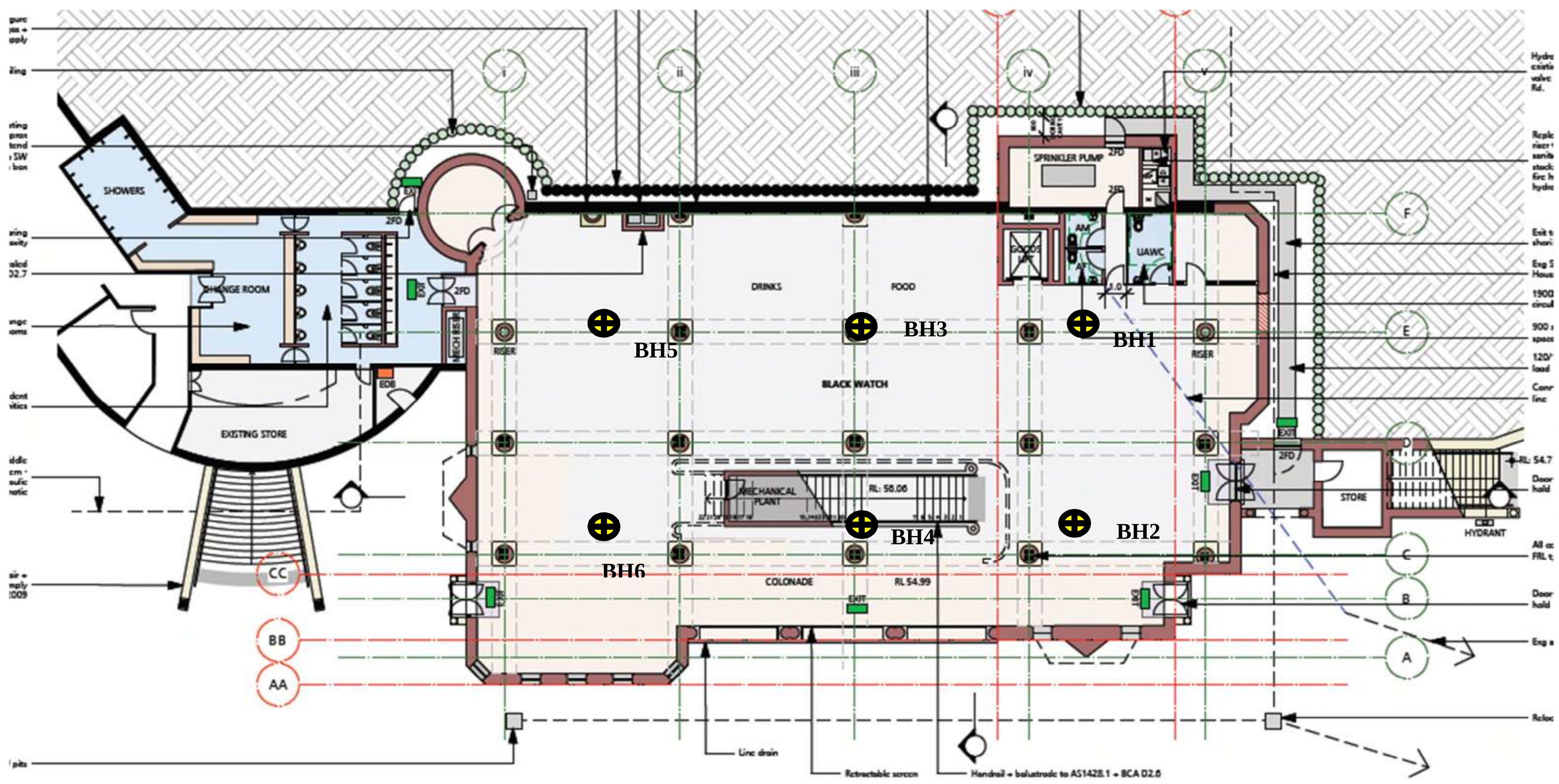
Aargus

BOREHOLE LOCATIONS ON AERIAL VIEW

Legend	
(red line)	Site Boundary
(borehole symbol)	Aargus Borehole Location

Drawn by	LC	Date	11.03.18	Project title	Detailed Site Investigation	Aargus	Figure No.4	Revision No.
Approved by	MK	Date	27.03.18	Client	Impact Group Pty Ltd on behalf of The Scots College		Source	Six Viewer
Approx. scale	NTS			Site address	29-53 Victoria Rd, Bellevue Hill NSW		Project number	ES7155/2

BOREHOLE LOCATIONS ON PROPOSED PLAN



N

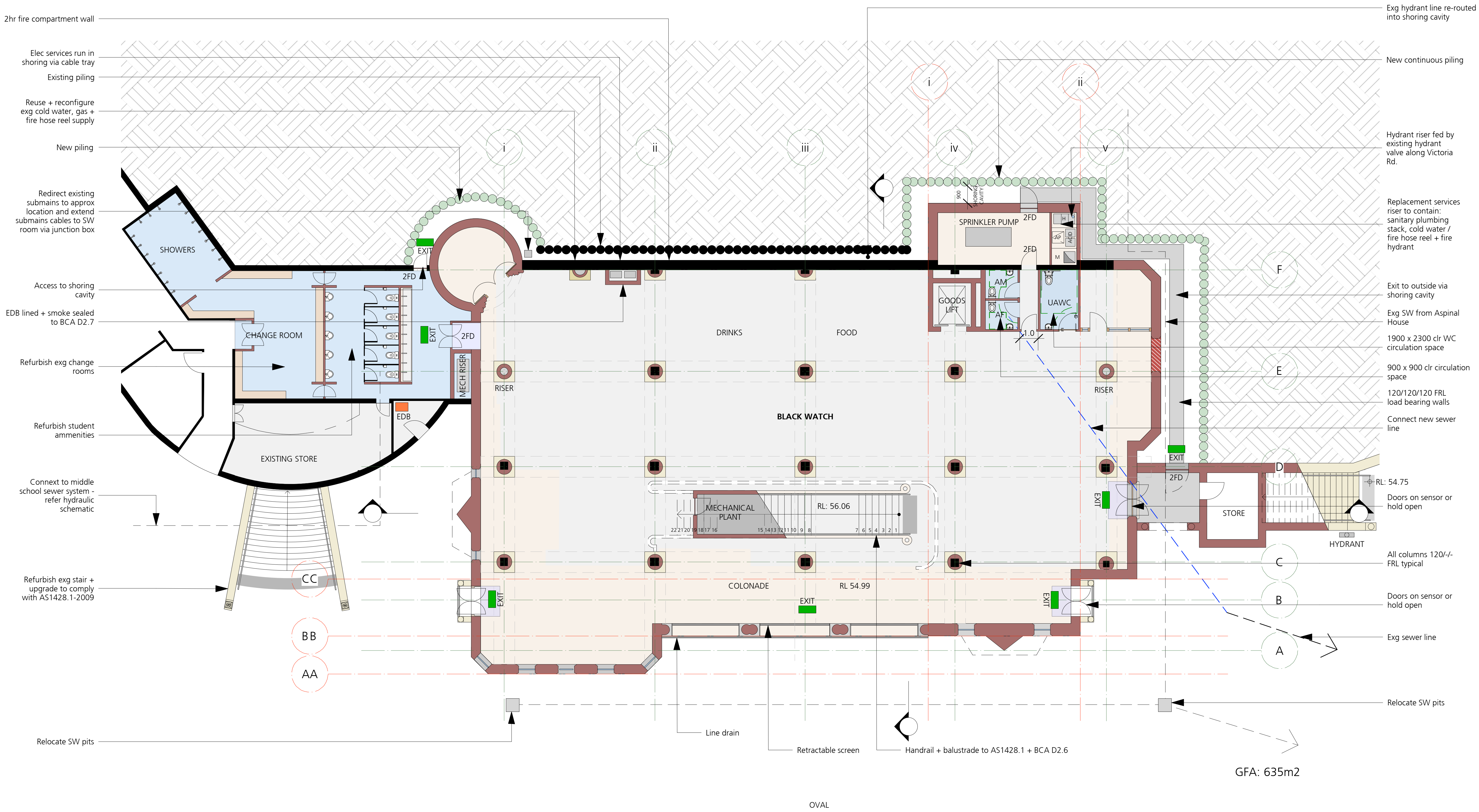
Legend	
(red line)	Site Boundary
(borehole symbol)	Aargus Borehole Location

Drawn by	LC	Date	11.03.18	Project title	Detailed Site Investigation	Aargus	Figure No.5	Revision No.
Approved by	MK	Date	27.03.18	Client	Impact Group Pty Ltd on behalf of The Scots College		Source	Six Viewer
Approx. scale	NTS			Site address	29-53 Victoria Rd, Bellevue Hill NSW		Project number	ES7155/2

APPENDIX B

PROPOSED DEVELOPMENT PLANS & SITE SURVEY PLANS

Aargus



1 Proposed Ground Floor Plan RL 54.99
Scale: 1:200

LEGEND

Exg floor area	Entry matt
Exg structure	Wet area
Additional floor area	HYD Fire hydrant
New masonry - 120/120/120 FRL construction of load bearing walls	1FD 1hr fire door set
Render / Sandstone capping	2FD 2hr fire door set
New concrete	

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Education | Conservation | Residential
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E info@jca-architects.com.au
W jca-architects.com.au
JCA Architects Pty Ltd ABN 53 139 457 784
Nominated Architect
John Cockings NSW ARB6065 AIA

GENERAL NOTES
- Consult with ALL relevant authorities prior to commencing works
- DO NOT scale. All dimensions are nominal + should be confirmed on site prior to commencement
- Obtain setting out information from architect PRIOR to commencment
- Bring discrepencies to the immediate attention of the Architect
- If unsure of any aspect of the works seek instruction from the Architect before proceeding
- All drawings must be read in conjunction with the council consent, specification, schedules, site notes + instructions issued by the Architect
- This material / work is protected by Copyright

CONSULTANTS

TPQS
Quantity Surveyors

BBC
Planning Consultant

ACV
Mechanical Engineer

BCA Access
Accessibility Consultant

PBE
Structural Engineer

BCG
BCA Consultant

JCL
Hydraulic Engineer

Riley Mac
Fire Consultant

MCD
Fire Engineer

UMEA
Electrical Engineer

CLIENT
STEVEN ADAMS
THE SCOTS COLLEGE

PROJECT
PROPOSED REFURBISHMENT OF THE STEVENSON LIBRARY

ADDRESS
29-53 Victoria Rd
Bellevue Hill, NSW

DRAWING TITLE
PROPOSED GROUND FLOOR PLAN

DRAWN BY
JC, CF , JW

SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P5

DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-201

LEGEND:

BW BOTTOM OF WALL
ELP ELECTRIC LIGHT POLE
FH FIRE HYDRANT
FLR FLOOR LEVEL
RIG RIDGE
RR ROOF RIDGE
TC TOP CHIMNEY
TG TOP OF GUTTER
TK TOP OF KERB
TOG TOP OF GRATE
TR TOP OF ROCK
TW TOP OF WALL
UAC UNIDENTIFIED ACCESS CHAMBER
US UNDERSIDE OF GUTTER
U/S UNDERSIDE OF FLOOR

NOTES:

- THE PURPOSE OF THIS SURVEY WAS TO OBTAIN TOPOGRAPHICAL DETAIL AS REPRESENTED ON THIS PLAN
- BOUNDARIES HAVE BEEN SURVEYED BASED ON PUBLIC RECORDS. PRIOR TO CONSTRUCTION CORNERS SHOULD BE MARKED
- LEVELS SHOWN HEREON ARE RELATED TO AUSTRALIAN HEIGHT DATUM (A.H.D.)
- TREE CANOPIES AND HEIGHTS ARE APPROXIMATE ONLY AND SHOULD BE VERIFIED BY DETAILED SURVEY IF CRITICAL TO DESIGN
- SERVICES AND PIT INFORMATION SHOWN RELATES TO VISIBLE DATA AT GROUND SURFACE AND DOES NOT INDICATE SIZE OR POSITION OF BELOW SURFACE FEATURES. SYMBOLS SHOWN ON PLAN MAY NOT BE ACTUAL DIMENSIONS
- CONTRACTORS SHOULD CONSULT WITH SERVICE AUTHORITIES (DBYD) PRIOR TO ANY WORKS AT SITE
- THIS PLAN MUST NOT BE ALTERED IN SCALE

EASEMENTS:

(B) EASEMENT FOR ELECTRICITY AND OTHER PURPOSES 2.05 WIDE VIDE AE38975
(C) RIGHT OF WAY AND EASEMENT FOR ELECTRICITY PURPOSES 3.61 WIDE & VARIABLE WIDTH & LEASE TO ENERGY AUSTRALIA OF SUBSTATION PREMISES VIDE 9156095
(D) EASEMENTS AFFECTING THE LAND ALONG & WITHIN THE SOUTH WESTERN BOUNDARY OF LOT 1 DP 929570 VIDE D258527

(E) SITE OF PROPOSED EASEMENT FOR EMBANKMENT SUPPORT 1.22 WIDE AND VARIABLE WIDTH
(F) SITE OF PROPOSED POSITIVE COVENANT 0.8 WIDE

CAD REFERENCE: 1601403_180123.DWG

VER	BY	AMENDMENTS	DATE
B	J.G.	BUSINESS STUDIES BUILDING ADDED, DETAIL UPDATED IN ASPINAL PRECINCT, ROOF DETAIL UPDATED ON BUILDING WEST OF DINING HALL	23/1/18

SURVEYOR: D.G.W
DRAWN: D.H.
CHECKED: D.G.W
DATUM: A.H.D

SURVEYORS REF.
1601403
VERSION B
24 JULY 2009
SHEET 1 OF 2

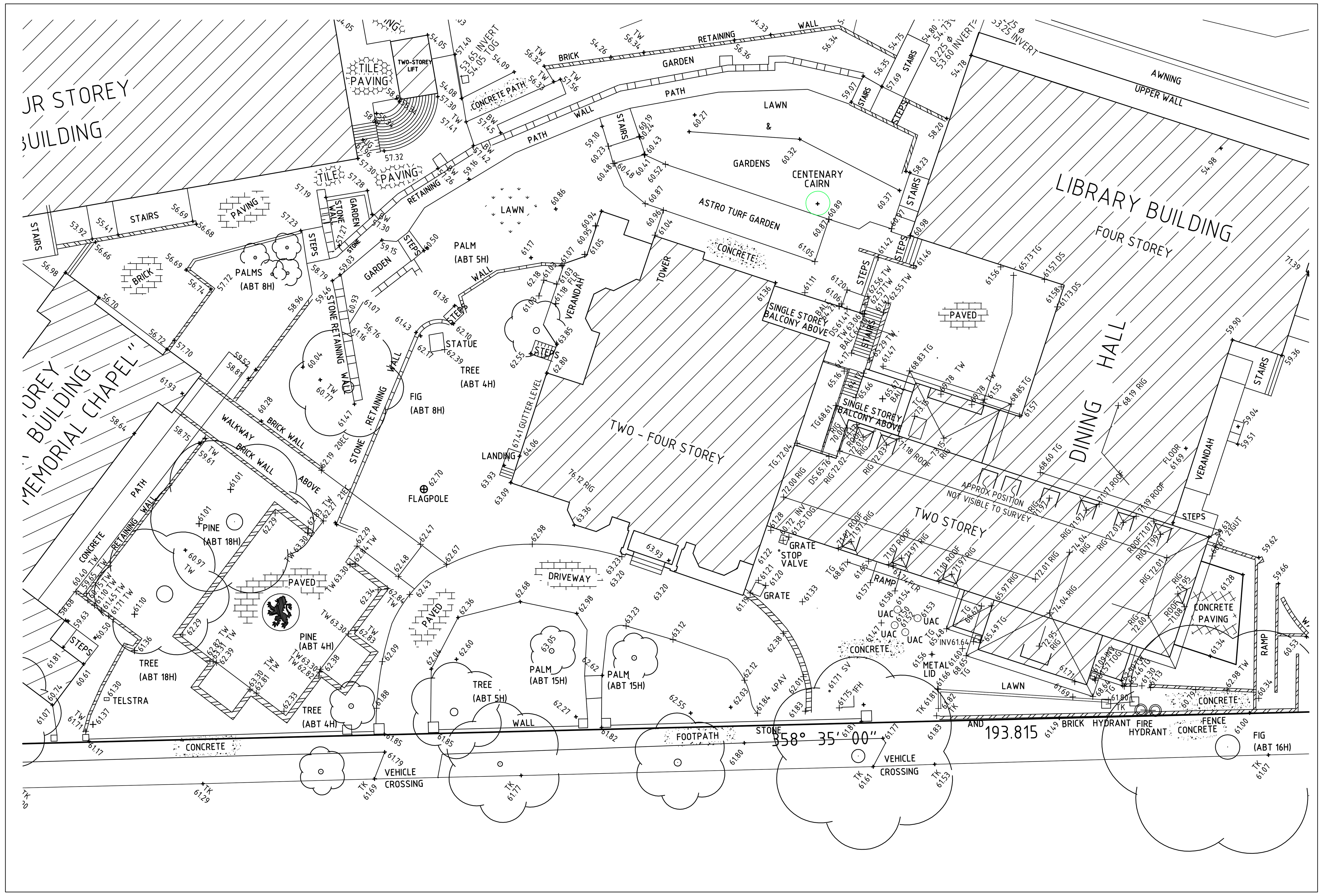
ORIGINAL
SCALE 1:500
SHEET SIZE A1
0 5 10 15 20
LENGTHS ARE IN METRES

Beveridge Williams
incorporating Dunlop Thorpe
Sydney ph : 02 9283 6677
www.beveridgewilliams.com.au

www.dialbeforeyoudig.com.au
DIAL 1100
BEFORE YOU DIG

CLIENT: THE SCOTS COLLEGE
c/- JCA ARCHITECTS
DETAILS: VICTORIA ROAD
BELLEVUE HILL
FEATURE & LEVEL SURVEY

TITLE:
PLAN OF THE SCOTS COLLEGE
VICTORIA ROAD
AT BELLEVUE HILL
L.G.A. WOOLLAHRA



TRUE NORTH

LEGEND:

BW BOTTOM OF WALL
ELP ELECTRIC LIGHT POLE
FH FIRE HYDRANT
FLR FLOOR LEVEL
RIG RIDGE
RR ROOF RIDGE
TC TOP CHIMNEY
TG TOP OF GUTTER
TK TOP OF KERB
TOG TOP OF GRATE
TR TOP OF ROCK
TW TOP OF WALL
UAC UNIDENTIFIED ACCESS CHAMBER
US UNDERSIDE OF GUTTER
U/S UNDERSIDE OF FLOOR

NOTES:

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- THIS PLAN MUST NOT BE ALTERED IN SCALE

CAD REFERENCE: 1601403_180123.DWG

VER	BY	AMENDMENTS	DATE
B	J.G.	BUSINESS STUDIES BUILDING ADDED, DETAIL UPDATED IN ASPINAL PRECINCT, ROOF DETAIL UPDATED ON BUILDING WEST OF DINING HALL	23/1/18

SURVEYOR: D.G.W
DRAWN: D.H.
CHECKED: D.G.W
DATUM: A.H.D

SURVEYORS REF. 1601403
VERSION B
24 JULY 2009
SHEET 2 OF 2

ORIGINAL SCALE 1:250 SHEET SIZE A1
0 5 10
LENGTHS ARE IN METRES

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www.beveridgewilliams.com.au

www.dialbeforeyoudig.com.au
DIAL 1100 BEFORE YOU DIG

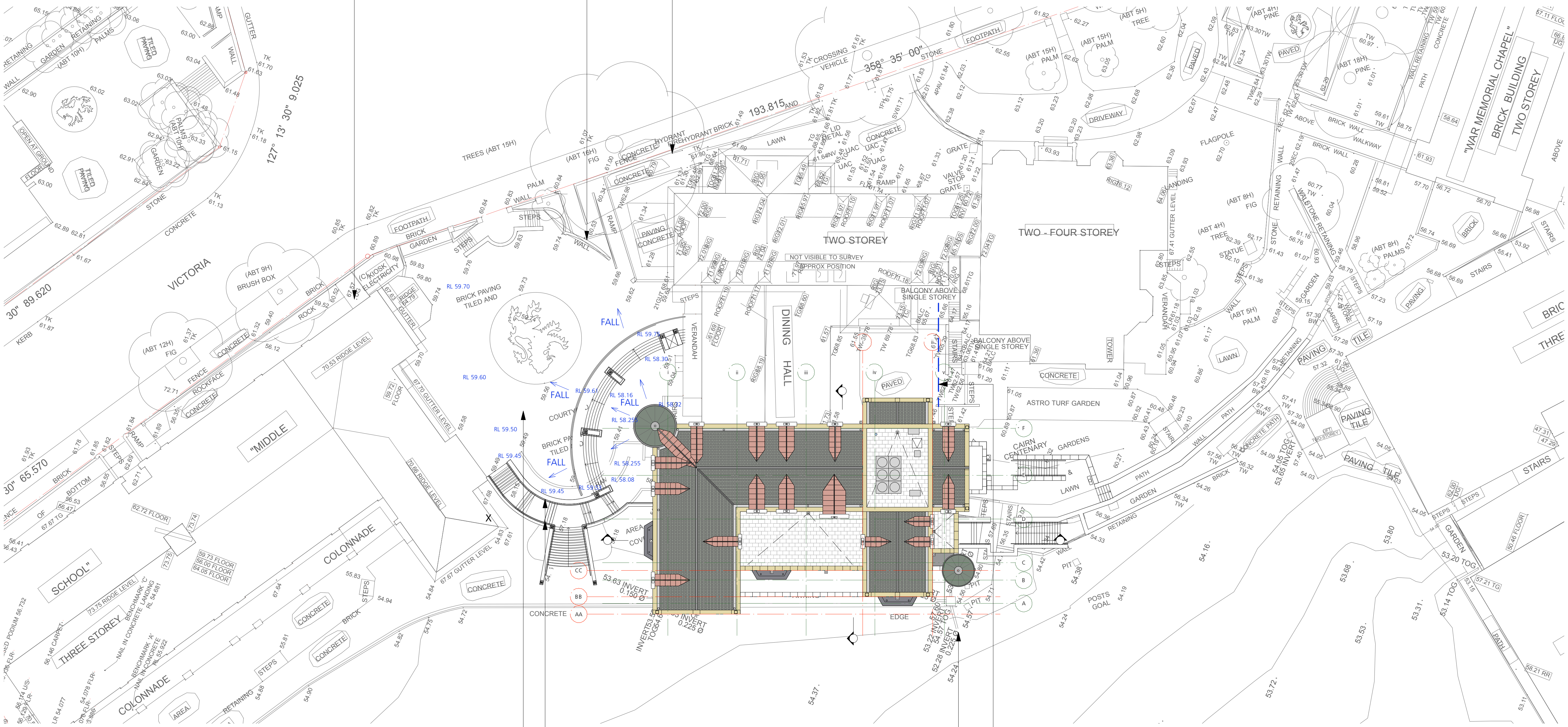
CLIENT: THE SCOTS COLLEGE c/- JCA ARCHITECTS
DETAILS: VICTORIA ROAD BELLEVUE HILL FEATURE & LEVEL SURVEY

TITLE: PLAN OF THE SCOTS COLLEGE VICTORIA ROAD AT BELLEVUE HILL L.G.A. WOOLLAHRA

Provide upgraded supply from recently replaced main switchboard maintaining existing CB

Form slot in wall for overland flow path

Upgrade fire hydrant as necessary, reconnect to + maintain exg fire hydrant system



Regrade courtyard falls to hydraulic engineers requirements

No hob in replacement balustrade for overland flow path

Reconnect SW discharge from Aspinall House

Reconnect SW to existing discharge / OSD system

1 Proposed Site Plan
Scale: 1:500

jca architects

Member Australian Institute of Architects

Education | Conservation | Residential
PO Box 156 Double Bay
NSW 1360 Australia

T 02 9327 6706
E info@jca-architects.com.au
W jca-architects.com.au

JCA Architects Pty Ltd ABN 53 139 457 784
Nominated Architect
John Cockings NSW ARB6055 AIA

GENERAL NOTES

- Consult with ALL relevant authorities prior to commencing works
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BCA Access
Accessibility Consultant

PBE
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BCG
BCA Consultant

JCL
Hydraulic Engineer

Riley Mac
Fire Consultant

MCD
Fire Engineer

UMEA
Electrical Engineer

CLIENT
STEVEN ADAMS
THE SCOTS COLLEGE

PROJECT
PROPOSED REFURBISHMENT OF THE STEVENSON LIBRARY

ADDRESS
29-53 Victoria Rd
Bellevue Hill, NSW

DRAWING TITLE
PROPOSED SITE PLAN

DRAWN BY
JC, CF , JW

SCALE
1:500 @ A3

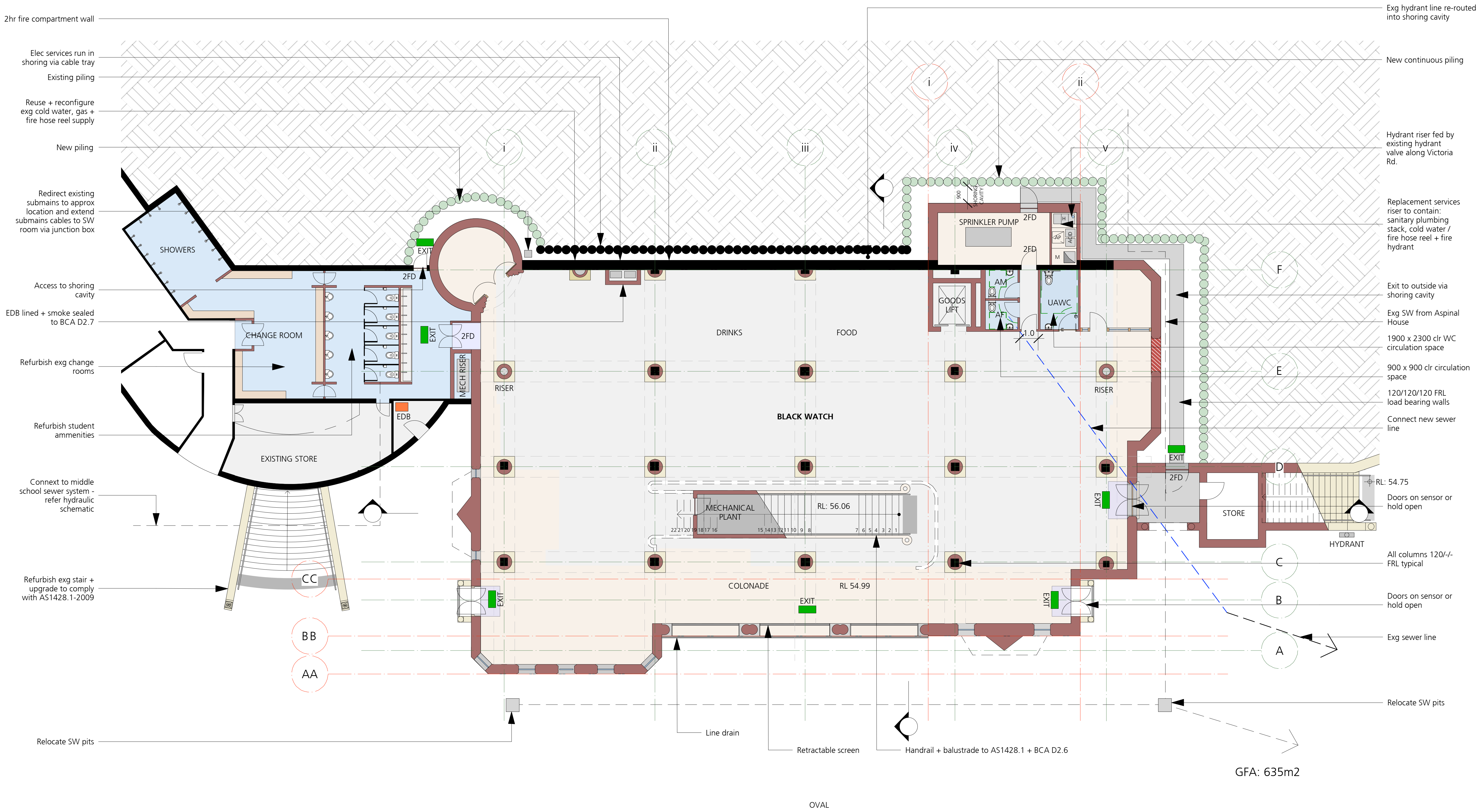
ISSUE
PRELIMINARY

REVISION
P2

DATE
MARCH 2018

DRAWING NUMBER

SSD1.02/17-200



1 Proposed Ground Floor Plan RL 54.99
Scale: 1:200

LEGEND

- Exg floor area
- Exg structure
- Additional floor area
- New masonry - 120/120/120 FRL construction of load bearing walls
- Render / Sandstone capping
- New concrete
- Entry matt
- Wet area
- HYD Fire hydrant
- 1FD 1hr fire door set
- 2FD 2hr fire door set

jca architects
Education | Conservation | Residential

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Bellevue Hill, NSW

DRAWING TITLE
PROPOSED GROUND FLOOR PLAN

DRAWN BY
JC, CF, JW

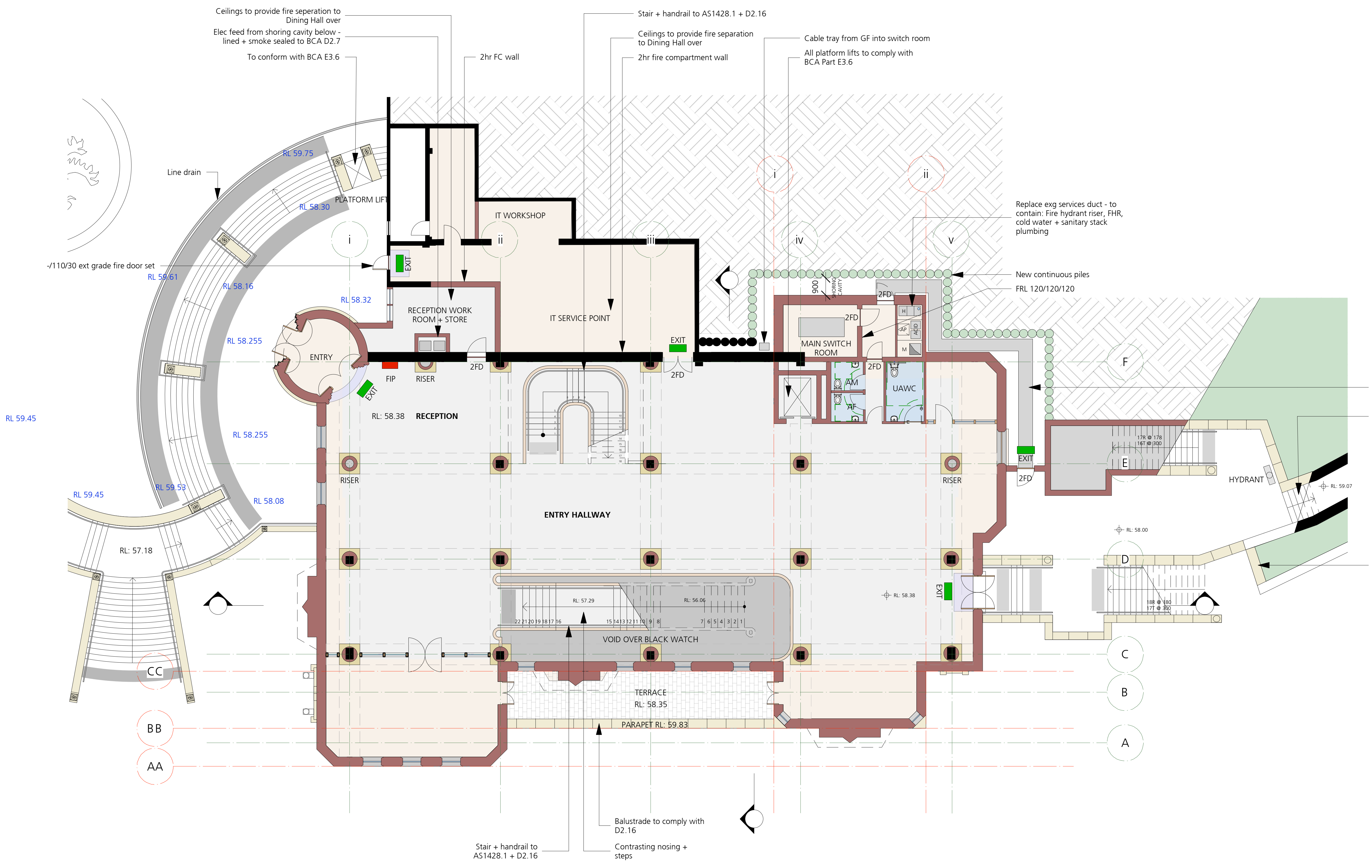
SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P5

DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-201



GFA: 668m2

1 Proposed First Floor Plan RL 58.38

Scale: 1:200

LEGEND

Exg floor area	Entry matt
Exg structure	Wet area
Additional floor area	HYD Fire hydrant
New masonry - 120/120/120 FRL construction of load bearing walls	1FD 1hr fire door set
Render / Sandstone capping	2FD 2hr fire door set
New concrete	

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E info@jca-architects.com.au
W jca-architects.com.au
JCA Architects Pty Ltd ABN 53 139 457 784
Nominated Architect John Cockings NSW/ARB6055 AIA

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UMEA
Electrical Engineer

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PROPOSED REFURBISHMENT OF THE STEVENSON LIBRARY

ADDRESS
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DRAWING TITLE
PROPOSED FIRST FLOOR PLAN

DRAWN BY
JC, CF, JW

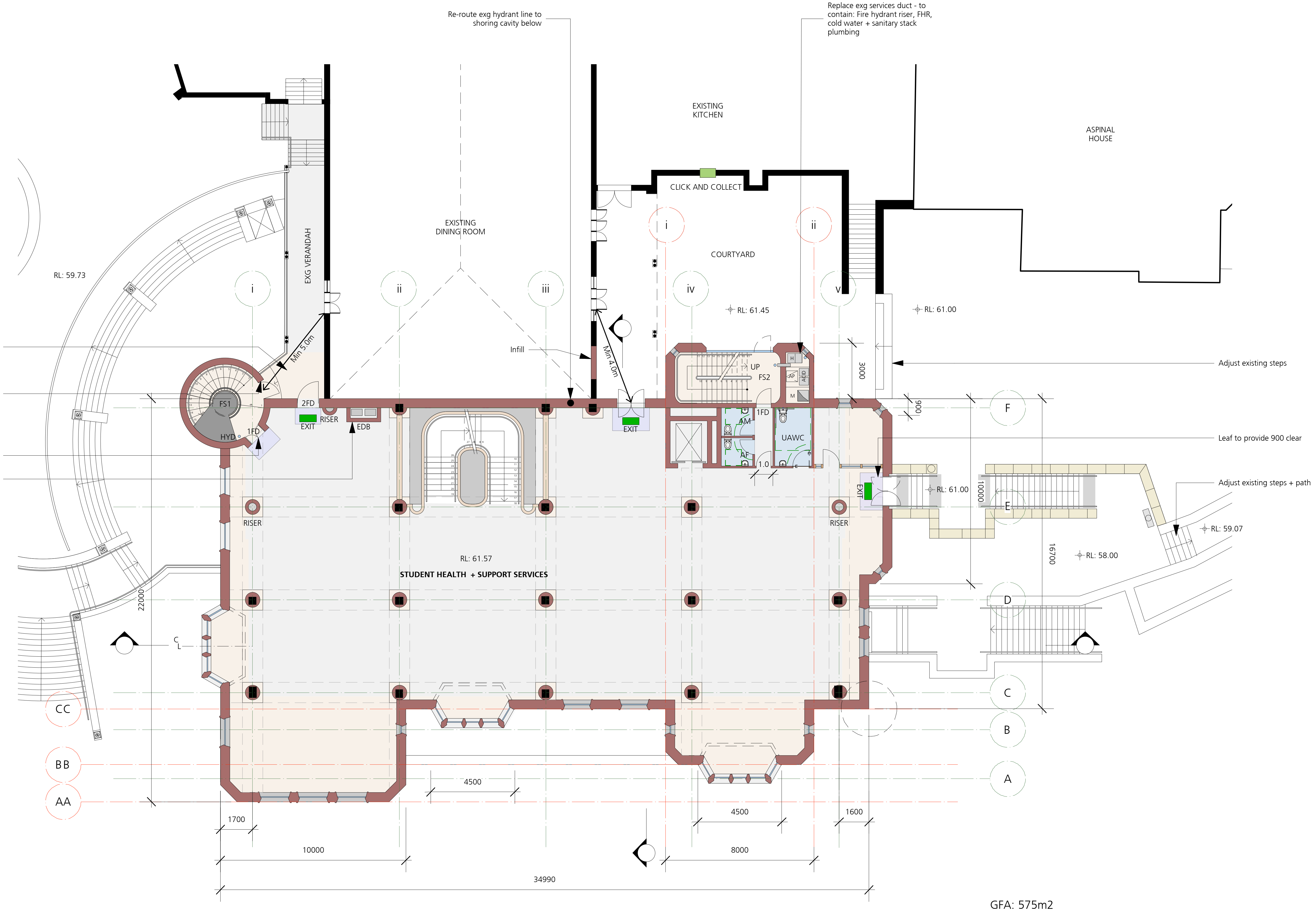
SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P6

DATE
MARCH 2018

DRAWING NUMBER
SSD1.02/17-202



1 Proposed Second Floor Plan RL 61.57
Scale: 1:200

GFA: 575m2

LEGEND

	Exg floor area		Entry matt
	Exg structure		Wet area
	Additional floor area	HYD	Fire hydrant
	New masonry - 120/120/120 FRL construction of load bearing walls	1FD	1hr fire door set
	Render / Sandstone capping	2FD	2hr fire door set

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PROPOSED REFURBISHMENT OF THE STEVENSON LIBRARY

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DRAWING TITLE
PROPOSED SECOND FLOOR PLAN

DRAWN BY
JC, CF, JW

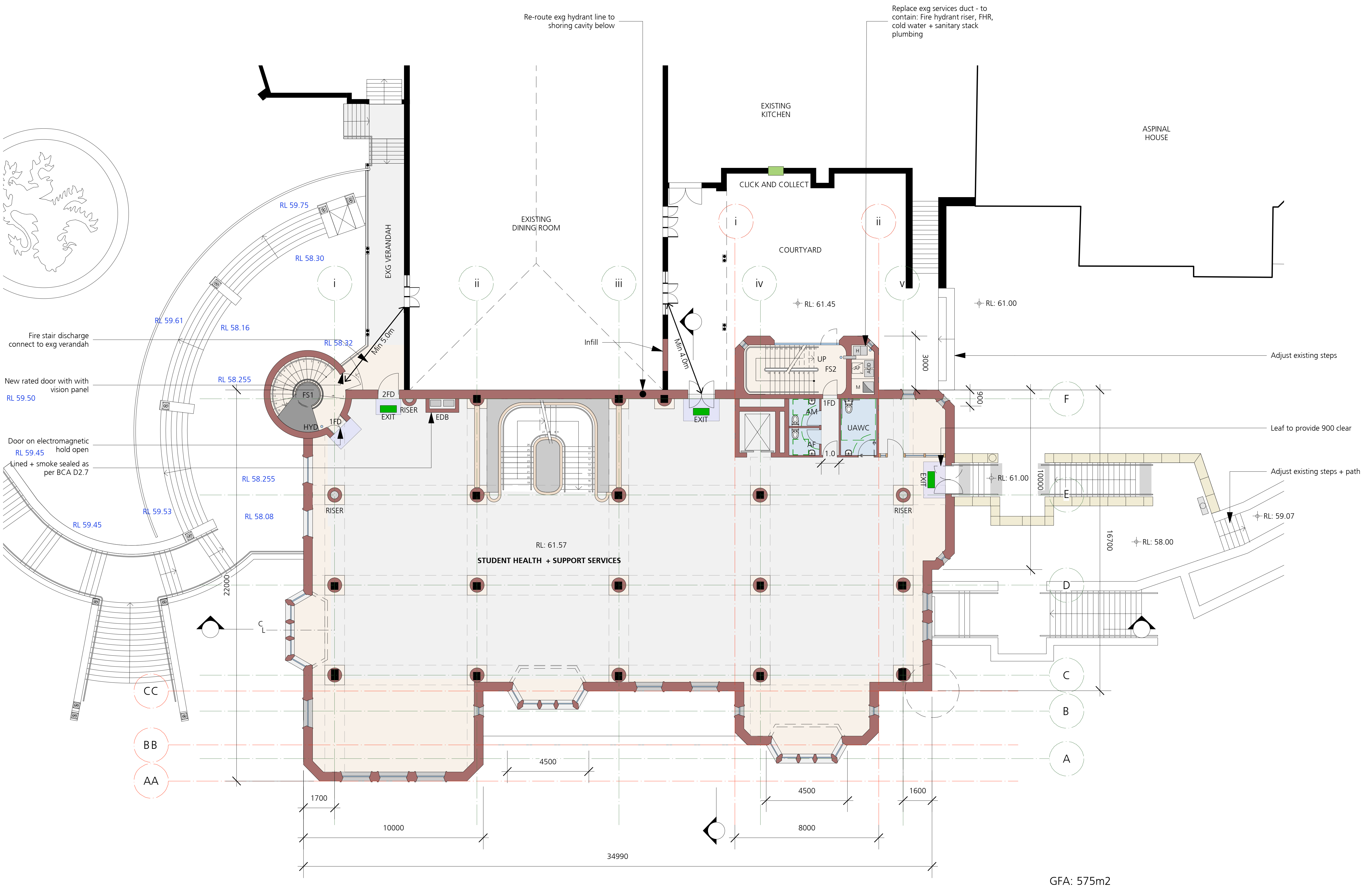
SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P5

DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-203



GFA: 575m2

1 Proposed Second Floor Plan RL 61.57
Scale: 1:200

LEGEND

Exg floor area	Entry matt
Exg structure	Wet area
Additional floor area	HYD Fire hydrant
New masonry - 120/120/120 FRL construction of load bearing walls	1FD 1hr fire door set
Render / Sandstone capping	2FD 2hr fire door set

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MCD
Fire Engineer

UMEA
Electrical Engineer

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Bellevue Hill, NSW

DRAWING TITLE
PROPOSED SECOND FLOOR PLAN

DRAWN BY
JC, CF, JW

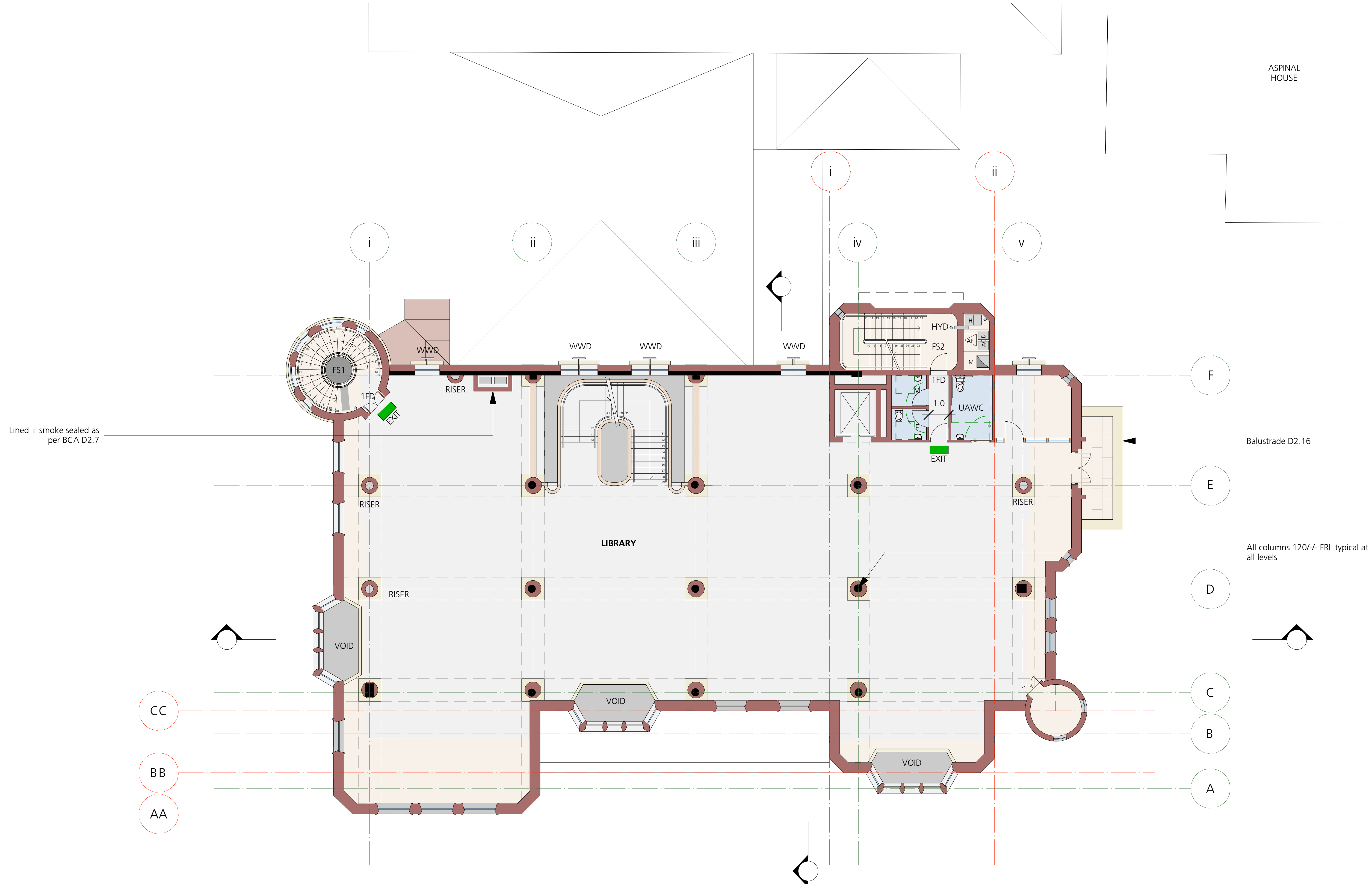
SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P6

DATE
MARCH 2018

DRAWING NUMBER
SSD1.02/17-203



1 Proposed Third Floor Plan RL 65.275
Scale: 1:200

GFA: 654m2

LEGEND

Exg floor area	Copper roofing
Exg structure	Wet area
Additional floor area	HYD Fire hyrdrant
New masonry - 120/120/120 FRL construction of load bearing walls	1FD 1hr fire door set
Render / Sandstone capping	2FD 2hr fire door set

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Nominated Architect
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MCD
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UMEA
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DRAWING TITLE
PROPOSED THIRD FLOOR PLAN

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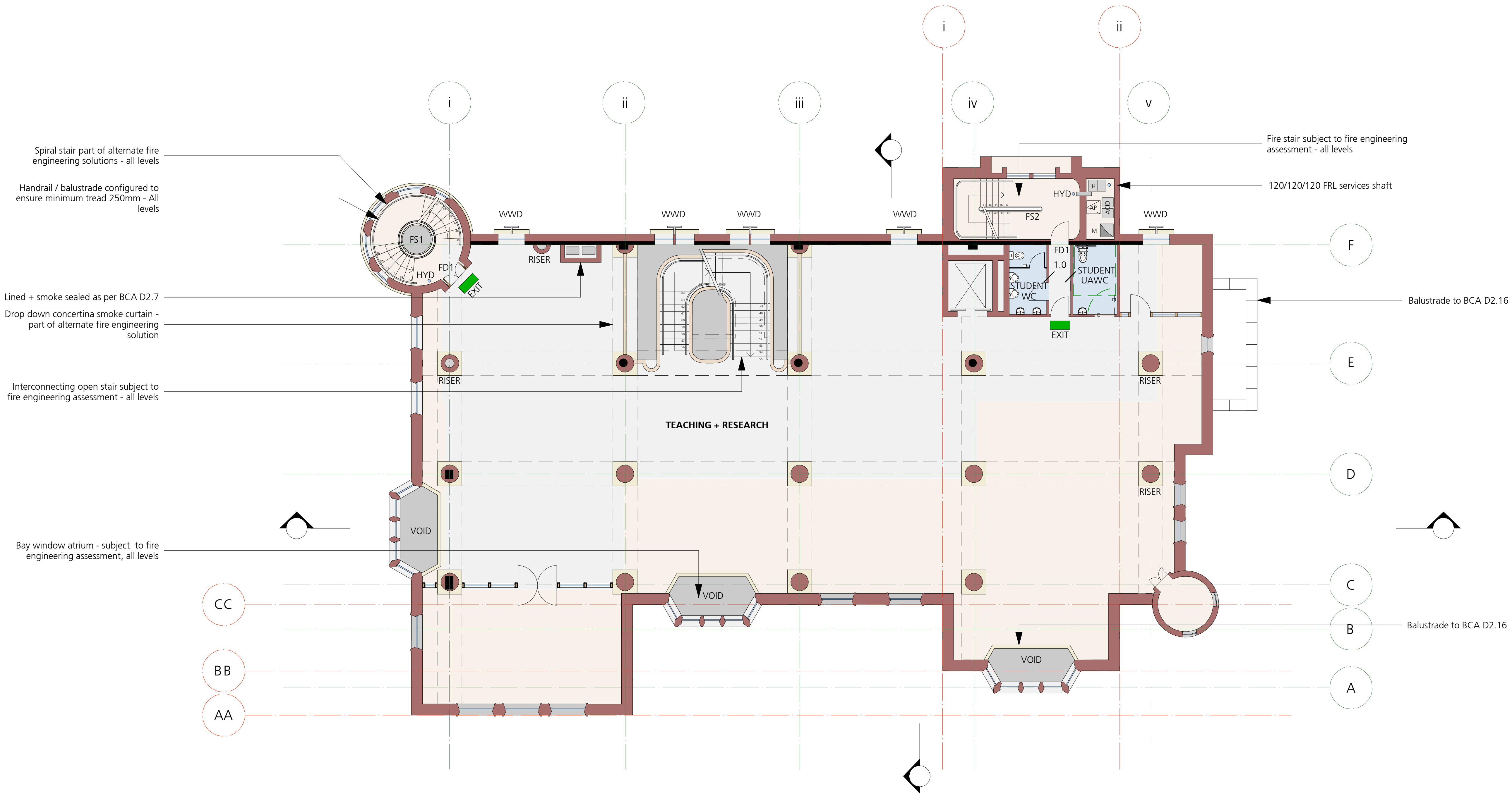
SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P5

DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-204



1 Proposed Fourth Floor Plan RL 67.95
Scale: 1:200

GFA: 655m2

LEGEND

Exg floor area	Wet area
Exg structure	HYD Fire hyrdrant
Additional floor area	1FD 1hr fire door set
New masonry - 120/120/120 FRL construction of load bearing walls	2FD 2hr fire door set
Render / Sandstone capping	

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DRAWING TITLE
PROPOSED FOURTH FLOOR PLAN

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SCALE
1:200 @ A3

ISSUE
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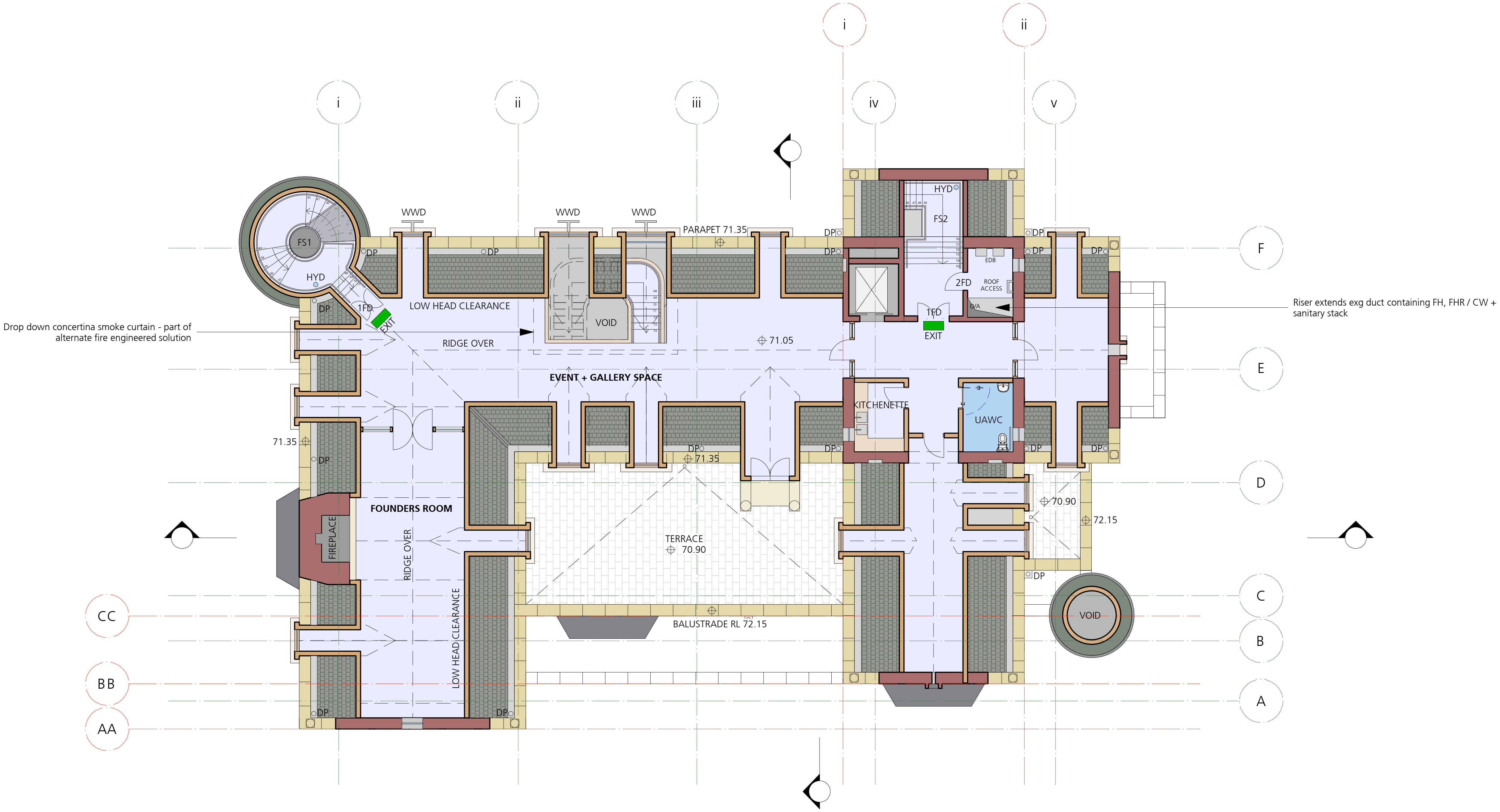
REVISION
P5

DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-205



1 Proposed Fifth Floor Plan RL 71.05
Scale: 1:200

GFA: 312m2

LEGEND

- New flooring
- Wet area
- Timber frame
- New masonry - 120/120/120 FRL construction of load bearing walls
- Render / Sandstone capping
- Welsh slate roof
- Roof leadwork
- HYD Fire hyrdrant
- 1FD 1hr fire door set
- 2FD 2hr fire door set

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UMEA
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PROPOSED REFURBISHMENT OF THE STEVENSON LIBRARY

ADDRESS
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Bellevue Hill, NSW

DRAWING TITLE
PROPOSED FIFTH FLOOR PLAN

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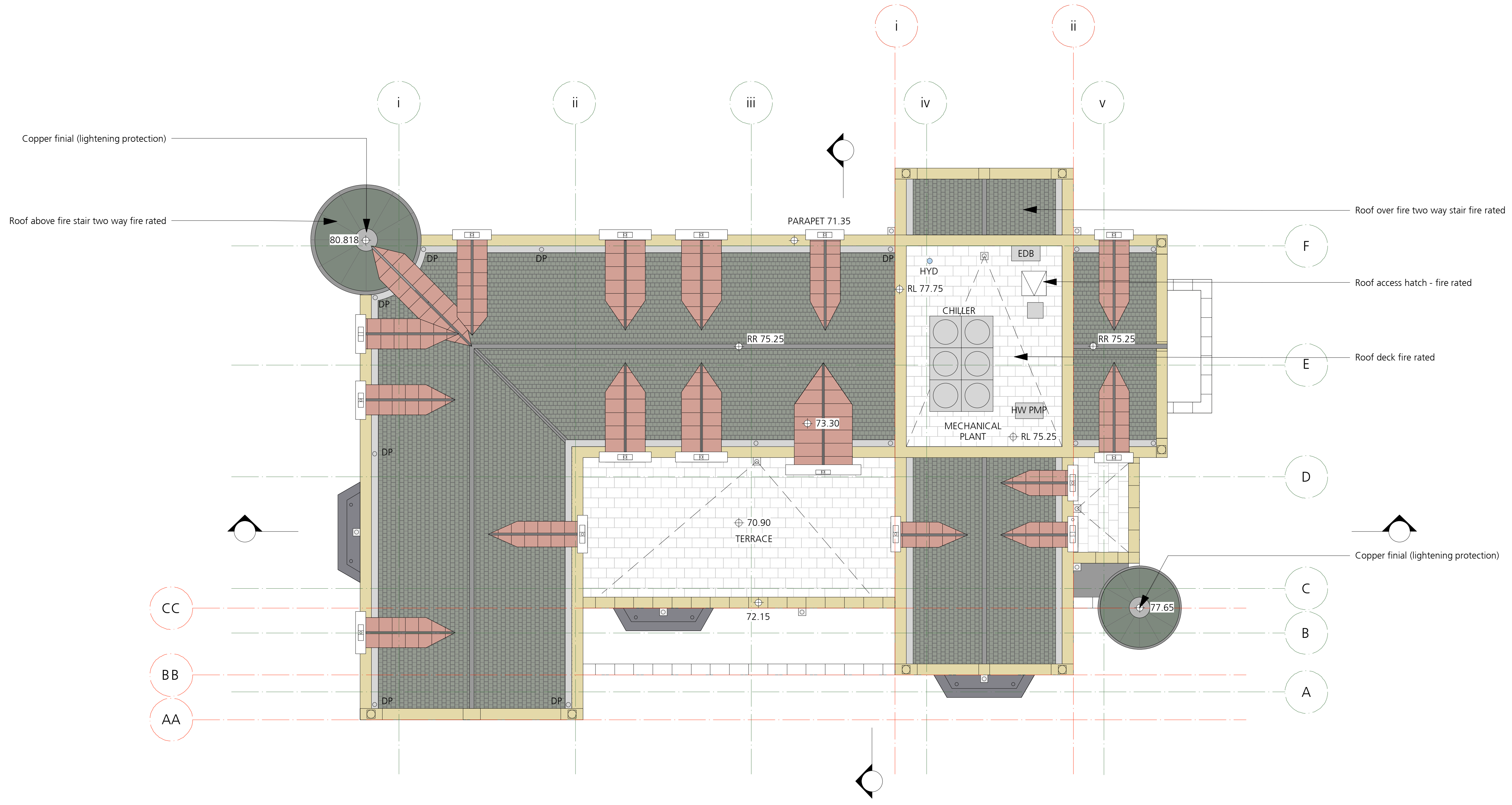
DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-206



1 Proposed Roof Plan RL 75.25
Scale: 1:200

LEGEND

- Welsh slate
- Roof leadwork
- Standing seam copper
- Sandstone capping
- Pavers
- HYD Fire hydrant

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Bellevue Hill, NSW

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PROPOSED ROOF PLAN

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SCALE
1:200 @ A3

ISSUE
PRELIMINARY

REVISION
P5

DATE
FEBRUARY 2018

DRAWING NUMBER
SSD1.02/17-207

APPENDIX C

SITE PHOTOGRAPHS

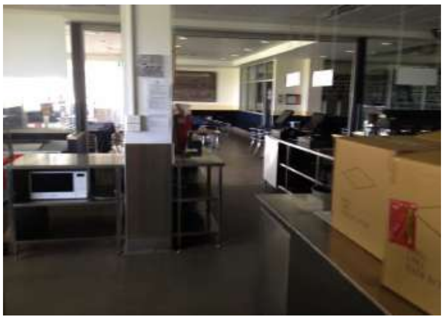
Aargus

SITE PHOTOGRAPHS

Client:	Impact Group Pty Ltd on behalf of The Scots College
Project:	DSI
Site Location:	29-53 Victoria Road, Bellevue Hill NSW
Job No.:	ES7155-2
Photos Taken By:	SP

Aargus

Photograph Nº 1



View of: kitchen area
Inspected on 11.03.2018

Photograph Nº 2

View of: kitchen area
Inspected on 11.03.2018

Photograph Nº 3

View of: cafe
Inspected on 11.03.2018

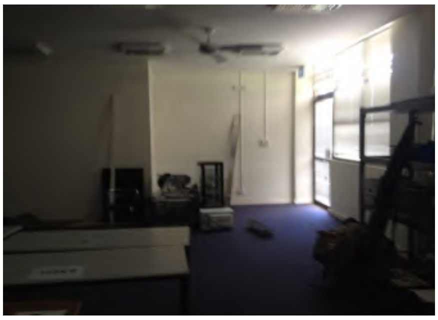
Photograph Nº 4

View of: outside of building
Inspected on 11.03.2018

Photograph Nº 5

View of: the site
Inspected on 11.03.2018

Photograph Nº 6



View of: the site
Inspected on 11.03.2018

APPENDIX D

LAND TITLE INFORMATION

LAND REGISTRY SERVICES

TITLE SEARCH

Computer Folio Certificate issued under Section 96D of the Real Property Act 1900

COMPUTER FOLIO REFERENCE	
1/231713	
EDITION No. & DATE OF CURRENT CERTIFICATE OF TITLE	
3	18/11/2016

No. 35

Search certified to:

2/2/2018 10:21 AM

LAND

LOT 1 IN DEPOSITED PLAN 231713

AT BELLEVUE HILL

LOCAL GOVERNMENT AREA WOOLLAHRA

PARISH OF ALEXANDRIA COUNTY OF CUMBERLAND

TITLE DIAGRAM DP231713

FIRST SCHEDULE

PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST

SECOND SCHEDULE (3 NOTIFICATIONS)

----

1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)

2 9156095 LEASE TO AUSGRID (SEE AJ71566) OF SUBSTATION NO.6628 TOGETHER WITH RIGHT OF WAY AND EASEMENT FOR ELECTRICITY PURPOSES OVER ANOTHER PART OF THE LAND ABOVE DESCRIBED AS SHOWN IN PLAN WITH 9156095. EXPIRES: 30/4/2038.

* AK971351 LEASE OF LEASE 9156095 TO BLUE ASSET PARTNER PTY LTD, ERIC ALPHA ASSET CORPORATION 1 PTY LTD, ERIC ALPHA ASSET CORPORATION 2 PTY LTD, ERIC ALPHA ASSET CORPORATION 3 PTY LTD & ERIC ALPHA ASSET CORPORATION 4 PTY LTD EXPIRES: SEE DEALING. CLAUSE 2.3 (b) (ii).

* AK971352 LEASE OF LEASE AK971351 TO BLUE OP PARTNER PTY LTD, ERIC ALPHA OPERATOR CORPORATION 1 PTY LTD, ERIC ALPHA OPERATOR CORPORATION 2 PTY LTD, ERIC ALPHA OPERATOR CORPORATION 3 PTY LTD & ERIC ALPHA OPERATOR CORPORATION 4 PTY LTD EXPIRES: SEE DEALING. CLAUSE 12.1

END OF PAGE 1 - CONTINUED OVER

SECOND SCHEDULE (3 NOTIFICATIONS) (CONTINUED)

----

* AK971502 MORTGAGE OF LEASE AK971351 TO ANZ FIDUCIARY SERVICES PTY LTD

* AK971571 CHANGE OF NAME AFFECTING LEASE 9156095 LESSEE NOW ALPHA DISTRIBUTION MINISTERIAL HOLDING CORPORATION

3 AE344527 POSITIVE COVENANT

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

NSW LAND REGISTRY SERVICES

HISTORICAL TITLE SEARCH

Certificate issued under Section 96G
of the Real Property Act 1900

No. 98

Search certified to: 2/2/2018 10:22AM

Computer Folio Reference: 1/231713

First Title(s): SEE PRIOR TITLE(S)

Prior Title(s): VOL 10739 FOL 128

Recorded	Number	Type of Instrument	C.T. Issue
5/6/1987		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
18/3/1988		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
17/12/2002	9156095	LEASE	EDITION 1
24/11/2008	AE344527	POSITIVE COVENANT	EDITION 2
11/3/2015	AJ321406	DEPARTMENTAL DEALING	
23/3/2015	AJ71566	CHANGE OF NAME	
1/8/2015	AJ701432	DEPARTMENTAL DEALING	
18/11/2016	AK934599	DISCHARGE OF MORTGAGE	EDITION 3
28/2/2017	AK971351	LEASE	
28/2/2017	AK971352	SUB-LEASE	
28/2/2017	AK971502	MORTGAGE OF LEASE	
28/2/2017	AK971571	CHANGE OF NAME	
1/3/2017	AK995132	DEPARTMENTAL DEALING	

*** END OF SEARCH ***

NEW SOUTH WALES

[redacted]CATE OF TITLE
[redacted]ERTY ACT, 1900, as amended.

Application No.45394

Vol. 10739 Fol. 128

MA Edition issued 28-2-1968

(Page 1) Vol. 10739 Fol. 128

I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

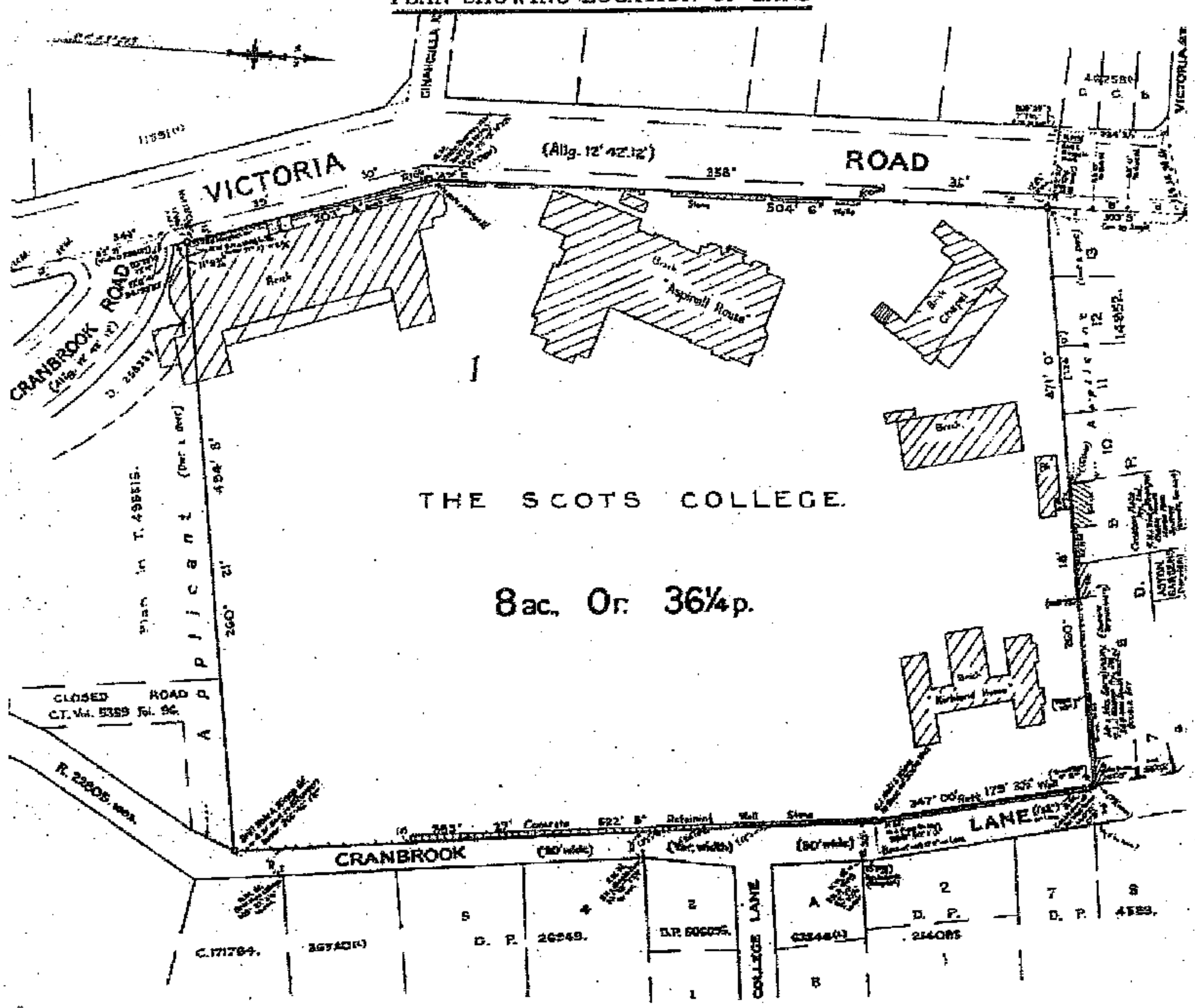
CANCELLED

SEE AUTO FOLIO

Witness [signature]

[signature]
Registrar General

PLAN SHOWING LOCATION OF LAND



S

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 1 in Deposited Plan 231713 at Bellevue Hill in the Municipality of Woollahra Parish of Alexandria and County of Cumberland being part of 190 acres granted to John Piper on 10-2-1820.

FIRST SCHEDULE (continued overleaf)

PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST.

SECOND SCHEDULE (continued overleaf)

CRY 1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
M 2. Mortgage No.K780784 dated 22-8-1967 to the Bank of New South Wales.
M 3. Mortgage No.K783210 dated 22-8-1967 to the Bank of New South Wales Savings Bank Limited.

[signature]
Registrar General.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

V. C. N. BLIGHT, GOVERNMENT PRINTER

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT			ENTERED	Signature of Registrar-General
	NATURE	NUMBER	DATE		
CANCELLED SEE AUTO FOLIO					

SECOND SCHEDULE (continued)

INSTRUMENT			PARTICULARS	ENTERED	Signature of Registrar-General	CANCELLATION		
NATURE	NUMBER	DATE						

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR-GENERAL ARE CANCELLED

R.P. 2

No. 45394

New South Wales

APPLICATION TO BRING LANDS UNDER THE PROVISIONS OF THE REAL PROPERTY ACT

FEE SIMPLE

DUTY PAID

Lodgment 18-0-0
Certificate
Advertising
Office Copy
Plan
Total £18-0-0

a This form may be modified to suit the case of a leasehold title.

REGISTRAR GENERAL NEW SOUTH WALES

CAUTION.—Applicants are reminded that by virtue of the provisions of the Oaths Act, 1900, the penalties of perjury are attached to a false declaration concerning any matter or procedure under the Act, and that the utmost care is therefore necessary in framing (or reading over, if the form be filled up by an Attorney) every particular statement herein.

It is further provided by Section 128 of the Real Property Act, 1900, that any applicant procuring a Certificate through any fraud, error, omission, misrepresentation, or misdescription will, notwithstanding the issue of such Certificate, remain liable for damages to any person thereby prejudiced. And any person who fraudulently procures, assists in fraudulently procuring, or is privy to the fraudulent procurement of any Certificate of Title, is declared guilty of a misdemeanour, and liable to a penalty not exceeding £500, or imprisonment not exceeding three years and any Certificate thereby procured is rendered void as between all parties or privies to the fraud.

b Here state Christian and surname (or names) in full with postal address and occupation.

I / WE KENNETH CHARLES AULD of 44 Margaret Street, Sydney, General Secretary, the duly appointed Attorney of the Presbyterian Church (New South Wales) Property Trust, a body corporate of 44 Margaret Street, Sydney do solemnly and sincerely declare, that c the Presbyterian ~~xxxxxxxxxxxxxxx~~ Church (new South Wales) Property Trust is seized for an Estate in fee simple of ALL THAT piece or parcel of land containing eight acres or thereabouts situate in the Parish of Alexandria, County of Cumberland as shown in the Plan of Mr. Surveyor Bryan Maxwell Brown dated 25th day of March, 1964 lodged with this Application.

c "I am" or if the declaration is made by an attorney "... of ..." as the case may be.

d Here give description of the property in full. If the land is shown on a plan lodged with the application or is fully described in a deed, it will be sufficient to insert a reference to the town, parish and county and words indicating that the land is shown on the plan or described in the deed in question. The application may include an appurtenant easement expressly created by an instrument not registered under the Real Property Act, 1900 (see section 46A). Unless the Registrar-General has previously dispensed with a plan of survey, an accurate plan, prepared and certified by a surveyor registered under the Surveyors Act, must accompany the application. If there be any rights of way or other rights or easements affecting the premises the particulars should be stated. If the space for description be insufficient, it may be completed by annexure which must however be identified as part of the declaration by memorandum signed by the declarant and attesting officer.

SER 12 PAGE 128

20/12/64

~~xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx~~

~~xxxxxxxx~~ which land is part of e 190 acres originally granted to h John Piper by Crown grant, under the hand of the Governor of the Colony, dated the Tenth day of February 1820.

e The full improved value should be stated.
f State whether "the whole" or "part".
g Insert allotment with reference to township and section on plan, if any, or if not, number of acres granted.
h Name of Grantee.

k If there be any Lease, add the words "except as follows" and insert particulars thereof.

And I/we further declare, that I/we verily believe there does not exist any lease or agreement for lease of the said land for any term exceeding a tenancy for one year, or from year to year, k except as follows: SEE ANNEXRE "A" Paragraph 1.

l If there be any mortgage, lien, etc., add the words "except as follows" and insert particulars thereof.

Also, that there does not exist any mortgage, lien, writ of execution, charge or encumbrance, will or settlement, or any deed or writing, contract, or dealing (other than such lease or tenancy as aforesaid), giving any right, claim, or interest in or to the said land, or any part thereof, to any other person than ~~xxxxxxxxxx~~ the Presbyterian Church (New South Wales) Property Trust except as follows: SEE ANNEXURE "A" paragraph 2.

m Insert "unoccupied" or "in the occupation of", adding names and addresses of tenants in full. State also nature of tenancy, if not under some lease before mentioned. When the applicant is not in actual occupation, but has a caretaker or manager in occupation, the name of such caretaker or manager should be stated, together with the nature of his occupancy.

n Here insert names and residences of adjacent owners, and occupiers, on all sides.

And I/we further declare, that there is no person in possession or occupation of the said land or any part thereof adversely to Applicant's ~~xxxxxx~~ Estate or Interest therein; and that the said land is now m in the occupation of the Scots College whose Council controls the land on behalf of the Applicant.

and that the owners and occupiers of adjacent lands are as follows n:—

State whether on North, South, East, or West.	Name.	State whether owner or occupier.	Address.
	Council Apre...		
North	1. Mr. & Mrs. Sarajinsky	Owner	c/- L.J. Hooker Pty. Limited, 354 New South Head Road, Double Bay
	~~Various Tenants~~	~~Occupiers~~	
	2. Creston ~~Hats~~ Flats Pty. Limited	Owner	c/- H.J. Trist & Stranger, Challis House, Martin Place, Sydney
	~~Various Tenants~~	~~Occupiers~~	
East	Cranbrook Lane		
South	The Applicant	Owner and Occupier	
West	Victoria Road		

Cert. of T. issued Vol. 10759 Fol. 8
Dated 20 FEB 1968

594464 OS

* The declaration may be qualified to the extent to which Applicant's title has been previously passed by the Registrar General by inserting the words "Commencing with Conveyance dated ... registered ... of all the deeds. Otherwise all documents from the Crown Grant onwards must be entered in the Schedule.

And I/we further declare, that the annexed Schedule, to which my/our signature is/are affixed, and which is to be taken as part of this Declaration, contains a full and correct list * commencing with Lease dated 26th September 1881 registered Number 68 Book 231 of all settlements, deeds, documents, or instruments, maps, plans and papers relating to the land comprised in this application, so far as I/we have any means of ascertaining the same, distinguishing such as being in my/our possession or under my/our control, are herewith lodged and indicating where or with whom, so far as known to me/us any others thereof are deposited. Also, that there does not exist any fact or circumstance whatever material to the title, which is not hereby fully and fairly disclosed to the utmost extent of my/our knowledge, information, and belief; and that there is not, to my/our knowledge and belief, any action or suit pending affecting the said land, nor any person who has or claims any estate, right, title or interest therein, or in any part thereof, otherwise than by virtue and to the extent of some lease or tenancy hereby fully disclosed.*

* If there be any exception add the words "except as follows" and insert necessary particulars.

And I/we make this solemn Declaration, conscientiously believing the same to be true.

* If made in New South Wales this Declaration must be attested by the Registrar General or Deputy, or by a Notary Public, or by a Justice of the Peace, or Commissioner for Affidavits. If made outside the State it should be made according to the law of the State where made, before a person authorised by that law to take declarations. If the signature be by mark, the attesting witness must state that the document was read over to the declarant and that he appeared fully to understand the contents. This applies also to the subjoined direction, particularly if a different person be nominated to receive certificate.

DATED at Sydney this Twenty eighth day of January 1966.

(RULE UP ALL BLANKS BEFORE SIGNING.)

Made and subscribed by the abovenamed KENNETH CHARLES AULD this 28th day of January 1966 in the presence of

G. Roberton J.P.
Justice of the Peace

Signature of Applicant

For and on behalf of THE PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST

General Secretary

To the Registrar-General.

I/We KENNETH CHARLES AULD of 44 Margaret Street, Sydney General Secretary the above declarant, do hereby apply to have the land described in the above declaration brought under the provisions of the Real Property Act, and request you to issue the Certificate of Title in the name of * PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST of 44 Margaret Street, Sydney.

* If to Applicant, say "myself"; if to other person write name in full length, with postal address and occupation. If to two or more, state whether as joint tenants or tenants in common; if as tenants in common, state shares. If to an infant, the age should be stated, and verified by Certificate of Birth, or by Statutory Declaration. If to a married woman, the name of the husband together with his postal address and occupation, should be stated.

DATED at Sydney this twenty eighth day of January 1966

Witness to Signature—

G. Roberton J.P.

For and on behalf of THE PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST

(Signature of Applicant)

General Secretary

*N.B.—The Schedule below and Certificate indorsed on fourth page should be also signed.

In no case can any alterations, however trifling, be allowed to be made after the application has been once declared, unless all the parties resign and re-declare the same. If it is discovered that any alterations are necessary, the applicant may make a statutory declaration setting out in what manner he desires the application to be altered, which declaration will then (unless the Registrar General considers that a fresh application ought to be made) be read as one with the application.

(RULE UP ALL BLANKS BEFORE SIGNING.)

SCHEDULE REFERRED TO.*

(TO BE SIGNED BY APPLICANT IMMEDIATELY BELOW THE LAST DOCUMENT SCHEDULED.)

To include not only Title Deeds, Probates, Letters of Administration, etc., but also the Surveyor's Plan or Statement in lieu thereof.

* For the particulars with which this Schedule must comprise, see concluding part of Declaration, to which particular attention is directed, as any omission or mis-statement will render applicant liable to the penalties of false declaration.

No.	Date.	Nature of Instrument.	Parties.	Registration. Book.	Registration. No.	For Office use only. By whom Produced.
1	26.9.1881	Lease	Sir D. Cooper one part J. F. Josephson other part	No. 68	Bk. 231	
2	26.9.1881	Confirmation of above.		No. 672	Bk. 242	
3.	30.3.1885	Underlease	J. B. Donkin one part J.F. Josephson other part (Confirmed)	826	307	
4.	28.6.1901	Assignment	T.F. Josephson & Ors. one part A.A. Aspinall other part	506	696	
5.	29.6.1901	Mortgage	A.A. Aspinall one part T.F. Josephson other part	507	696	
6	18.10.1905	Transfer of Mtge.	T.J. Josephson & Ors. 1st part A.A. Aspinall 2nd part The Bank of North Queensland Limited 3rd part	256	790	26-1-67

Should any transaction affecting the land in this application be entered into or any alterations in the buildings or fences be made subsequent to the date of the application, but prior to the issue of the Certificate of Title, the Registrar General should be informed immediately, and all documents evidencing such transaction should be lodged.

ANNEXURE " A "

PARAGRAPH 1.

Lease dated the 26th day of September, 1881 between Sir D. Cooper of the one part and J. F. Josephson of the other part registered number 68 book 231 assignment made the 28th day of June, 1901 between J. F. Josephson and others of the one part and A. A. Aspinall of the other part registered number 506 book 696 further assignment made the 14th day of February 1907 between the said A. A. Aspinall of the one part and the Trustees of the Presbyterian Church in the State of New South Wales of the other part.

PARAGRAPH 2.

(i) Mortgage dated 12th day of April, 1929 between the Presbyterian Church of Australia in the State of New South Wales of the one part and the Bank of New South Wales of the other part registered number 300 book 1565.

(ii) Mortgage dated 12th day of April, 1929 between the Presbyterian Church of Australia in the State of New South Wales of the one part and the Bank of New South Wales of the other part registered Number 301 book 1565.

(iii) Mortgage dated 2nd day of December, 1963 between the Presbyterian Church (New South Wales) Property Trust of the one part and the Bank of New South Wales Savings Bank Limited., of the other part registered number 132 book 2694.

(iv) Mortgage dated 2nd day of December, 1963 between the Presbyterian Church (New South Wales) Property Trust of the one part and the Bank of New South Wales Savings Bank Limited., of the other part registered Number 133 book 2694.

THIS is the annexure marked with the letter "A" referred to in Real Property Application made this twenty eighth day of January ~~1965~~ 1966 in my presence.

G. Roberts J.P.
Justice of the Peace

ANNEXURE "B"

BANK OF NEW SOUTH WALES being the mortgagee of the land comprised in the within written application HEREBY CONSENTS to such application and to the Certificate(s) of Title issuing in the name of the said PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST subject and without prejudice however to the security of the said Bank and subject to a substituted mortgage under the Real Property Act 1900 in lieu of the existing mortgage being given to the said Bank in such form as the said Bank may require.

DATED this Thirteenth day of May 1966.

SIGNED for and on behalf of the Bank of New South Wales by ROY ARTHUR PAGE who is personally known to me.

E. Dolamins J.P.

For and on behalf of the BANK OF NEW SOUTH WALES

R.A. Page
MORTGAGEE.
Assistant to Chief Security Officer

BANK OF NEW SOUTH WALES SAVINGS BANK LIMITED being the mortgagee of the land comprised in the within written application HEREBY CONSENTS to such application and to the Certificate(s) of Title issuing in the name of the said PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST subject and without prejudice however to the security of the said Bank and subject to a substituted mortgage under the Real Property Act 1900 in lieu of the existing mortgage being given to the said Bank in such form as the said Bank may require.

DATED this Thirteenth day of May 1966.

SIGNED for and on behalf of the Bank of New South Wales Savings Bank Limited by ROY ARTHUR PAGE who is personally known to me.

E. Dolamins J.P.

For and on behalf of the BANK OF NEW SOUTH WALES SAVINGS BANK LIMITED

R.A. Page
MORTGAGEE.
Assistant to Chief Security Officer.

SCHEDULE REFERRED TO—(*continued*).*

(TO BE SIGNED BY APPLICANT, IF UTILISED, IMMEDIATELY BELOW THE LAST DOCUMENT SCHEDULED.)

No.	Date.	Nature of Instrument.	Parties.	Registration. Book.	No.	For Office use only. By whom Produced.
				do	Book	
7.	13.2.1907	Discharge	(endorsed on Mortgage of 29.6.1901	411	821	
8.	13.2.1907	Discharge	(endorsed on Transfer of Mortgage of 18.10.1905)	412	821	
9.	14.2.1907	Assignment	A.A. Aspinall one part The Trustees of the Presbyterian Church of Australia in the State of New South Wales other part	413	821	
			Agent	373	1022	
10.	18.1.1929	Conveyance	Dame Harriet Cooper & Others 1st part, T.K. Raine & Others 2nd part, Trustees of the Presbyterian Church of Australia in the State of New South Wales 3rd Part	801	1545	
11.	12.4.1929	Mortgage	Presbyterian Church of Australia in the State of New South Wales to The Bank of New South Wales	Book 1565	No. 300	
12.	12.4.1929	Mortgage	Presbyterian Church of Australia in the State of New South Wales to the Bank of New South Wales	1565	301	
13.	2.12.1963	Mortgage	Presbyterian Church of Australia in the State of New South Wales to the Bank of New South Wales Savings Bank Limited	2694	132	
14.	2.12.1963	Mortgage	Presbyterian Church of Australia in the State of New South Wales to the Bank of New South Wales Savings Bank Limited	2694	133	
15.		Power of Attorney	Presbyterian Church (New South Wales) Property Trust and Kenneth Charles Auld	9118	[illegible]	
16.	25.3.1964	Survey Cert.	of Mr. Surveyor Bryan Maxwell ~~Brown~~. MASON			

For and on behalf of THE PRESBYTERIAN CHURCH (NEW SOUTH WALES) PROPERTY TRUST

Docs 1-15 [illegible]

These documents will be produced by Bank of N.S.W.

	3.2.1914	Agent	Exor of will of Harriet Cooper to the Trustees of the Presbyterian Church of Australia in the State of New South Wales	1022	373	
17	21.10.6[illegible]	[illegible]	Kenneth Charles Auld			[illegible]
18	26.10.6[illegible]	Appln	Kenneth C Auld			[illegible]

See indorsement overleaf.

I certify that the within application is correct for the purposes of the Real Property Act, 1900.†

Section 117 requires that this Certificate be signed by Applicant or his Solicitor and renders liable any person falsely or negligently certifying to a penalty not exceeding £50; also to damages recoverable by parties injured. If by Solicitor he should insert "And that I am the Solicitor of the within named Applicant," and should add his own address to his signature. The signature should be that of the Solicitor himself and not of his clerk.

Secretary on behalf of
THE PRESBYTERIAN CHURCH (NEW SOUTH WALES)
PROPERTY TRUST

(Signature) ——————

(RULE UP ALL BLANKS BEFORE SIGNING, EXCEPT SPACE IN SCHEDULE BELOW APPLICANT'S SIGNATURE.)

FEES.

DP281713

PAYMENT OF THESE MUST ACCOMPANY THE APPLICATION.

	£	s.	d.
Certificate of Title — — — — —	2	10	0
Office Copy of Plan (when a Plan is furnished) —	1	0	0
Preparation of Plan (when a Plan is not furnished)	1	0	0
Advertisement — — — — — —	8	0	0
Lodgment fee — — — — — —	1	0	0

[illegible] State to whom all correspondence relating to this Application should be sent, with address, as under, viz.:—

Name HUNT & HUNT

28 [illegible]

Occupation Solicitors

Post Town 2 Hunter St. Sydney

APPENDIX E

CURRENT AND HISTORICAL AERIAL PHOTOGRAPHS

Aargus

HISTORICAL AERIAL PHOTOGRAPHS - 1943

N

LEGEND

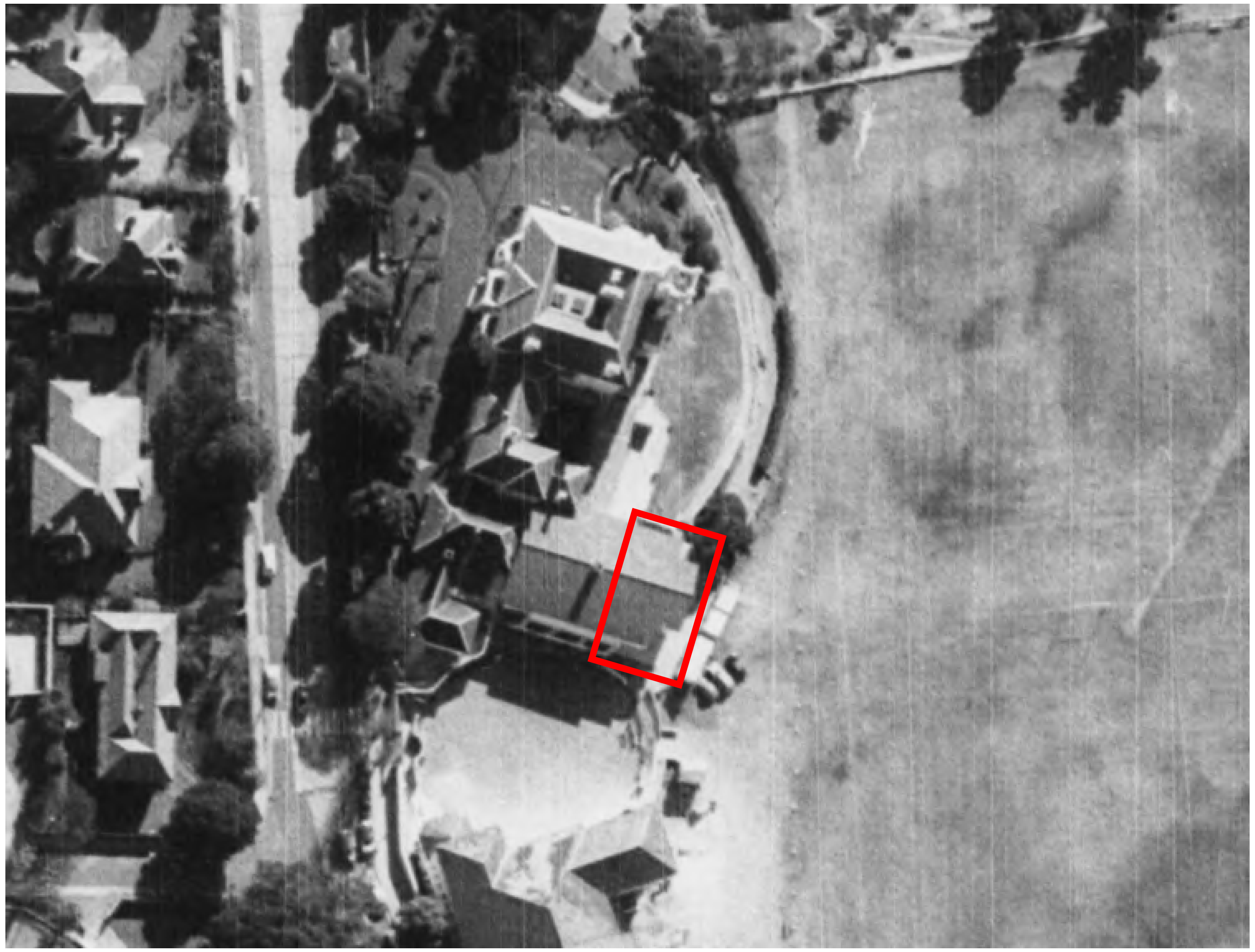
Site Boundary

PROJECT DETAILS	
Project Title	Detailed Site Investigation
Project No.	ES7155/2
Client	Impact Group Pty Ltd on behalf of The Scots College
Site Address	29-53 Victoria Road, Bellevue Hill NSW

Aargus

DRAWING DETAILS			
Figure No.	A	**Rev No.**	0
Scale	NA	**Size**	A3
Drawn by	LC	**Date**	31.01.2018
Approved by	MK	**Date**	27.03.2018

HISTORICAL AERIAL PHOTOGRAPHS - 1961



N

LEGEND

Site Boundary

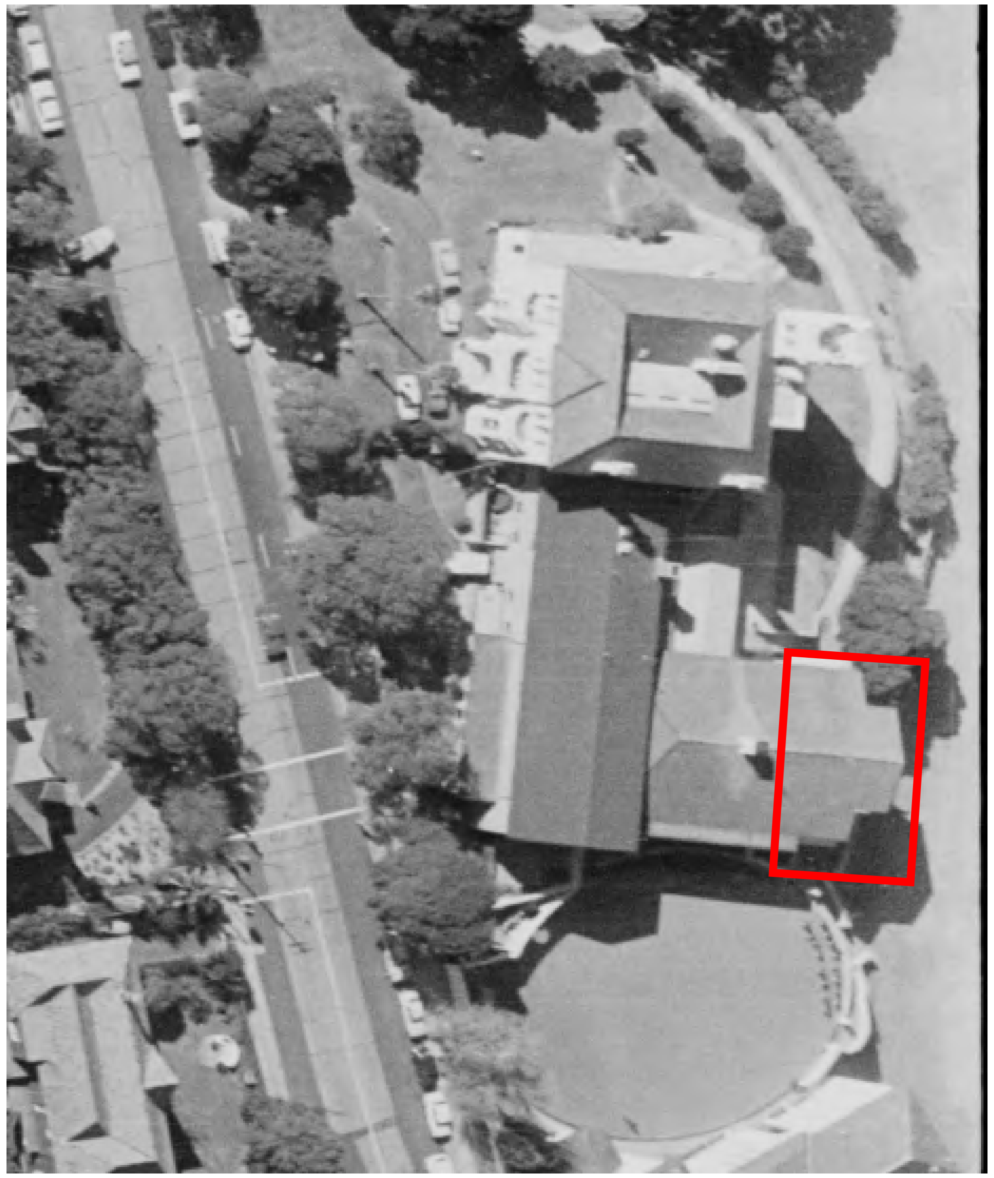
PROJECT DETAILS	
Project Title	Detailed Site Investigation
Project No.	ES7155/2
Client	Impact Group Pty Ltd on behalf of The Scots College
Site Address	29-53 Victoria Road, Bellevue Hill NSW

Aargus

DRAWING DETAILS			
Figure No.	B	**Rev No.**	0
Scale	NA	**Size**	A3
Drawn by	LC	**Date**	31.01.2018
Approved by	MK	**Date**	27.03.2018

HISTORICAL AERIAL PHOTOGRAPHS - 1972

N



LEGEND

Site Boundary

PROJECT DETAILS	
Project Title	Detailed Site Investigation
Project No.	ES7155/2
Client	Impact Group Pty Ltd on behalf of The Scots College
Site Address	29-53 Victoria Road, Bellevue Hill NSW

Aargus

DRAWING DETAILS			
Figure No.	C	**Rev No.**	0
Scale	NA	**Size**	A3
Drawn by	LC	**Date**	31.01.2018
Approved by	MK	**Date**	27.03.2018

HISTORICAL AERIAL PHOTOGRAPHS - 1994

N

LEGEND

Site Boundary

PROJECT DETAILS		**DRAWING DETAILS**			
Project Title	Detailed Site Investigation	**Figure No.**	D	**Rev No.**	0
Project No.	ES7155/2	**Scale**	NA	**Size**	A3
Client	Impact Group Pty Ltd on behalf of The Scots College	**Drawn by**	LC	**Date**	31.01.2018
Site Address	29-53 Victoria Road, Bellevue Hill NSW	**Approved by**	MK	**Date**	27.03.2018

Aargus

HISTORICAL AERIAL PHOTOGRAPHS - 2002

N

LEGEND

Site Boundary

PROJECT DETAILS	
Project Title	Detailed Site Investigation
Project No.	ES7155/2
Client	Impact Group Pty Ltd on behalf of The Scots College
Site Address	29-53 Victoria Road, Bellevue Hill NSW

Aargus

DRAWING DETAILS			
Figure No.	E	**Rev No.**	0
Scale	NA	**Size**	A3
Drawn by	LC	**Date**	31.01.2018
Approved by	MK	**Date**	27.03.2018

CURRENT AERIAL PHOTOGRAPHS - 2017

LEGEND

Site Boundary

PROJECT DETAILS	
Project Title	Detailed Site Investigation
Project No.	ES7155/2
Client	Impact Group Pty Ltd on behalf of The Scots College
Site Address	29-53 Victoria Road, Bellevue Hill NSW

Aargus

DRAWING DETAILS			
Figure No.	F	**Rev No.**	0
Scale	NA	**Size**	A3
Drawn by	LC	**Date**	31.01.2018
Approved by	MK	**Date**	27.03.2018

APPENDIX F

NSW EPA RECORDS

Aargus

Search results

Your search for:Suburb: BELLEVUE HILL

Search Again
Refine Search

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the planning process.

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... more search tips

More information about particular sites may be available from:

- The POEO public register
- The appropriate planning authority: for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act.

See What's in the record and What's not in the record.

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.
This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register.POEO public register

For

30 January 2018

business and industry ()

For local government ()

Contact us

131 555 (tel:131555)

Online (http://www.epa.nsw.gov.au/about-us/contact-us/feedback/feedback-form)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (http://www.epa.nsw.gov.au/about-us/contact-us/locations)

Home Environment protection licences POEO Public Register Search for licences, applications and notices

Search results

Your search for: **General Search** with the following criteria

Suburb - BELLEVUE HILL

returned 0 result

Search Again

For business and industry ()

For local government ()

Contact us

131 555 (tel:131555)

Online (http://www.epa.nsw.gov.au/about-us/contact-us/feedback/feedback-form)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (http://www.epa.nsw.gov.au/about-us/contact-us/locations)

APPENDIX G

SECTION 149 CERTIFICATES

Aargus

PLANNING CERTIFICATE UNDER SECTION 10.7 (2)
ENVIRONMENTAL PLANNING & ASSESSMENT ACT

Woollahra Municipal Council

ABN 32 218 483 245

Redleaf Council Chambers
536 New South Head Road
Double Bay NSW 2028

Correspondence to
General Manager
PO Box 61
Double Bay NSW 1360

DX 3607 Double Bay
records@woollahra.nsw.gov.au

www.woollahra.nsw.gov.au

Telephone: (02) 9391 7000
Facsimile: (02) 9391 7044

Darren D'Mello
Level 1, 51 Walker Street
North Sydney
NSW 2060

Applicant's reference:
201193

Certificate number:	660
Certificate issue date:	20/03/2018
Transaction ID:	425897
Certificate fee:	$144.50 (expedite)

DESCRIPTION OF PROPERTY

Address:	29-53 Victoria Road BELLEVUE HILL NSW 2023
Title:	LOT: 1 DP: 231713
Parish:	Alexandria
County:	Cumberland

This planning certificate should be read in conjunction with the Woollahra Local Environmental Plan 2014. This is available on the NSW legislation website at www.legislation.nsw.gov.au

The land to which this certificate relates, being the lot or one of the lots described in the corresponding application, is shown in the Council's records as being situated at the street address described on page 1 of this certificate.

It is the applicant's responsibility to confirm that the legal description of the lot to which the application relates is accurate and current. Council does not check the accuracy or currency of the information; nor does Council have the copyright to this information.

The legal description of land is obtained from NSW Land and Property Information. Applicants must verify all property and lot information with NSW Land and Property Information.

The information contained in this certificate relates only to the lot described on the certificate.

Where the street address comprises more than one lot in one or more deposited plans or strata plans, separate planning certificates can be obtained upon application for the other lots. Those certificates may contain different information than is contained in this certificate.

SECTION 10.7(2) DETAILS

In accordance with section 10.7(2) of the *Environmental Planning and Assessment Act 1979* , at the date of this certificate the following information is provided in respect of the prescribed matters to be included in a planning certificate.

1. NAMES OF RELEVANT LOCAL ENVIRONMENTAL PLANS

(a) The following local environmental plan applies to the land:

Woollahra Local Environmental Plan 2014 (commenced 23 May 2015)

(b) Zone:

SP2 Infrastructure

(c) Development that may be carried out within the zone without development consent:

Roads

(d) Development that may be carried out within the zone with development consent:

Community facilities; Environmental protection works; Recreation areas; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose

Also refer to Schedule 1 of the LEP "Additional permitted uses" to see if this schedule applies to your land.

(e) Development that is prohibited within the zone:

Any development not specified in item (c) or (d) above.

(f) Do any development standards apply to the land that set minimum land dimensions for the erection of a dwelling house on the land? If yes, what are the minimum dimensions?

No

(g) Does the land include or comprise 'critical habitat' under the provisions of the local environmental plan applying to the land?

No

(h) Is the land located in a heritage conservation area under the provisions of the local environmental plan applying to the land?

No

(i) Is there an item of environmental heritage situated on the land under the provisions of the local environmental plan applying to the land?

Yes. Refer to Woollahra Local Environmental Plan 2014, Schedule 5 Environmental Heritage and the Heritage Map for more information.

2. NAMES OF RELEVANT EXHIBITED PROPOSED ENVIRONMENTAL PLANNING INSTRUMENTS

The following proposed environmental planning instruments, including a planning proposal for a LEP or a draft environmental planning instrument have been the subject of community consultation or on public exhibition under the *Environmental Planning and Assessment Act 1979* (unless the Director-General has notified Council that the making of the proposed instrument has been deferred indefinitely or has not been approved.)

Properties affected: Ian Street and Wilberforce Avenue car parks in the Rose Bay Centre
Details: A planning proposal has been prepared to amend the Woollahra Local Environment Plan 2014 by:

Ian Street Car Park
- rezoning the land from Special Purpose Zone SP2 Infrastructure (Car Park) to Business Zone B2 Local Centre,
- amending Schedule 1 to allow 'residential flat building' as an additional permitted use on the site,
- increasing the maximum building height from 10.5m (3 storeys) to 14.1m (4 storeys),
- applying a floor space ratio of 2:1 (none currently applies).

Wilberforce Avenue Car Park
- increasing the maximum building height from 14.1m (4 storeys) to 17.2m (5 storeys).

In summary, these changes would facilitate a four storey building on the Ian Street Car Park site and a five storey building on the Wilberforce Avenue Car Park site.

Exhibition period: 26 April 2017 to 2 June 2017.

Properties affected: Dunara Reserve, Point Piper
Details: A planning proposal has been prepared to reclassify the land from community land to operational land under the *Local Government Act 1993* . Reclassifying the land would allow the sale of the site.

Re-exhibition period: 25 October to 24 November 2017

Properties affected: 42-58 Old South Head Road, Vaucluse
Details: A planning proposal has been prepared to amend the *Woollahra Local Environment Plan 2014* to allow redevelopment of the site for medium density residential development, including residential flat buildings, to a maximum height of 10.5 metres (3 storeys) and a maximum floor space ratio (FSR) of 1:1.

The changes to the LEP involve the following:

- amending the zoning of the site from R2 Low Density Residential to R3 Medium Density Residential;
- increasing the maximum building height control of the site from 9.5m to 10.5m; and
- applying an FSR control of 1:1 to the site (no FSR control currently applies).

Exhibition period: Wednesday 18 October to Friday 17 November 2017.

3. NAMES OF RELEVANT DEVELOPMENT CONTROL PLANS

The following table contains a list of development control plans that have been prepared by Council under Division 6 of Part 3 of the *Environmental Planning and Assessment Act 1979* (including any made by the Council under section 72 of the Act before repeal of that section). Please check the table to see the relevancy of the plans to the land that is the subject of this certificate.

(a) The following development control plan applies to the land:

Woollahra Development Control Plan 2015 (commenced 23 May 2015)

4. NAMES OF RELEVANT DEVELOPMENT CONTROL PLANS PREPARED BY THE DIRECTOR GENERAL

The following development control plans have been prepared by the Director-General under Division 6 of Part 3 of the *Environmental Planning and Assessment Act 1979* (including any made by the Director-General under section 51A, before the repeal of that section).

Sydney Harbour Foreshores and Waterways Area Development Control Plan 2005

This DCP applies to certain land within the Woollahra Municipality being land within the Foreshores and Waterways area identified on the Sydney Regional Environmental Plan (Sydney Harbour Catchment) Foreshores and Waterways Area Map.

5. NAMES OF RELEVANT STATE ENVIRONMENTAL PLANNING POLICIES

Below is a list of all State environmental planning policies that apply to the Woollahra Municipality.

Depending on circumstances set down in each SEPP, the policy may be specifically applicable to the land that is the subject of this certificate. You are advised to peruse the policy for the necessary details. Refer to NSW Department of Planning and Environment.

– State Environmental Planning Policy No. 1 – Development Standards
– State Environmental Planning Policy No. 19 – Bushland in Urban Areas
– State Environmental Planning Policy No. 21 – Caravan Parks

State Environmental Planning Policy No. 30 – Intensive Agriculture
- State Environmental Planning Policy No. 32 – Urban Consolidation (Redevelopment of Urban Land)
- State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
- State Environmental Planning Policy No. 50 – Canal Estate Development
- State Environmental Planning Policy No. 55 – Remediation of Land
- State Environmental Planning Policy No. 64 – Advertising and Signage
- State Environmental Planning Policy No. 65 – Design Quality of Residential Apartment Development
- State Environmental Planning Policy No. 71 – Coastal Protection
- State Environmental Planning Policy (Affordable Rental Housing) 2009
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004
- State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
- State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004
- State Environmental Planning Policy (Infrastructure) 2007
- State Environmental Planning Policy (Major Development) 2005
- State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
- State Environmental Planning Policy (Miscellaneous Consent Provisions) 2007
- State Environmental Planning Policy (State and Regional Development) 2011
- State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

Deemed SEPPs:

- Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005
  This REP applies to all land within the Woollahra Municipality except for land at Christison Park, Vaucluse as shown on the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 Sydney Harbour Catchment Map

6. NAMES OF PROPOSED STATE ENVIRONMENTAL PLANNING POLICIES

The following proposed State Environmental Planning Policies have been the subject of community consultation or on public exhibition under the *Environmental Planning and Assessment Act 1979* (unless the Director-General has notified Council that the making of the proposed instrument has been deferred indefinitely or has not been approved.)

There are currently no proposed State Environmental Planning Policies applying to the land.

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

7. COMPLYING DEVELOPMENT

Is the land, land on which complying development may be carried out under the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* ?

General Housing Code
Complying development under the General Housing Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

Rural Housing Code
Rural Housing Code is not applicable to Woollahra Local Government Area.

Housing Alterations Code
Complying development under the Housing Alterations Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

General Development Code
Complying development under the General Development Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

Commercial and Industrial Alterations Code
Complying development under the Commercial and Industrial Alterations Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

Commercial and Industrial (New Buildings and Additions) Code
Complying development under the Commercial and Industrial (New Buildings and Additions) Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

Subdivisions Code
Complying development under the Subdivisions Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

Demolition Code
Complying development under the Demolition Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

Fire Safety Code
Complying development under the Fire Safety Code may not be carried out on the land because it is land that comprises an item that is listed as a heritage item in Woollahra Local Environmental Plan (LEP) 2014.

Notwithstanding the above, complying development under that Code may be undertaken in either of the following circumstances:

1. If the development has been granted an exemption under section 57 (2) of the Heritage Act 1977, or is subject to an exemption under section 57 (1A) or (3) of that Act.

2. If the complying development is not located on that part of the land described and mapped as an item in Woollahra LEP 2014.

Refer to the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 for full details.

8. COASTAL PROTECTION

Is the land affected by the operation of section 38 or 39 of the *Coastal Protection Act 1979* , but only to the extent that Council has been so notified by the Department of Services, Technology and Administration?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

8A. CERTAIN INFORMATION RELATING TO BEACHES AND COASTS

Has the council been notified under section 55X of the *Coastal Protection Act 1979* that temporary coastal protection works (within the meaning of that Act) have been placed on the land (or on public land adjacent to that land)?

No

Disclaimer: These statements are based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

8B. ANNUAL CHARGES UNDER LOCAL GOVERNMENT ACT 1993 FOR COASTAL PROTECTION SERVICES THAT RELATE TO EXISTING COASTAL PROTECTION WORKS

Has the owner (or any previous owner) of the land consented in writing to the land being subject to annual charges under section 496B of the *Local Government Act 1993* for coastal protection services that relate to existing coastal protection works (within the meaning of section 553B of that Act)?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council. If the information is vital for the proposed end use, then it should be verified by the applicant.

9. MINE SUBSIDENCE

Is the land proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961* ?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

10. ROAD WIDENING OR ROAD REALIGNMENT

Is the land affected by any road widening or road realignment under:

(a) Division 2 of Part 3 of the Roads Act 1993; or

(b) any environmental planning instrument; or

(c) any resolution of the Council?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

11. COUNCIL AND OTHER PUBLIC AUTHORITY POLICIES ON HAZARD RISK RESTRICTIONS

Is the land affected by a policy:

(a) adopted by the Council that restricts the development of the land because of the likelihood of land slip, bushfire, tidal inundation, subsidence, acid sulfate soils or any other risk (other than flooding)?

Yes

Woollahra LEP 2014, clause 6.1 (Acid sulfate soils) may require an assessment of acid sulfate soils for certain types of development located on certain land identified on the Acid Sulfate Soils Map of the LEP.

Woollahra DCP 2015 includes a policy on contaminated land which may restrict the development of the land. This policy is implemented when zoning or land use changes are proposed on lands which have previously been used for certain purposes. Applicants must consider Council's DCP as well as State legislation including the State Environmental Planning Policy No. 55 – Remediation of Land.

(b) adopted by any other public authority and notified to the Council for the express purpose of its adoption by that authority being referred to in planning certificates issued by the Council, that restricts the development of the land because of the likelihood of land slip, bushfire, tidal inundation, subsidence, acid sulfate soils or any other risk (other than flooding)?

No

12. FLOOD RELATED DEVELOPMENT CONTROLS INFORMATION

(a) Is development on the land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) subject to flood related development controls?

No

(b) Is development on the land or part of the land for any other purpose subject to flood related development controls?

No

Note: Words and expressions used in this item have the same meanings as in the instrument set out in the Schedule to the *Standard Instrument (Local Environmental Plans) Order 2006* .

13. LAND RESERVED FOR ACQUISITION

Does an environmental planning instrument or proposed environmental planning instrument applying to the land make provision in relation to the acquisition of the land by a public authority, as referred to in section 27 of the *Environmental Planning and Assessment Act 1979* ?

No

14. CONTRIBUTIONS PLAN

The following contributions plan may apply to the land:

- Woollahra Section 94A Development Contributions Plan 2011 (31 August 2011)
- Woollahra Section 94 Contributions Plan (31 March 2003).

15. BIODIVERSITY CERTIFIED LAND

Is the land biodiversity certified land under Part 8 of the *Biodiversity Conservation Act 2016*?

No

16. BIODIVERSITY STEWARDSHIP SITES

Is the land a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the *Biodiversity Conservation Act 2016*?

No

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17. NATIVE VEGETATION CLEARING SET ASIDES

Does the land contain a set aside area under section 60ZC of the *Local Land Services Act 2013*?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

18. BUSH FIRE PRONE LAND

Is the land to which this certificate relates bush fire prone land?

No

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19. PROPERTY VEGETATION PLANS

Is the land the subject of a property vegetation plan approved under Part 4 of the *Native Vegetation Act 2003* (and that continues in force) ?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

20. ORDERS UNDER TREES (DISPUTES BETWEEN NEIGHBOURS) ACT 2006

Has an order been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if Council has been notified of the order).

No

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21. DIRECTIONS UNDER PART 3A

Is there a direction by the Minister in force under section 75P (2) (c1) of the Act that a provision of an environmental planning instrument prohibiting or restricting the carrying out of a project or a stage of a project on the land under Part 4 of the Act does not have effect?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

22. SITE COMPATIBILITY CERTIFICATES AND CONDITIONS FOR SENIORS

Is there a current site compatibility certificate (seniors housing), of which the Council is aware *?*

No

Are there any terms of a kind referred to in clause 18(2) of *State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004* that have been imposed as a condition of consent to a development application granted after 11 October 2007?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

23. SITE COMPATIBILITY CERTIFICATES FOR INFRASTRUCTURE, SCHOOLS OR TAFE ESTABLISHMENTS

Is there a valid site compatibility certificate (infrastructure) or site compatibility certificate (schools or TAFE establishments), of which the Council is aware *?*

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

24. SITE COMPATIBILITY CERTIFICATES AND CONDITIONS FOR AFFORDABLE HOUSING

Is there a current site compatibility certificate (affordable rental housing), of which the Council is aware *?*

No

Are there any terms of a kind referred to in clause 17(1) or 37(1) of *State Environmental Planning Policy (Affordable Rental Housing) 2009* that have been imposed as a condition of consent to a development application in respect of the land?

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

25. PAPER SUBDIVISION INFORMATION

Is there a development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot?

No

26. SITE VERIFICATION CERTIFICATE

Is there a current site verification certificate of which this council is aware?

No

Note: A site verification certificate sets out the Director-General's opinion as to whether the land concerned is or is not biophysical strategic agricultural land or critical industry cluster land – see Division 3 of Part 4AA of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*

27. MATTERS ARISING UNDER THE CONTAMINATED LAND MANAGEMENT ACT 1997

(a) Is the land (or part of the land) to which this certificate relates significantly contaminated land?

No

(b) Is the land to which this certificate relates subject to a management order?

No

(c) Is the land to which this certificate relates the subject of an approved voluntary management proposal?

No

(d) Is the land to which this certificate relates subject to an ongoing maintenance order?

No

(e) Is the land to which this certificate relates the subject of a site audit statement?

No

Note: These matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate. Section 53B requires site auditors to furnish local authorities with copies of audit statements relating to site audits for the purposes of statutory requirements.

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

28. LOOSE-FILL ASBESTOS INSULATION

Does the land include any residential premises (within the meaning of Division 1A of Part 8 of the *Home Building Act 1989*) listed on the register that is required to be maintained under that Division.

No

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

29. AFFECTED BUILDING NOTICES AND BUILDING PRODUCT RECTIFICATION ORDERS

(a) Is there any affected building notice in force in respect of the land?

No

(b) Is there any building product rectification order in force in respect of the land that has not been fully complied with?

No

(c) Is there any outstanding notice of intention to make a building product rectification order?

No

Note: ***affected building notice*** has the same meaning as in Part 4 of the *Building Products (Safety) Act 2017.*

building product rectification order has the same meaning as in the *Building Products (Safety) Act 2017.*

Disclaimer: This statement is based on information supplied by a third party public authority. The accuracy of this information has not been verified by Woollahra Council and if the information is vital for the proposed end use, then it should be verified by the applicant.

Should the applicant require further information about any other matter please contact Council's Planning and Development Division.

Anne White
per:
Gary James
General Manager

APPENDIX H

GROUNDWATER BORE SEARCH

Aargus

NSW Office of Water
Work Summary

GW106478

Licence: 10BL164255
Licence Status: CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: Supply Obtained
Construct.Method: Auger - Solid Flight
Owner Type: Private

Commenced Date:
Completion Date: 26/10/2004
Final Depth: 6.00 m
Drilled Depth: 6.00 m

Contractor Name: WATER WORKS
Driller: Andrew Malcolm Chalmers
Assistant Driller:

Property: MILLER 26 BERESFORD RD ROSE BAY
GWMA: -
GW Zone: -
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.1	3 212629
Licensed:	CUMBERLAND	ALEXANDRIA	Whole Lot 3//212629

Region: 10 - Sydney South Coast
CMA Map:
River Basin: - Unknown
Area/District:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6250499.0
Easting: 338696.0
Latitude: 33°52'24.7"S
Longitude: 151°15'21.5"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure

Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	6.00	125			Auger - Solid Flight
1	1	Casing	Pvc Class 12	0.00	4.00	14	6		Driven into Hole, Glued
1	1	Opening	Slots - Horizontal	4.50	5.50	55		1	Slotted On Site, Steel - ERW, Screwed, SL: 1200.0mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.00	6.00	4.00	Unknown	2.00				00:30:00	430.00

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.00	6.00	sand	Sand	

Remarks

13/01/2010: updated from original form A

***** End of GW106478 *****

NSW Office of Water
Work Summary

GW107058

Licence: 10BL164827

Licence Status: CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: Supply Obtained
Construct.Method: Auger
Owner Type: Private

Commenced Date:
Completion Date: 25/02/2005

Final Depth: 7.00 m
Drilled Depth:

Contractor Name: WATER WORKS
Driller: Andrew Malcolm Chalmers
Assistant Driller:

Property: RAMSAY 24 BERESFORD RD ROSE BAY 2029
GWMA: -
GW Zone: -

Standing Water Level: 3.000
Salinity:
Yield: 1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.1	B//369469
Licensed:	CUMBERLAND	ALEXANDRIA	Whole Lot B//369469

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:

CMA Map: 9130-2N
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6250520.0
Easting: 338695.0

Latitude: 33°52'24.0"S
Longitude: 151°15'21.5"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unidentified Location

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	7.00	125			Auger
1	1	Casing	Pvc Class 9	-0.30	7.00	114			Driven into Hole, Screwed and Glued
1	1	Opening	Screen	6.00	7.00	55		1	Screwed, A: 0.20mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
3.00	7.00	4.00	Unknown	3.00		1.00		00:05:00	385.00

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

25/02/2005: Form A Remarks:
Only first page of form A provided, information missing
16/02/2010: updated from original form A

***** End of GW107058 *****

NSW Office of Water
Work Summary

GW107613

Licence: 10BL164350

Licence Status: CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: Supply Obtained
Construct.Method: Auger
Owner Type: Private

Commenced Date:
Completion Date: 10/01/2005

Final Depth: 7.00 m
Drilled Depth: 7.00 m

Contractor Name: WATER WORKS
Driller: Andrew Malcolm Chalmers
Assistant Driller:

Property: ISSA 28 BERESFORD RD ROSE BAY
GWMA: -
GW Zone: -

Standing Water Level: 3.000
Salinity:
Yield: 0.500

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.1	4//212629
Licensed:	CUMBERLAND	ALEXANDRIA	Whole Lot 4//212629

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:

CMA Map: 9130-2N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6250488.0
Easting: 338717.0

Latitude: 33°52'25.0"S
Longitude: 151°15'22.3"E

GS Map: -
MGA Zone: 0
Coordinate Source: GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	7.00	125			Auger
1	1	Casing	Pvc Class 9	-0.30	7.00	114			Driven into Hole, Screwed and Glued
1	1	Opening	Screen	6.00	7.00	55		1	Other, Screwed, A: 0.20mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
3.00	7.00	4.00	Unknown	3.00		0.50		00:05:00	387.00

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	7.00	7.00	sand	Sand	

Remarks

08/04/2010: updated from original form A

***** End of GW107613 *****

NSW Office of Water
Work Summary

GW109248

Licence: 10BL602531
Licence Status: CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 20/08/2008
Final Depth:
Drilled Depth:

Contractor Name: INTERTEC DRILLING SERVICES
Driller: Paul Sheehy
Assistant Driller:

Property: WAGNER 24 A VICTORIA ROAD BELLEVUE HILL 2023 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.1	1//415296
Licensed:			

Region: 10 - Sydney South Coast
CMA Map:
River Basin: - Unknown
Area/District:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6250464.0
Easting: 338262.0
Latitude: 33°52'25.6"S
Longitude: 151°15'04.6"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

Remarks

***** End of GW109248 *****

NSW Office of Water
Work Summary

GW109378

Licence: 10BL165173

Licence Status: CANCELLED

Authorised Purpose(s): TEST BORE
Intended Purpose(s): RECREATION (GROUNDWATER)

Work Type: Bore
Work Status: Test Hole
Construct.Method: Rotary Air/Mud
Owner Type: Private

Commenced Date:
Completion Date: 02/10/2008

Final Depth: 150.00 m
Drilled Depth: 150.00 m

Contractor Name: INTERTEC DRILLING SERVICES
Driller: Paul Sheehy
Assistant Driller:

Property: PRESBYTERIAN CHURCH 29-53 VICTORIA RD BELLEVUE HILL 2023 NSW
GWMA:
GW Zone:

Standing Water Level: 68.000
Salinity:
Yield: 0.300

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.1	1 1064059
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:

CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6250269.0
Easting: 338569.0

Latitude: 33°52'32.1"S
Longitude: 151°15'16.4"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	18.00	240			Rotary Air/Mud
1		Hole	Hole	18.00	150.00	158			Down Hole Hammer
1	1	Casing	Steel	-0.40	18.60	158			Driven into Hole, Welded
1	1	Casing	Pvc Class 9	0.40	89.60	140			Suspended in Clamps, Screwed and Glued

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
44.00	48.00	4.00	Unknown			0.10			101.00
94.50	100.00	5.50	Unknown			0.60			175.00
112.00	119.00	7.00	Unknown	68.00		0.30			223.00

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	13.00	13.00	SANDY CLAY	Sandy Clay	
13.00	20.00	7.00	SANDSTONE WEATHERED	Sandstone	
20.00	21.00	1.00	CLAYSTONE	Claystone	
21.00	44.00	23.00	SANDSTONE GREY	Claystone	
44.00	48.00	4.00	SANDSTONE QUARTZ	Sandstone	
48.00	53.00	5.00	SANDSTONE CLAY BANDS	Sandstone	
53.00	60.00	7.00	SANDSTONE GREY	Sandstone	
60.00	61.00	1.00	SANDSTONE CLAY BANDS	Sandstone	
61.00	66.00	5.00	SANDSTONE QUARTZ	Sandstone	
66.00	70.00	4.00	SANDSTONE GREY	Sandstone	
70.00	71.50	1.50	SHALE	Shale	
71.50	79.00	7.50	SANDSTONE GREY	Sandstone	
79.00	84.00	5.00	SANDSTONE QUARTZ	Sandstone	
84.00	86.00	2.00	SANDSTONE GREY	Sandstone	
86.00	86.50	0.50	SANDSTONE FRACTURED	Sandstone	
86.50	94.50	8.00	SANDSTONE GREY	Sandstone	
94.50	100.00	5.50	SANDSTONE QUARTZ	Sandstone	
100.00	112.00	12.00	SANDSTONE GREY	Sandstone	
112.00	119.00	7.00	SANDSTONE QUARTZ	Sandstone	
119.00	126.00	7.00	SANDSTONE GREY	Sandstone	
126.00	134.00	8.00	SANDSTONE QUARTZ	Sandstone	
134.00	142.00	8.00	SANDSTONE GREY	Sandstone	
142.00	142.50	0.50	SILTSTONE	Siltstone	
142.50	150.00	7.50	SANDSTONE GREY	Sandstone	

Remarks

02/10/2008: Previously 10BL165173

***** End of GW109378 *****

All Groundwater
find a site
- All Groundwater Map
  - North Coast Region
  - Hunter Region
  - **Greater Sydney Re...**
  - South Coast Region
  - Northwest Region
  - Central West Region
  - Southwest Region
  - Far West Region
  - Great Artesian Basin
  - Coal Basins

bandwidth ◉ high ○ low

glossary and metadata

All Groundwater » All Groundwater Map

Greater Sydney Region

bookmark this page

All data times are Eastern Standard Time

Map

Scale = 1 : 1693

APPENDIX I

METEORLOGICAL INFORMATION

Australian Government
Bureau of Meteorology

Monthly rainfall

The Monthly rainfall is the total of all available Daily rainfall for the month. Observations of Daily rainfall are nominally made at 9 am local clock time and record the total for the previous 24 hours. Rainfall includes all forms of precipiation that reach the ground, such as rain, drizzle, hail and snow.
About monthly rainfall

Station: Rose Bay (Royal Sydney Golf Club)	Number: 66098	Opened: 1928	Now: Open
	Lat: 33.88° S	Lon: 151.27° E	Elevation: 8 m

Key: Units are millimetres. *12.3* = Not quality controlled.

Period for calculating statistics: **All years** **1961-1990**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1928			150.1	141.4	111.2	180.2	190.8	53.0	7.7	37.2	5.6	23.3	
1929	17.9	406.8	148.2	199.5	326.0	56.4	102.4	105.1	36.3	272.4	90.3	41.2	1802.5
1930	160.6	11.7	127.9	112.2	112.4	269.8	156.9	44.4	14.8	54.6	17.4	161.0	1243.7
1931	57.5	41.4	131.4	223.4	77.3	108.2	285.7	8.6	117.6	23.1	111.5	88.7	1274.4
1932	8.7	128.9	117.4	138.2	90.2	38.2	62.7	54.6	209.6	28.0	87.7	100.8	1065.0
1933	201.2	5.5	103.2	196.2	107.3	58.8	73.3	12.7	67.0	99.4	129.1	117.1	1170.8
1934	78.8	211.6											
1941	84.1	56.2	44.3	84.3	48.5	69.1	41.7	102.9	57.2	70.5	31.4	24.2	714.4
1942	12.5	34.1	466.9	17.1	35.5	172.9	70.2	39.5	15.3	145.3	118.3	87.0	1214.6
1943	38.5	14.0	14.2	41.8	366.2	26.6	6.7	191.8	135.6	43.1	152.6	71.9	1103.0
1944	65.7	149.2	115.3	70.7	83.6	40.1	74.8	123.8	27.4	19.9	21.9	23.8	816.2
1945	59.9	42.5	33.4	331.4	150.1	198.7	91.1						
1947												170.2	
1948	190.8	65.3	113.6	39.2			40.3	11.8	70.1				
1949	237.3	123.9	106.3	38.5	118.9	317.0	67.0	128.4	246.3				
1979	116.4	4.3	234.8	39.6	138.1	160.8	34.0	7.6	22.1	55.2	83.6	0.0	896.5
1980	112.0	87.9	65.8	43.0	112.7	64.8	71.6	14.8	7.6	27.7	55.9	43.9	707.7
1981	53.8	226.0	46.7	106.7	125.7	62.2	50.8	10.2	0.0	162.1	92.8	70.2	1007.2
1982	66.3	0.0	186.8	4.6	42.9	203.7	182.9	24.0	228.2	46.6	27.5	27.3	1040.8
1983	47.3	57.0	256.2	297.7	191.7	88.9	44.3	86.4	42.6	162.4	35.8	82.7	1393.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1984	213.4	135.3	231.5	109.7	177.7	73.2	171.2	19.9	43.4	62.3	420.8	109.0	1767.4
1985	6.5	51.0	79.7	337.0	123.5	148.9	121.4	22.9	93.5	181.6	78.5	77.5	1322.0
1986	245.0	104.0	7.0	78.0	62.5	13.0	29.0	392.0	34.5	34.0	121.0	8.9	1128.9
1987	75.5	25.0	109.6	75.5	54.2	75.0	91.0	169.0	0.0	202.9	162.5	72.9	1113.1
1988	271.3	95.5	108.8	453.3	129.9	131.6	97.0	74.2	121.4	0.2	165.6	125.6	1774.4
1989	174.4	74.6	152.1	370.8	167.7	279.5	17.9	52.4	1.0	21.8	59.1	143.7	1515.0
1990	73.2	613.8	163.1	335.3	150.1	35.4	104.0	178.0	220.6	42.8	38.2	75.7	2030.2
1991	102.2	53.6	23.8	40.8	132.2	323.0	128.8	5.0	22.1	17.2	39.8	212.8	1101.3
1992	117.8	370.0	94.0	94.3	89.9	116.0	20.2	61.0	31.4	138.8	152.2	177.2	1462.8
1993	80.0	73.0	88.7	72.6	23.0	86.2	110.8	79.0	106.0	64.0	84.6	34.8	902.7
1994	46.8	99.6	165.2	96.2	37.2	73.7	154.2	26.6	40.6	72.6	53.0	69.8	935.5
1995	82.2	100.4	173.8	26.2	210.0	128.4	8.6	0.0	218.8	42.2	133.0	85.8	1209.4
1996	120.8	43.2	34.8	67.2	172.2	204.6	54.6	101.0	102.2	27.4	95.0	34.6	1057.6
1997	156.8	120.8	17.8	17.2	267.8	151.4	276.8	35.0	139.4	30.0	47.0	31.0	1291.0
1998	94.7	37.8	35.6	251.2	235.2	135.2	93.2	529.6	48.4	63.2	59.4	98.4	1681.9
1999	156.4	152.6	41.8	310.4	95.2	95.8	174.0	123.0	25.2	159.0	80.8	97.4	1511.6
2000	41.5	59.4	238.6	69.2	41.0	45.2	34.8	33.2	33.4	67.4	122.6	51.2	837.5
2001	169.8	76.2	105.0	133.2	432.8	35.2	181.6	98.6	36.0	40.0	99.8	72.8	1481.0
2002	89.6	396.6	83.4	64.8	123.0	47.6	21.8	66.6	57.2	8.6	31.6	82.0	1072.8
2003	7.8	47.0	193.6	187.0	333.2	50.8	118.0	53.4	8.9	82.2	88.6	59.2	1229.7
2004	57.4	119.8	73.4	20.0	12.8	55.8	66.0	153.2	89.0	213.2	70.0	86.0	1016.6
2005	54.0	141.4	113.2	37.0	78.2	80.4	81.2	2.0	49.0	65.4	116.6	25.6	844.0
2006	129.0	28.0	55.6	17.6	65.8	238.0	233.8	70.6	133.6	22.4	50.4	104.8	1149.6
2007	50.0	92.4	53.0	386.8	12.2	411.8	50.4	131.4	51.2	21.0	165.2	87.2	1512.6
2008	40.4	289.0	65.4	143.4	11.2	135.0	131.6	77.8	83.8	70.2	64.2	61.6	1173.6
2009	30.2	102.8	67.2	161.8	197.2	115.8	70.6	6.0	11.2	143.8	17.2	87.2	1011.0
2010	47.4	234.8	41.2	43.8	247.4	163.0	144.2	36.6	44.4	101.0	126.4	121.8	1352.0
2011	73.8	9.8	220.0	177.4	147.8	71.0	278.0	74.8	73.8	36.8	145.0	84.4	1392.6
2012	189.6	180.4	211.2	174.0	30.0	273.8	68.6	22.4	33.6	42.2	47.4	*19.6*	*1292.8*
2013	*152.0*	*109.8*	*54.2*	*208.4*	*77.6*	*348.4*	*51.8*	*19.4*	*80.2*	25.0		56.6	
2014	28.6	51.2	159.2	154.4	32.4	90.5	16.6	236.7	79.0	90.0	26.6	87.8	1053.0
2015	165.4	77.2	69.1	342.2	138.7	148.4	61.8	91.0	134.2	35.2	116.2	180.8	1560.2
2016	238.4	34.2	178.2		10.5	280.4	94.2	121.5	91.8				

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017	23.9	225.4	*230.0*	80.3	42.9	*202.2*	*27.7*	*24.5*	*5.3*	*41.2*	*99.7*	*51.4*	*1054.5*

1928 ▼ Go View a year of daily data

Summary statistics for all years

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	100.3	117.2	119.3	142.4	125.5	136.9	96.8	82.5	71.6	73.2	90.2	79.8	1223.7
Lowest	6.5	0.0	7.0	4.6	10.5	13.0	6.7	0.0	0.0	0.2	5.6	0.0	707.7
5th %ile	10.8	7.9	21.1	17.4	12.5	35.3	17.3	5.5	3.2	18.1	18.8	21.1	821.5
10th %ile	24.4	15.1	34.9	26.2	30.0	40.1	22.4	8.6	7.7	21.6	27.1	24.1	870.2
Median	79.4	82.6	107.6	106.7	112.4	115.8	74.1	54.6	49.0	50.6	84.6	77.5	1172.2
90th %ile	200.2	233.9	229.0	335.3	247.4	279.5	182.8	169.0	139.4	162.2	152.4	147.2	1621.1
95th %ile	237.8	382.0	236.5	356.5	329.6	320.0	253.1	214.2	219.7	195.4	164.4	174.4	1772.6
Highest	271.3	613.8	466.9	453.3	432.8	411.8	285.7	529.6	246.3	272.4	420.8	212.8	2030.2

Data within the table which are in italics represent observations which have not been fully quality controlled, a process which may take a number of months to complete. While these data may be correct, you should exercise caution in their use.

Gaps occur in the table where there are missing valid daily observations within the month. This is frequently associated with the observer being unavailable (where observations are undertaken manually), a failure in the observing equipment, or when an event has produced suspect data.

Product Code: IDCJAC0001 reference: 34955047

Page created: Tue 30 Jan 2018 13:26:27 PM EST

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APPENDIX J

BOREHOLE LOGS

Aargus

BOREHOLE NUMBER BH1

Aargus Pty Ltd
446 Parramatta Road
Petersham NSW 2049
Telephone: 1300 137 038

CLIENT Impact Group Pty Ltd
PROJECT NAME DSI
PROJECT NUMBER ES7155/2
PROJECT LOCATION 53 Victoria Rd, Bellevue Hill NSW

DATE STARTED 11/3/18 **COMPLETED** 11/3/18
R.L. SURFACE
DATUM
DRILLING CONTRACTOR
SLOPE 90°
BEARING ---
EQUIPMENT Hand Auger
HOLE LOCATION
HOLE SIZE 100mm
LOGGED BY LC
CHECKED BY MK
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
DT						Concrete		D		No hydrocarbon odour and staining observed, No Fibro-cement fragments noted, PID = 0.0ppm
HA			0.5			Fill: Sand, fine to medium grained, light grey/brown		D		
			1.0		SW	SAND, medium grained, brown/yellow		M		

Borehole BH1 terminated at 1m

BOREHOLE NUMBER BH2

Aargus Pty Ltd
446 Parramatta Road
Petersham NSW 2049
Telephone: 1300 137 038

CLIENT Impact Group Pty Ltd
PROJECT NAME DSI
PROJECT NUMBER ES7155/2
PROJECT LOCATION 53 Victoria Rd, Bellevue Hill NSW

DATE STARTED 11/3/18 **COMPLETED** 11/3/18 **R.L. SURFACE** **DATUM**
DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---
EQUIPMENT Hand Auger **HOLE LOCATION**
HOLE SIZE 100mm **LOGGED BY** LC **CHECKED BY** MK
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
DT						Concrete		D		No hydrocarbon odour and staining observed, No Fibro-cement fragments noted, PID = 0.0ppm
HA			0.5			Fill: Sand, fine to medium grained, light grey/brown		D		
			1.0		SW	SAND, medium grained, brown/yellow		M		

Borehole BH2 terminated at 1m

Aargus Pty Ltd
446 Parramatta Road
Petersham NSW 2049
Telephone: 1300 137 038

BOREHOLE NUMBER BH3

CLIENT Impact Group Pty Ltd
PROJECT NAME DSI
PROJECT NUMBER ES7155/2
PROJECT LOCATION 53 Victoria Rd, Bellevue Hill NSW

DATE STARTED 11/3/18 **COMPLETED** 11/3/18
R.L. SURFACE
DATUM
DRILLING CONTRACTOR
SLOPE 90°
BEARING ---
EQUIPMENT Hand Auger
HOLE LOCATION
HOLE SIZE 100mm
LOGGED BY LC
CHECKED BY MK
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
DT						Concrete		D		No hydrocarbon odour and staining observed, No Fibro-cement fragments noted, PID = 0.0ppm
HA						Fill: Sand, fine to medium grained, light grey/brown		D		
			0.5		SW	SAND, medium grained, brown/yellow		M		
			1.0							

Borehole BH3 terminated at 1m

Aargus Pty Ltd
446 Parramatta Road
Petersham NSW 2049
Telephone: 1300 137 038

BOREHOLE NUMBER BH4

CLIENT Impact Group Pty Ltd **PROJECT NAME** DSI
PROJECT NUMBER ES7155/2 **PROJECT LOCATION** 53 Victoria Rd, Bellevue Hill NSW

DATE STARTED 11/3/18 **COMPLETED** 11/3/18 **R.L. SURFACE** **DATUM**
DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---
EQUIPMENT Hand Auger **HOLE LOCATION**
HOLE SIZE 100mm **LOGGED BY** LC **CHECKED BY** MK
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
DT						Concrete		D		No hydrocarbon odour and staining observed, No Fibro-cement fragments noted, PID = 0.0ppm
HA						Fill: Sand, fine to medium grained, light grey/brown	D1/SS1	D		
			0.5		SW	SAND, medium grained, brown/yellow		M		
			1.0							

Borehole BH4 terminated at 1m

Aargus Pty Ltd
446 Parramatta Road
Petersham NSW 2049
Telephone: 1300 137 038

BOREHOLE NUMBER BH5

CLIENT Impact Group Pty Ltd
PROJECT NAME DSI
PROJECT NUMBER ES7155/2
PROJECT LOCATION 53 Victoria Rd, Bellevue Hill NSW

DATE STARTED 11/3/18 **COMPLETED** 11/3/18
R.L. SURFACE
DATUM
DRILLING CONTRACTOR
SLOPE 90°
BEARING ---
EQUIPMENT Hand Auger
HOLE LOCATION
HOLE SIZE 100mm
LOGGED BY LC
CHECKED BY MK
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
DT						Concrete		D		No hydrocarbon odour and staining observed, No Fibro-cement fragments noted, PID = 0.0ppm
HA						Fill: Sand, fine to medium grained, light grey/brown		D		
			0.5		SW	SAND, medium grained, brown/yellow		M		
			1.0							

Borehole BH5 terminated at 1m

Aargus Pty Ltd
446 Parramatta Road
Petersham NSW 2049
Telephone: 1300 137 038

BOREHOLE NUMBER BH6

CLIENT Impact Group Pty Ltd
PROJECT NAME DSI
PROJECT NUMBER ES7155/2
PROJECT LOCATION 53 Victoria Rd, Bellevue Hill NSW

DATE STARTED 11/3/18 **COMPLETED** 11/3/18 **R.L. SURFACE** **DATUM**
DRILLING CONTRACTOR **SLOPE** 90° **BEARING** ---
EQUIPMENT Hand Auger **HOLE LOCATION**
HOLE SIZE 100mm **LOGGED BY** LC **CHECKED BY** MK
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
DT						Concrete		D		No hydrocarbon odour and staining observed, No Fibro-cement fragments noted, PID = 0.0ppm
HA						Fill: Sand, fine to medium grained, light grey/brown		D		
			0.5		SW	SAND, medium grained, brown/yellow		M		
			1.0							

Borehole BH6 terminated at 1m

APPENDIX K

FIELD RECORD FORMS AND CALIBRATION CERTIFICATES

Aargus

Site Assessment
Daily Worksheet Record

Aargus

Project Name:	DSI			Project No: ES 7155/2	
Client Name:	Impact Group			Fieldwork Date: 11/03/2018	
Site Address:	53 Victoria Rd, Bellevue Hill				
Site Contact:				Phone:	
Aargus Field Staff:	SP/LL			Phone:	
Site Safety Induction Required?	Yes	No	(circle)	Date of Induction:	
Meteorological Data:				Station:	
Weather	Rainfall (mm)	Wind Direction	Wind Speed	Temp °C	Humidity
Sunny				25	
Site Observations:				Whole Site / Part Site (circle)	
Stormwater Controls		Traffic Controls		Silt Fencing	
Plant & Equipment Onsite		Exclusion Zones		PPE Required	
Odours Present		Odour Suppression		Staining Present	
No		No		No	
USTs / ASTs present		Hotspots present		Stockpiles present	
No		No		No	

Site Observations	Location & Comments
	The site is used as cafe
	the site is fully covered by concrete
	~~Bounded~~ Bounded by a concrete pathway
	then grass covered playground,
	and garden bed.
	No staining
	No surface standing water

Soil Sampling

Aargus

Sample No.	Depth (m)	Fill or Natural	Material Description	PID Reading (ppm)	Hazardous Gas Comments
BH1	0.4-0.5	F		0	
BH1	0.6-0.7	N		0	
BH2	0.4-0.5	F		0	
BH2	0.6-0.7	N		0	
BH3	0.2-0.3	F		0	
BH3	0.4-0.5	N		0	
BH4	0.2-0.3	F		0	
BH4	0.4-0.5	N		0	
BH5	0.2-0.3	F		0	
BH5	0.4-0.5	N		0	
BH6	0.2-0.3	F		0	
BH6	0.4-0.5	N		0	
D1		F		0	
SS1		F		0	

Aargus Pty Ltd
PID Certification Report
Minirae 2000 PID

This PID has been performance checked/calibrated as follows:

- ☑ Calibrate 0.0ppm — Reading 0.0 ppm
- ☑ Calibrate 99.9ppm isobutylene — Reading 92.9 ppm
- ☑ Charged
- ☑ Filter check
- ☑ Lamp check

Date: 11/03/2018
Checked by: SP/ LC,
Signature: Z Len

Please check that the following items are contained within the PID Equipment Register

- ☑ PID carry. case
- ☑ Model Minirae 2000 PID meter
- ☑ Charger and adapter
- ☑ Fresh air filter
- ☑ Calibration tube
- ☑ Sample Probe
- ☑ Water Filter Trap
- ☑ Computer cable connector
- ☑ 2 CD software and USB memory.
- ☑ Regulator for small cylinder

Serial Number: 87148

APPENDIX L

REGULATORY CRITERIA

Aargus

Table 1: CT1 & CT2 values for classifying waste by chemical assessment without the TCLP test

For disposal requirements for organic and inorganic chemical contaminants not listed below, contact the EPA. Aluminium, barium, boron, chromium (0 and III oxidation states), cobalt, copper, iron, manganese, vanadium and zinc have not been listed with values in this table and need not be tested for.

	Maximum values of *specific contaminant concentration* (SCC) for classification without TCLP		
	General solid waste[1]	**Restricted solid waste**	
Contaminant	**CT1 (mg/kg)**	**CT2 (mg/kg)**	**CAS Registry Number**
Arsenic	100	400	
Benzene	10	40	71-43-2
Benzo(a)pyrene[2]	0.8	3.2	50-32-8
Beryllium	20	80	
Cadmium	20	80	
Carbon tetrachloride	10	40	56-23-5
Chlorobenzene	2,000	8,000	108-90-7
Chloroform	120	480	67-66-3
Chlorpyrifos	4	16	2921-88-2
Chromium (VI)[3]	100	400	
m-Cresol	4,000	16,000	108-39-4
o-Cresol	4,000	16,000	95-48-7
p-Cresol	4,000	16,000	106-44-5
Cresol (total)	4,000	16,000	1319-77-3
Cyanide (amenable)[4]	70	280	
Cyanide (total)	320	1,280	
2,4-D	200	800	94-75-7
1,2-Dichlorobenzene	86	344	95-50-1
1,4-Dichlorobenzene	150	600	106-46-7
1,2-Dichloroethane	10	40	107-06-2
1,1-Dichloroethylene	14	56	75-35-4
Dichloromethane	172	688	75-09-2
2,4-Dinitrotoluene	2.6	10.4	121-14-2
Endosulfan[5]	60	240	See below[5]
Ethylbenzene	600	2,400	100-41-4
Fluoride	3,000	12,000	
Fluroxypyr	40	160	69377-81-7
Lead	100	400	

Contaminant	Maximum values of *specific contaminant concentration* (SCC) for classification without TCLP		CAS Registry Number
	General solid waste[1]	Restricted solid waste	
	CT1 (mg/kg)	CT2 (mg/kg)	
Mercury	4	16	
Methyl ethyl ketone	4,000	16,000	78-93-3
Moderately harmful pesticides[6] (total)	250	1,000	See below[6]
Molybdenum	100	400	
Nickel	40	160	
Nitrobenzene	40	160	98-95-3
C6–C9 petroleum hydrocarbons[7]	650	2,600	
C10–C36 petroleum hydrocarbons[7]	10,000	40,000	
Phenol (non-halogenated)	288	1,152	108-95-2
Picloram	60	240	1918-02-1
Plasticiser compounds[8]	20	80	See below[8]
Polychlorinated biphenyls[9]	<50	<50	1336-36-3
Polycyclic aromatic hydrocarbons (total)[10]	200	800	
Scheduled chemicals[11]	<50	<50	
Selenium	20	80	
Silver	100	400	
Styrene (vinyl benzene)	60	240	100-42-5
Tebuconazole	128	512	107534-96-3
1,2,3,4-Tetrachlorobenzene	10	40	634-66-2
1,1,1,2-Tetrachloroethane	200	800	630-20-6
1,1,2,2-Tetrachloroethane	26	104	79-34-5
Tetrachloroethylene	14	56	127-18-4
Toluene	288	1,152	108-88-3
1,1,1-Trichloroethane	600	2,400	71-55-6
1,1,2-Trichloroethane	24	96	79-00-5
Trichloroethylene	10	40	79-01-6
2,4,5-Trichlorophenol	8,000	32,000	95-95-4
2,4,6-Trichlorophenol	40	160	88-06-2
Triclopyr	40	160	55335-06-3

	Maximum values of *specific contaminant concentration* (SCC) for classification without TCLP		
	General solid waste[1]	Restricted solid waste	
Contaminant	CT1 (mg/kg)	CT2 (mg/kg)	CAS Registry Number
Vinyl chloride	4	16	75-01-4
Xylenes (total)	1,000	4,000	1330-20-7

Notes

1. Values are the same for general solid waste (putrescible) and general solid waste (non-putrescible).
2. There may be a need for the laboratory to concentrate the sample to achieve the TCLP limit value for benzo(a)pyrene with confidence.
3. These limits apply to chromium in the +6 oxidation state only.
4. Analysis for cyanide (amenable) is the established method for assessing potentially leachable cyanide. The EPA may consider other methods if it can be demonstrated that these methods yield the same information.
5. Endosulfan (CAS Registry Number 115-29-7) means the total of Endosulfan I (CAS Registry Number 959-98-8), Endosulfan II (CAS Registry Number 891-86-1) and Endosulfan sulfate (CAS Registry Number 1031-07-8).
6. The following moderately harmful pesticides are to be included in the total values specified:

Moderately harmful pesticides (total)			
Name	**CAS Registry Number**	**Name**	**CAS Registry Number**
Atrazine	1912-24-9	Imidacloprid	138261-41-3
Azoxystrobin	131860-33-8	Indoxacarb	173584-44-6
Bifenthrin	82657-04-3	Malathion (Maldison)	121-75-5
Brodifacoum	56073-10-0	Metalaxyl	57837-19-1
Carboxin	5234-68-4	Metalaxyl-M	70630-17-0
Copper naphthenate	1338-02-9	Methidathion	950-37-8
Cyfluthrin	68359-37-5	3-Methyl-4-chlorophenol	59-50-7
Cyhalothrin	68085-85-8	Methyl chlorpyrifos	5598-13-0
Cypermethrin	52315-07-08	N-Methyl pyrrolidone	872-50-4
Deltamethrin	52918-63-5	2-octylthiazol-3-one	26530-20-1
Dichlofluanid	1085-98-9	Oxyfluorfen	42874-03-3
Dichlorvos	62-73-7	Paraquat dichloride	1910-42-5
Difenoconazole	119446-68-3	Parathion methyl	298-00-0
Dimethoate	60-51-5	Permethrin	52645-53-1
Diquat dibromide	85-00-7	Profenofos	41198-08-7
Emamectin benzoate	137515-75-4 & 155569-91-8	Prometryn	7287-19-6
Ethion	563-12-2	Propargite	2312-35-8
Fenthion	55-38-9	Pentachloronitrobenzene (Quintozene)	82-68-8
Fenitrothion	122-14-5	Simazine	122-34-9
Fipronil	120068-37-3	Thiabendazole	148-79-8

Moderately harmful pesticides (total)			
Name	**CAS Registry Number**	**Name**	**CAS Registry Number**
Fluazifop-P-butyl	79241-46-6	Thiamethoxam	153719-23-4
Fludioxonil	131341-86-1	Thiodicarb	59669-26-0
Glyphosate	1071-83-6	Thiram	137-26-8

7. Approximate range of petroleum hydrocarbon fractions: petrol C6–C9, kerosene C10–C18, diesel C12–C18, and lubricating oils above C18. Laboratory results are reported as four different fractions: C6–C9, C10–C14, C15–C28 and C29–C36. The results of total petroleum hydrocarbons (TPH) (C10–C36) analyses are reported as a sum of the relevant three fractions. Please note that hydrocarbons are defined as molecules that only contain carbon and hydrogen atoms. Prior to TPH (C10–C36) analysis, clean-up may be necessary to remove non-petroleum hydrocarbon compounds. Where the presence of other materials that will interfere with the analysis may be present, such as oils and fats from food sources, you are advised to treat the extract that has been solvent exchanged to hexane with silica gel as described in *USEPA Method 1664A* (USEPA 2000).
8. Plasticiser compounds means the total of di-2-ethyl hexyl phthalate (CAS Registry Number 117-81-7) and di-2-ethyl hexyl adipate (CAS Registry Number 103-23-1) contained within a waste.
9. Polychlorinated biphenyls must be managed in accordance with the EPA's polychlorinated biphenyl (PCB) chemical control order 1997, which is available on the EPA website at www.epa.nsw.gov.au/resources/pesticides/pcbcco1997.pdf.
10. The following polycyclic aromatic hydrocarbons (PAHs) are assessed as the total concentration of 16 USEPA Priority Pollutant PAHs, as follows:

Polycyclic aromatic hydrocarbons (total)			
PAH name	**CAS Registry Number**	**PAH name**	**CAS Registry Number**
Acenaphthene	83-32-9	Chrysene	218-01-9
Acenaphthylene	208-96-8	Dibenzo(a,h)anthracene	53-70-3
Anthracene	120-12-7	Fluoranthene	206-44-0
Benzo(a)anthracene	56-55-3	Fluorene	86-73-7
Benzo(a)pyrene	50-32-8	Indeno(1,2,3-cd)pyrene	193-39-5
Benzo(b)fluoranthene	205-99-2	Naphthalene	91-20-3
Benzo(ghi)perylene	191-24-2	Phenanthrene	85-01-8
Benzo(k)fluoranthene	207-08-9	Pyrene	129-00-0

11. Scheduled chemicals must be managed in accordance with the EPA's scheduled chemical wastes chemical control order 2004, which is available on the EPA website at www.epa.nsw.gov.au/resources/pesticides/scwcco2004.pdf.

    The following scheduled chemicals are to be included in the total values specified:

Scheduled chemicals (total)			
Name	**CAS Registry Number**	**Name**	**CAS Registry Number**
Aldrin	309-00-2	Heptachlor	76-44-8
Alpha-BHC	319-84-6	Heptachlor epoxide	1024-57-3
Beta-BHC	319-85-7	Hexachlorobenzene	118-74-1
Gamma-BHC (Lindane)	58-89-9	Hexachlorophene	70-30-4
Delta-BHC	319-86-8	Isodrin	465-73-6

Scheduled chemicals (total)			
Name	**CAS Registry Number**	**Name**	**CAS Registry Number**
Chlordane	57-74-9	Pentachlorobenzene	608-93-5
DDD	72-54-8	Pentachloronitrobenzene	82-68-8
DDE	72-55-9	Pentachlorophenol	87-86-5
DDT	50-29-3	1,2,4,5-Tetrachlorobenzene	95-94-3
Dieldrin	60-57-1	2,3,4,6-Tetrachlorophenol	58-90-2
Endrin	72-20-8	1,2,4-Trichlorobenzene	120-82-1
Endrin aldehyde	7421-93-4	2,4,5-Trichlorophenoxyacetic acid, salts and esters	93-76-5

Table 2: TCLP and SCC values for classifying waste by chemical assessment

For disposal requirements for organic and inorganic chemical contaminants not listed below, contact the EPA. Aluminium, barium, boron, chromium (0 and III oxidation states), cobalt, copper, iron, manganese, vanadium and zinc have not been listed with values in this table and need not be tested for.

	Maximum values for *leachable concentration* and *specific contaminant concentration* when used together				
	General solid waste[1]		Restricted solid waste		
	Leachable concentration	Specific contaminant concentration	Leachable concentration	Specific contaminant concentration	
Contaminant	**TCLP1 (mg/L)**	**SCC1 (mg/kg)**	**TCLP2 (mg/L)**	**SCC2 (mg/kg)**	**CAS Registry Number**
Arsenic	5.0[2]	500	20	2,000	
Benzene	0.5[2]	18	2	72	71-43-2
Benzo(a)pyrene[3]	0.04[4]	10	0.16	23	50-32-8
Beryllium	1.0[5]	100	4	400	
Cadmium	1.0[2]	100	4	400	
Carbon tetrachloride	0.5[2]	18	2	72	56-23-5
Chlorobenzene	100[2]	3,600	400	14,400	108-90-7
Chloroform	6[2]	216	24	864	67-66-3
Chlorpyrifos	0.2	7.5	0.8	30	2921-88-2
Chromium (VI)[6]	5[2]	1,900	20	7,600	
m-Cresol	200[2]	7,200	800	28,800	108-39-4
o-Cresol	200[2]	7,200	800	28,800	95-48-7
p-Cresol	200[2]	7,200	800	28,800	106-44-5
Cresol (total)	200[2]	7,200	800	28,800	1319-77-3
Cyanide (amenable)[7, 8]	3.5[7]	300	14	1,200	
Cyanide (total)[7]	16[7]	5,900	64	23,600	
2,4-D	10[2]	360	40	1,440	94-75-7
1,2-Dichlorobenzene	4.3[2]	155	17.2	620	95-50-1
1,4-Dichlorobenzene	7.5[2]	270	30	1,080	106-46-7
1,2-Dichloroethane	0.5[2]	18	2	72	107-06-2
1,1-Dichloroethylene	0.7[2]	25	2.8	100	75-35-4
Dichloromethane	8.6[2]	310	34.4	1,240	75-09-2
2,4-Dinitrotoluene	0.13[2]	4.68	0.52	18.7	121-14-2
Endosulfan[9]	3	108	12	432	See below[9]

Contaminant	Maximum values for *leachable concentration* and *specific contaminant concentration* when used together				CAS Registry Number
	General solid waste[1]		Restricted solid waste		
	Leachable concentration	Specific contaminant concentration	Leachable concentration	Specific contaminant concentration	
	TCLP1 (mg/L)	SCC1 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)	
Ethylbenzene	30[10]	1,080	120	4,320	100-41-4
Fluoride	150[10]	10,000	600	40,000	
Fluroxypyr	2	75	8	300	69377-81-7
Lead	5[2]	1,500	20	6,000	
Mercury	0.2[2]	50	0.8	200	
Methyl ethyl ketone	200[2]	7,200	800	28,800	78-93-3
Moderately harmful pesticides[11] (total)	N/A[12]	250	N/A[12]	1,000	See below[11]
Molybdenum	5[10]	1,000	20	4,000	
Nickel	2[10]	1,050	8	4,200	
Nitrobenzene	2[2]	72	8	288	98-95-3
C6–C9 petroleum hydrocarbons[13]	N/A[12]	650	N/A[12]	2,600	
C10–C36 petroleum hydrocarbons[13]	N/A[12]	10,000	N/A[12]	40,000	
Phenol (non-halogenated)	14.4[14]	518	57.6	2,073	108-95-2
Picloram	3	110	12	440	1918-02-1
Plasticiser compounds[15]	1	600	4	2,400	See below[15]
Polychlorinated biphenyls[12]	N/A[12]	< 50	N/A[12]	< 50	1336-36-3
Polycyclic aromatic hydrocarbons (total)[16]	N/A[12]	200	N/A[12]	800	
Scheduled chemicals[17]	N/A[12]	< 50	N/A[12]	< 50	See below[17]
Selenium	1[2]	50	4	200	
Silver	5.0[2]	180	20	720	
Styrene (vinyl benzene)	3[10]	108	12	432	100-42-5
Tebuconazole	6.4	230	25.6	920	107534-96-3
1,2,3,4-Tetrachlorobenzene	0.5	18	2	72	634-66-2

Contaminant	Maximum values for *leachable concentration* and *specific contaminant concentration* when used together				CAS Registry Number
	General solid waste[1]		Restricted solid waste		
	Leachable concentration	Specific contaminant concentration	Leachable concentration	Specific contaminant concentration	
	TCLP1 (mg/L)	SCC1 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)	
1,1,1,2-Tetrachloroethane	10[2]	360	40	1,440	630-20-6
1,1,2,2-Tetrachloroethane	1.3[2]	46.8	5.2	187.2	79-34-5
Tetrachloroethylene	0.7[2]	25.2	2.8	100.8	127-18-4
Toluene	14.4[14]	518	57.6	2,073	108-88-3
1,1,1-Trichloroethane	30[2]	1,080	120	4,320	71-55-6
1,1,2-Trichloroethane	1.2[2]	43.2	4.8	172.8	79-00-5
Trichloroethylene	0.5[2]	18	2	72	79-01-6
2,4,5-Trichlorophenol	400[2]	14,400	1,600	57,600	95-95-4
2,4,6-Trichlorophenol	2[2]	72	8	288	88-06-2
Triclopyr	2	75	8	300	55335-06-3
Vinyl chloride	0.2[2]	7.2	0.8	28.8	75-01-4
Xylenes (total)	50[18]	1,800	200	7,200	1330-20-7

Notes

1. Values are the same for general solid waste (putrescible) and general solid waste (non- putrescible).
2. See *Hazardous Waste Management System: Identification and Listing of Hazardous Waste – Toxicity Characteristics Revisions, Final Rule* (USEPA 2012b) for TCLP levels.
3. There may be a need for the laboratory to concentrate the sample to achieve the TCLP limit value for benzo(a)pyrene with confidence.
4. Calculated from *Hazardous Waste: Identification and Listing* (USEPA 2012a).
5. Calculated from 'Beryllium' in *The Health Risk Assessment and Management of Contaminated Sites* (DiMarco & Buckett 1996).
6. These limits apply to chromium in the +6 oxidation state only.
7. Taken from the *Land Disposal Restrictions for Newly Identified and Listed Hazardous Wastes and Hazardous Soil: Proposed Rule* (USEPA 1993).
8. Analysis for cyanide (amenable) is the established method used to assess the potentially leachable cyanide. The EPA may consider other methods if it can be demonstrated that these methods yield the same information.
9. Endosulfan (CAS Registry Number 115-29-7) means the total of endosulfan I (CAS Registry Number 959-98-8), endosulfan II (CAS Registry Number 891-86-1) and endosulfan sulfate (CAS Registry Number 1031-07-8).
10. Calculated from *Australian Drinking Water Guidelines* (NHMRC 2011).
11. The following moderately harmful pesticides are to be included in the total values specified:

Moderately harmful pesticides (total)			
Name	**CAS Registry Number**	**Name**	**CAS Registry Number**
Atrazine	1912-24-9	Imidacloprid	138261-41-3
Azoxystrobin	131860-33-8	Indoxacarb	173584-44-6
Bifenthrin	82657-04-3	Malathion (Maldison)	121-75-5
Brodifacoum	56073-10-0	Metalaxyl	57837-19-1
Carboxin	5234-68-4	Metalaxyl-M	70630-17-0
Copper naphthenate	1338-02-9	Methidathion	950-37-8
Cyfluthrin	68359-37-5	3-Methyl-4-chlorophenol	59-50-7
Cyhalothrin	68085-85-8	Methyl chlorpyrifos	5598-13-0
Cypermethrin	52315-07-08	N-Methyl pyrrolidone	872-50-4
Deltamethrin	52918-63-5	2-octylthiazol-3-one	26530-20-1
Dichlofluanid	1085-98-9	Oxyfluorfen	42874-03-3
Dichlorvos	62-73-7	Paraquat dichloride	1910-42-5
Difenoconazole	119446-68-3	Parathion methyl	298-00-0
Dimethoate	60-51-5	Permethrin	52645-53-1
Diquat dibromide	85-00-7	Profenofos	41198-08-7
Emamectin benzoate	137515-75-4 & 155569-91-8	Prometryn	7287-19-6
Ethion	563-12-2	Propargite	2312-35-8
Fenthion	55-38-9	Pentachloronitrobenzene (Quintozene)	82-68-8
Fenitrothion	122-14-5	Simazine	122-34-9
Fipronil	120068-37-3	Thiabendazole	148-79-8
Fluazifop-P-butyl	79241-46-6	Thiamethoxam	153719-23-4
Fludioxonil	131341-86-1	Thiodicarb	59669-26-0
Glyphosate	1071-83-6	Thiram	137-26-8

12. No TCLP analysis is required. Moderately harmful pesticides, petroleum hydrocarbons, polychlorinated biphenyls, polycyclic aromatic hydrocarbons and scheduled chemicals are assessed using SCC1 and SCC2.

    Polychlorinated biphenyls must be managed in accordance with the EPA's polychlorinated biphenyl (PCB) chemical control order 1997, which is available on the EPA website at www.epa.nsw.gov.au/resources/pesticides/pcbcco1997.pdf.

13. Approximate range of petroleum hydrocarbon fractions: petrol C6–C9, kerosene C10–C18, diesel C12–C18, and lubricating oils above C18. Laboratory results are reported as four different fractions: C6–C9, C10–C14, C15–C28 and C29–C36. The results of total petroleum hydrocarbons (C10–C36) analyses are reported as a sum of the relevant three fractions. Please note that hydrocarbons are defined as molecules that only contain carbon and hydrogen atoms. Prior to TPH (C10–C36) analysis, clean-up may be necessary to remove non-petroleum hydrocarbon compounds. Where the presence of other materials that will interfere with the analysis may be present, such as oils and fats from food sources, you are advised to treat the extract that has been solvent exchanged to hexane with silica gel as described in USEPA *Method 1664A* (USEPA 2000).

14. Proposed level for phenol and toluene in *Hazardous Waste Management System: Identification and Listing of Hazardous Waste – Toxicity Characteristics Revisions, Final Rule* (USEPA 2012b).

15. Plasticiser compounds means the total of di-2-ethyl hexyl phthalate (CAS Registry Number 117-81-7) and di-2-ethyl hexyl adipate (CAS Registry Number 103-23-1) contained within a waste.
16. The following polycyclic aromatic hydrocarbons are assessed as the total concentration of 16 USEPA Priority Pollutant PAHs, as follows:

Polycyclic aromatic hydrocarbons (total)			
PAH name	**CAS Registry Number**	**PAH name**	**CAS Registry Number**
Acenaphthene	83-32-9	Chrysene	218-01-9
Acenaphthylene	208-96-8	Dibenzo(a,h)anthracene	53-70-3
Anthracene	120-12-7	Fluoranthene	206-44-0
Benzo(a)anthracene	56-55-3	Fluorene	86-73-7
Benzo(a)pyrene	50-32-8	Indeno(1,2,3-cd)pyrene	193-39-5
Benzo(b)fluoranthene	205-99-2	Naphthalene	91-20-3
Benzo(ghi)perylene	191-24-2	Phenanthrene	85-01-8
Benzo(k)fluoranthene	207-08-9	Pyrene	129-00-0

17. Scheduled chemicals must be managed in accordance with the EPA's scheduled chemical wastes chemical control order 2004, which is available on the EPA website at www.epa.nsw.gov.au/resources/pesticides/scwcco2004.pdf.

    The following scheduled chemicals are to be included in the total values specified:

Scheduled chemicals (total)			
Name	**CAS Registry Number**	**Name**	**CAS Registry Number**
Aldrin	309-00-2	Heptachlor	76-44-8
Alpha-BHC	319-84-6	Heptachlor epoxide	1024-57-3
Beta-BHC	319-85-7	Hexachlorobenzene	118-74-1
Gamma-BHC (Lindane)	58-89-9	Hexachlorophene	70-30-4
Delta-BHC	319-86-8	Isodrin	465-73-6
Chlordane	57-74-9	Pentachlorobenzene	608-93-5
DDD	72-54-8	Pentachloronitrobenzene	82-68-8
DDE	72-55-9	Pentachlorophenol	87-86-5
DDT	50-29-3	1,2,4,5-Tetrachlorobenzene	95-94-3
Dieldrin	60-57-1	2,3,4,6-Tetrachlorophenol	58-90-2
Endrin	72-20-8	1,2,4-Trichlorobenzene	120-82-1
Endrin aldehyde	7421-93-4	2,4,5-Trichlorophenoxyacetic acid, salts and esters	93-76-5

18. Calculated from *Guidelines for Drinking Water Quality* (WHO 2011).

Table 1A (1) Health-based Investigation Levels (mg/kg)

	Residential A	Residential B	Recreational C	Commercial / Industrial D
Metals & Inorganics				
Arsenic (total)	100	500	300	3,000
Beryllium	60	90	90	500
Boron	4,500	40,000	20,000	300,000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3,600
Cobalt	100	600	300	4,000
Copper	6,000	30,000	17,000	240,000
Lead	300	1,200	600	1,500
Manganese	3,800	14,000	19,000	60,000
Mercury (inorganic)	40	120	80	730
Methyl mercury	10	30	13	180
Nickel	400	1,200	1,200	6,000
Selenium	200	1,400	700	10,000
Zinc	7,400	60,000	30,000	400,000
Cyanide (free)	250	300	240	1,500
Polycyclic Aromatic Hydrocarbons				
Carcinogenic PAHs (as BaP TEQ)	3	4	3	40
Total PAHs	300	400	300	4,000
Phenols				
Phenols	3,000	45,000	40,000	240,000
Pentachlorophenol	100	130	120	660
Cresols	400	4,700	4,000	25,000
Organochlorine Pesticides				
DDT+DDD+DDE	240	600	400	3,600
Aldrin & Dieldrin	6	10	10	45
Chlordane	50	90	70	530
Endosulfan	270	400	340	2,000
Endrin	10	20	20	100
Heptachlor	6	10	10	50
HCB	10	15	10	80
Methoxychlor	300	500	400	2,500
Mirex	10	20	20	100
Toxaphene	20	30	30	160
Herbicides				
2,4,5-T	600	900	800	5,000
2,4-D	900	1,600	1,300	9,000
MCPA	600	900	800	5,000
MCPB	600	900	800	5,000
Mecoprop	600	900	800	5,000
Picloram	4,500	6,600	5,700	35,000
Other Pesticides				
Atrazine	320	470	400	2,500
Chlorpyrifos	160	340	250	2,000
Bifenthrin	600	840	730	4,500
Other Organics				
PCBs	1	1	1	7
PBDE Flame Retardants (Br1-Br9)	1	2	2	10

Table 1B(1) **Soil-specific added contaminant limits for aged zinc in soil**

Zn added contaminant limits (ACL, mg added contaminant/kg)						
Areas of ecological significance						
pH [a]	**CEC [b] (cmol/kg)**					
	5	**10**	**20**	**30**	**40**	**60**
4.0	15	20	20	20	20	20
4.5	20	25	25	25	25	25
5.0	30	40	40	40	40	40
5.5	40	60	60	60	60	60
6.0	50	90	90	90	90	90
6.5	50	90	130	130	130	130
7.0	50	90	130	190	190	190
7.5	50	90	130	210	260	280
Urban residential/public open space [1]						
pH [a]	**CEC [b] (cmol/kg)**					
	5	**10**	**20**	**30**	**40**	**60**
4.0	70	85	85	85	85	85
4.5	100	120	120	120	120	120
5.0	130	180	180	180	180	180
5.5	180	270	270	270	270	270
6.0	230	400	400	400	400	400
6.5	230	400	590	590	590	590
7.0	230	400	700	880	880	880
7.5	230	400	700	960	1200	1300
Commercial/Industrial						
pH [a]	**CEC [b] (cmol/kg)**					
	5	**10**	**20**	**30**	**40**	**60**
4.0	110	130	130	130	130	130
4.5	150	190	190	190	190	190
5.0	210	290	290	290	290	290
5.5	280	420	420	420	420	420
6.0	360	620	620	620	620	620
6.5	360	620	920	920	920	920
7.0	360	620	1100	1400	1400	1400
7.5	360	620	1100	1500	1900	2000

1: Urban residential/public open space is broadly equivalent to the HIL A, HIL B and HIL C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.

2: Aged values apply to contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.

3: The EIL is calculated from summing the ACL and the ABC.

a: pH measured using the CaCl2 method (Rayment & Higginson 1992).

b: CEC measured using the silver thiourea method (Chabra et al. 1972).

Table 1B(2): Soil-specific added contaminant limits for aged copper in soil

Cu added contaminant limits (ACL, mg added contaminant/kg)					
Aeras of ecological significance					
CEC (cmol/kg)[a] based					
5	**10**	**20**	**30**	**40**	**60**
30	65	70	70	75	80
pH[b] based					
4.5	**5.5**	**6**	**6.5**	**7.5**	**8**
20	45	65	90	190	270
Urban residential/public open space [1]					
CEC (cmol/kg)[a] based					
5	**10**	**20**	**30**	**40**	**60**
95	190	210	220	220	230
pH[b] based					
4.5	**5.5**	**6**	**6.5**	**7.5**	**8**
60	130	190	280	560	800
Commercial/industrial					
CEC (cmol/kg)[a] based					
5	**10**	**20**	**30**	**40**	**60**
140	280	300	320	330	340
pH[b] based					
4.5	**5.5**	**6**	**6.5**	**7.5**	**8**
85	190	280	400	830	1200

1. Urban residential/public open space is broadly equivalent to the HIL A, HIL B and HIL C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.
2. The lower of the CEC or the pH-based ACLs for the land use and soil conditions is the ACL to be used.
3. Aged values apply to contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.
4. The EIL is calculated from summing the ACL and the ABC.

a = CEC measured using the silver thiourea method (Chabra et al. 1972)

b = pH measured using the CaCl2 method (Rayment & Higginson 1992)

Table 1A(3) Soil HSLs for vapour intrusion (mg/kg)

CHEMICAL	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				Soil saturation concentration (Cast)
	0 m to <1 m	1 m to <2 m	2 m to <4m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4m	4 m+	
SAND													
Toluene	160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL	560
Ethylbenzene	55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	64
Xylenes	40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL	300
Naphthalene	3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	9
Benzene	0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3	360
F1	45	70	110	200	NL	NL	NL	NL	260	370	630	NL	950
F2	110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL	560
SILT													
Toluene	390	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	640
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	69
Xylenes	95	210	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330
Naphthalene	4	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.6	0.7	1	2	NL	NL	NL	NL	4	4	6	10	440
F1	40	65	100	190	NL	NL	NL	NL	250	360	590	NL	910
F2	230	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	570
CLAY													
Toluene	480	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	630
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	68
Xylenes	110	310	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330
Naphthalene	5	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.7	1	2	3	NL	NL	NL	NL	4	6	9	20	430
F1	50	90	150	290	NL	NL	NL	NL	310	480	NL	NL	850
F2	280	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	560

Table 1B(3): Soil-specific added contaminant limits for aged chromium III and nickel in soil

CHEMICAL	Clay content (%clay)	Added contaminant limits (mg aded contaminant/kg) for various land uses		
		Areas of ecological significance	Urban residential and public open space	Commercial and industrial
Chromium III	***1***	60	190	310
	2.5	80	250	420
	5	100	320	530
	≥10	130	400	660
Nickel	**CEC[a] ($cmol_c$ /kg)**	**Areas of ecological significance**	**Urban residential and public open space**	**Commercial and industrial**
	5	5	30	55
	10	30	170	290
	20	45	270	460
	30	60	350	600
	40	70	420	730
	60	95	560	960

Notes:

1. Urban residential/public open space is broadly equivalent to the HIL A, HIL B and HIL C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.
2. Aged values apply to contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.
3. The EIL is calculated from summing the ACL and the ABC.

a = CEC measured using the silver thiourea method (Chabra et al. 1972)

Table 1B(4): Generic added contaminant limits for lead in soils irrespective of their physicochemical properties

Pb added contaminant limit (ACL, mg added contaminant/kg) for various land uses			
CHEMICAL	**Area of ecological significance**	**Urban residential and public open space**	**Commercial and industrial**
LEAD	470	1100	1800

Notes:

1. Urban residential/public open space is broadly equivalent to the HIL A, HIL B and HIL C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.
2. Aged values are applicable to lead contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.
3. The EIL is calculated from summing the ACL and the ABC.

Table 1B(5) Generic EILs for aged As, fresh DDT and fresh naphthalene in soils irrespective of their physicochemical properties

Ecological Investigation Levels (mg total contaminant/kg)			
CHEMICAL	**Areas of ecological significance**	**Urban residential and public open space[1]**	**Commercial and industrial**
Arsenic[2]	40	100	160
DDT[3]	3	480	640
Naphthalene[3]	10	170	370

Notes:

1. Urban residential/public open space is broadly equivalent to the HIL-A, HIL-B and HIL-C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.
2. Aged values are applicable to arsenic contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.
3. Insufficient data was available to calculate aged values for DDT and naphthalene, consequently the values for fresh contamination should be used.
4. Insufficient data was available to calculate ACLs for As, DDT and naphthalene. The EIL should be taken directly from Table 1B(5).

Table 1B(6): ESLs for TPH fractions F1 – F4, BTEX and benzo(a)pyrene in soil

CHEMICAL	Soil texture	ESLs (mg/kg dry soil)		
		Areas of ecological significance	Urban residential and public open space	Commercial and industrial
F1 C6-C10	Coarse/	125*	180*	215*
F2 >C10-C16	Fine	25*	120*	170*
F3 >C16-C34	Coarse	-	300	1700
	Fine	-	1300	2500
F4 >C34-C40	Coarse	-	2800	3300
	Fine	-	5600	6600
Benzene	Coarse	10	50	75
	Fine	10	65	95
Toluene	Coarse	10	85	135
	Fine	65	105	135
Ethylbenzene	Coarse	1.5	70	165
	Fine	40	125	185
Xylenes	Coarse	10	105	180
	Fine	1.6	45	95
Benzo(a)pyrene	Coarse	0.7	0.7	1.4
	Fine	0.7	0.7	1.4

Notes:
ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.
'-' indicates that insufficient data was available to derive a value.

To obtain F1, subtract the sum of BTEX concentrations from C6-C10 fraction and subtract naphthalene from >C10-C16 to obtain F2.

Table 1 B(7): Management Limits for TPH fractions F1 - F4 in soil

TPH fraction	Soil texture	Management Limits1 (mg/kg dry soil)	
		Residential, parkland and public open space	Commercial and industrial
F1[2] C6- C10	Coarse	700	700
	Fine	800	800
F2[2] >C10-C16	Coarse	1000	1000
	Fine	1000	1000
F3 >C16-C34	Coarse	2500	3500
	Fine	3500	5000
F4 >C34-C40	Coarse	10 000	10 000
	Fine	10 000	10 000

Table 7: Health screening levels for asbestos contamination in soil

Form of asbestos	Health Screening Level (w/w)			
	Residential A[1]	Residential B[2]	Recreational C[3]	Commercial/ Industrial D[4]
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

Notes:

1. Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
2. Residential B with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
3. Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
4. Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.
5. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures (refer Section 4.10). This screening level is not applicable to free fibres.

APPENDIX M

LABORATORY TECHNICAL INFORMATION

Aargus

National Analyte Listings and LORs

For ALS Traditional Group operations

9 MAY 2014

RIGHT SOLUTIONS | RIGHT PARTNER

16. ANALYTES & GROUP ANALYTES INDEX — STARTING PAGE

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS								
	Fresh Water			Saline Water			Soil		Sediments
	ICP-AES	ICP-MS	Ultra Trace	ICP-AES	ICP-MS	Ultra Trace	Standard	Trace	
METALS									
Method Code	EG005	EG020	EG094	EG005	EG020	EG093	EG005	EG020	EG020SD
Units	mg/L	mg/L	µg/L	mg/L	mg/L	µg/L	mg/kg	mg/kg	mg/kg
Aluminium (Al)	0.1	0.01	5	1	0.5	5	50	-	
Antimony (Sb)	0.01	0.001	0.2	-	0.01	0.5	5	0.1	0.5
Arsenic (As)	0.01	0.001	0.2	1	0.05	0.5	5	0.1	1
Barium (Ba)	0.1	0.001	0.5	1	0.05	1	10	0.1	
Beryllium (Be)	0.01	0.001	0.1	-	0.01	0.1	1	0.1	
Bismuth (Bi)	-	0.001	0.05	-	0.01	0.1	-	-	
Boron (B)	0.1	0.05	5	-	-	100	50	5	
Cadmium (Cd)	0.005	0.0001	0.05	0.05	0.005	0.2	1	0.1	0.1
Cerium (Ce)	-	0.001	-	-	-	-	-	-	
Caesium (Cs)	-	0.001	-	-	0.01	-	-	-	-
Chromium (Cr)	0.01	0.001	0.2	1	0.01	0.5	2	0.1	1
Cobalt (Co)	0.01	0.001	0.1	1	0.01	0.2	2	0.1	0.5
Copper (Cu)	0.01	0.001	0.5	1	0.05	1	5	0.1	1
Dysprosium (Dy)	-	0.001	-	0.001	-	-	-	-	-
Erbium (Er)	-	0.001	-	0.001	-	-	-	-	-
Europium (Eu)	-	0.001	-	0.001	-	-	-	-	-
Gadolinium (Gd)	-	0.001	-	0.001	-	-	-	-	-
Gallium (Ga)	-	0.001	-	0.001	-	-	-	-	-
Hafnium (Hf)	-	0.01	-	0.01	-	-	-	-	-
Holmium (Ho)	-	0.001	-	0.001	-	-	-	-	-
Indium (In)	-	0.001	-	-	0.01	-	-	-	-
Iron (Fe)	0.05	0.05	2	0.5	0.5	5	50	-	-
Lanthanum (La)	-	0.001	-	-	-	-	-	-	-
Lead (Pb)	0.01	0.001	0.1	1	0.01	0.2	5	0.1	1
Lithium (Li)	-	0.001	0.5	-	-	1	-	-	-
Lutetium (Lu)	-	0.001	-	-	-	-	-	-	-
Manganese (Mn)	0.01	0.001	0.5	1	0.01	0.5	5	0.1	10
Molybdenum (Mo)	0.01	0.001	0.1	1	0.01	0.1	2	0.1	-
Neodymium (Nd)	-	0.001	-	-	-	-	-	-	-
Nickel (Ni)	0.01	0.001	0.5	1	0.05	0.5	2	0.1	1
Praseodymium (Pr)	-	0.001	-	-	-	-	-	-	-
Rubidium (Rb)	-	0.001	-	-	0.01	-	-	-	-
Samarium (Sm)	-	0.001	-	-	-	-	-	-	-
Selenium (Se)	0.01	0.01	0.2	-	0.1	2	5	1	0.1
Silver (Ag)	0.01	0.001	0.1	-	0.01	0.1	2	0.1	0.1
Strontium (Sr)	0.01	0.001	1	1	0.01	10	2	0.1	-
Tellurium (Te)	-	0.005	0.2	-	0.05	0.5	-	-	-
Terbium (Tb)	-	0.001	-	-	-	-	-	-	-
Thallium (Tl)	-	0.001	0.02	-	0.01	0.1	-	-	-
Thorium (Th)	-	0.001	0.1	-	0.01	0.1	-	-	-
Thulium (Tm)	-	0.001	-	-	-	-	-	-	-
Tin (Sn)	0.01	0.001	0.2	1	0.01	5	5	0.1	-
Titanium (Ti)	0.01	0.01	1	1	-	5	-	-	-
Uranium (U)	-	0.001	0.05	-	0.01	0.1	-	-	-
Vanadium (V)	0.01	0.01	0.2	1	-	0.5	5	1	2
Ytterbium (Yb)	-	0.001	-	-	-	-	-	-	-

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS								
	Fresh Water			Saline Water			Soil		Sediments
	ICP-AES	ICP-MS	Ultra Trace	ICP-AES	ICP-MS	Ultra Trace	Standard	Trace	
Yttrium (Y)	-	0.001	-	-	0.01	-	-	-	-
Zinc (Zn)	0.01	0.005	1	1	0.05	5	5	0.5	1
Zirconium (Zr)	-	0.005	-	-	0.05	-		-	-
Please note – 0.05 µg/L is equivalent to 0.00005 mg/L and due to the number of decimal places results are reported in µg/L for ultra-trace ORC analysis									
MERCURY (by ICP/MS or FIMS) – total or dissolved LORs									
Method Code		EG035	EG035-LL		EG035	EG-035-LL	EG-035T		EG035L
Units		mg/L	mg/L		mg/L	mg/L	Mg/kg		mg/kg
Mercury		0.0001	0.00004	-	0.0001	0.00004	0.1	-	0.01
ADDITIONAL METALS (non NATA)									
Method Code		EG020							
Units		mg/L							
Bromine	-	0.1	-	-	-	-	-	-	-
Germanium	-	0.001	-	-	-	-	-	-	-
Gold	-	0.001	-	-	-	-	-	-	-
Iodine	-	0.1	-	-	-	-	-	-	-
Niobium	-	0.001	-	-	-	-	-	-	-
Palladium	-	0.001	-	-	-	-	-	-	-
Platinum	-	0.001	-	-	-	-	-	-	-
Rhenium	-	0.001	-	-	-	-	-	-	-
Tantalum	-	0.001	-	-	-	-	-	-	-
Tungsten	-	0.001	-	-	-	-	-	-	-
RARE EARTH METALS									
Method Code		EG021							
Units		mg/L							
Iridium (Ir)		0.0001	-	-	-	-	-	-	-
Osmium (Os)		0.0002	-	-	-	-	-	-	-
Rhodium (Rh)		0.0001	-	-	-	-	-	-	-
Ruthenium (Ru)		0.0002	-	-	-	-	-	-	-
Scandium (Sc)b		0.0001	-	-	-	-	-	-	-
SPECIATED METALS									
Method Code		EG032 / 33		EG032/3SL					
		Fresh Water		Saline Water					
Units		µg/L		µg/L					
As (III), (Arsenite)		1	-	2	-	-	-	-	-
As (V), (Arsenate)		1	-	4	-	-	-	-	-
AsB, (Arsenobetaine)		1	-	4	-	-	-	-	-
DMA, (Dimethylarsenic Acid)		1	-	4	-	-	-	-	-
MMA, (Monomethylarsonic Acid)		1	-	4	-	-	-	-	-
Selenium (IV)		1	-	2	-	-	-	-	-
ORGANOTINS Method Code		EP090							EP090
Units		ng Sn/L							Ug Sn/kg
Monobutyltin		-	-	-	-	-	-	-	-
Dibutyltin		-	-	-	-	-	-	-	-
Tributyltin (TBT)		2	-	-	-	-	-	-	0.5

ALS ANALYTES & LORS LISTING

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS							
	Fresh/Saline Water				Soil			Sediments
TPH, TRH, TPH SPECIATION, SOLVENTS, BTEX, BTEXN								
TPH Method Code:	EP071,80	EP071SG			EP071,80	EP071SG		
Units	µg/L	µg/L			mg/kg	mg/kg		
C6 - C9	20	-			10	-		
C10 -C14	50	50			50	50		
C15 - C28	100	100			100	100		
C29 - C36	50	50			100	100		
Total C10-C36 ^	50	50			50	50		
TRH Method Code:	EP0711, 801				EP0711, 801			EP071SD
C6-C10	20				10			3-5
>C10 -C16	100				50			3-5
>C16 – C34	100				100			3-5
>C34 – C40	100				100			3-5
Total >C10 - C40 ^	100				100			
C6-C10 minus BTEX (F1)	20				10			
BTEXN Method Code:	EP080				EP080			EP080-SD
Benzene	1				0.2			0.2
Toluene	2				0.5			0.2
Ethylbenzene	2				0.5			0.2
meta- & para-Xylene	2				0.5			0.2
ortho-Xylene	2				0.5			0.2
Total Xylenes ^	2				0.5			
Naphthalene	5				2			
Sum of BTEX ^	1				0.5			
TRH Speciation-HRAF Method Code:	EP070				EP070			
Units	µg/L	µg/L			mg/kg	mg/kg		
Aliphatic C10-C14	50							
Aliphatic C15-C28	100							
Aliphatic C16-C35					50			
Aliphatic >C35					100			
Aromatic C10-C14	50							
Aromatic C15-C28	100							
Aromatic C29-C36	50							
Aromatic C16-C35					90			
Aromatic >C35					100			
TRH CWG Speciation Method Code:	EP070,79				EP070I,80I			
Aliphatics >C5-C6	20				5			
Aliphatics >C6-C8	20				5			
Aliphatics >C8-C10	20				5			
Aliphatics >C10-C12	50				50			
Aliphatics >C12-C16	50				50			
Aliphatics >C16-C21	50				50			
Aliphatics >C21-C35	50				50			
Aromatics >C5-C7	1				0.2			
Aromatics >C7-C8	2				0.5			
Aromatics >C8-C10	2				0.5			
Aromatics >C10-C12	50				50			
Aromatics >C12-C16	50				50			
Aromatics >C16-C21	50				50			
Aromatics >C21-C35	50				50			

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS							
	Water			Drinking water		Soils		Sediment
	Std VOC		Ultra Trace	Super UT	VOC Trace			
VOLATILE ORGANICS COMPOUNDS (VOC)								
Monocyclic Aromatics Method Code:	EP074A		EP125A	EP125LL	EP074-WF	EP074A	EP074SIM	
Units	µg/L		µg/L	µg/L	µg/L	mg/kg	mg/kg	
Benzene	1		0.05	-	1	0.2	0.02	
Toluene	2		0.5	-	1	0.5	0.05	
Ethylbenzene	2		0.05	-	1	0.5	0.02	
meta- & para-Xylene	2		0.05	-	1	0.5	0.02	
ortho-Xylene	2		0.05	-	1	0.5	0.02	
1,2,4-Trimethylbenzene	5		0.05	-	1	0.5	-	
1,3,5-Trimethylbenzene	5		0.05	-	1	0.5	-	
Isopropylbenzene	5		-	-	1	0.5	-	
n-Butylbenzene	5		-	-	1	0.5	-	
n-Propylbenzene	5		-	-	1	0.5	-	
p-Isopropyltoluene	5		-	-	1	0.5	-	
sec-Butylbenzene	5		-	-	1	0.5	-	
Styrene	5		0.05	-	1	0.5	-	
tert-Butylbenzene	5		-	-	1	0.5	-	
Sum of Xylenes	5		0.05	-	1			
Oxygenated Compounds Method Code:	EP074B		EP0125B		EP074-WF	EP074B	EP074SIM	
2-Butanone (MEK)	50		-		10	5	-	
2-Hexanone (MBK)	50		-		10	5	-	
2-Propanone (Acetone)	50		-		10	5	-	
4-Methyl-2-pentanone (MIBK)	50		-		10	5	-	
Vinyl acetate	50		-		10	5	-	
Sulfonated Compounds Method Code:	EP074C		EP0125C		EP074-WF	EP074C		
Carbon disulfide	5		-		1	0.5	-	
Fumigants Method Code:	EP074D		EP125D		EP074-WF	EP074D	EP074SIM	
1,2-Dibromoethane	5		0.1		1	0.5	-	
1,2-Dichloropropane	5		0.1		1	0.5	-	
2,2-Dichloropropane	5		-		1	0.5	-	
cis-1,3-Dichloropropylene	5		0.1		2	0.5	-	
trans-1,3-Dichloropropylene	5		0.1		2	0.5	-	
Halogenated Aliphatics Method Code:	EP074E		EP125E	EP125-LL	EP074-WF	EP074E	EP074SIM	
1,1,1-Trichloroethane	5		0.1		1	0.5	0.02	
1,1-Dichloroethane	5		0.1		1	0.5	0.02	
1,1-Dichloroethene	5		0.1		1	0.5	0.02	
Bromochloromethane	-		0.5		1			
Bromomethane	50		0.5		0.5	5	0.02	
Chloroethane	50		0.5		1	5	0.02	
Chloromethane	50		-		1	5	0.02	
cis-1,2-Dichloroethene	5		0.1		1	0.5	0.02	
Dichlorodifluoromethane	50		0.5		1	5	0.02	
Iodomethane	5		-		1	0.5	-	
Methylene chloride (DCM)	4		1	0.1	4	0.5	-	
Trichlorofluoromethane	50		0.5		1	5	0.02	
trans-1,2-Dichloroethene	5		0.1		1	0.5	0.02	
Vinyl chloride	50		0.3	0.025	0.3	5	0.02	
Units	µg/L		µg/L		µg/L	mg/kg	mg/kg	

ALS ANALYTES & LORS LISTING

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS							
	Water			Drinking water		Soils		Sediment
	Std VOC		Ultra Trace	Super UT	VOC Trace			
1,1,1,2-Tetrachloroethane	5		-		1	0.5	0.02	
1,1,2,2-Tetrachloroethane	5		-		1	0.5	0.02	
1,1,2-Trichloroethane	5		-		1	0.5	-	
1,1-Dichloropropylene	5		-		1	0.5	-	
1,2,3-Trichloropropane	5		-		1	0.5	-	
1,2-Dibromo-3-chloropropane	5		0.1		1	0.5	-	
1,2-Dichloroethane	5		0.1	0.02	1	0.5	0.02	
1,3-Dichloropropane	5		-		1	0.5	-	
Carbon tetrachloride	5		0.05	0.02	1	0.5	0.02	
cis-1,4-Dichloro-2-butene	5		-		1	0.5	-	
Dibromomethane	5		-		1	0.5	-	
Hexachlorobutadiene	5		0.04		0.5	0.5	0.02	
Pentachloroethane	5		-		1	0.5	-	
Tetrachloroethene	5		0.05		1	0.5	0.02	
trans-1,4-Dichloro-2-butene	5		-		1	0.5	-	
Trichloroethene	5		0.05		1	0.5	0.02	
Halogenated Aromatics Method Code	EP074F		EP125F		EP074-WF	EP074F	EP074SIM	
1,2,3-Trichlorobenzene	5		0.1		1	0.5	0.02	
1,2,4-Trichlorobenzene	5		0.1		1	0.5	0.02	
1,2-Dichlorobenzene	5		0.1		1	0.5	0.02	
1,3,5-Trichlorobenzene	-		-		1			
1,3-Dichlorobenzene	5		0.1		1	0.5	0.02	
1,4-Dichlorobenzene	5		0.1		1	0.5	0.02	
2-Chlorotoluene	5		0.1		1	0.5	0.02	
4-Chlorotoluene	5		0.1		1	0.5	0.02	
Benzyl Chloride	-		0.2		-	-	-	
Bromobenzene	5		0.1		1	0.5	0.02	
Chlorobenzene	5		0.1		1	0.5	0.02	
Trichlorobenzenes (Sum)	-		0.1		1			
Trihalomethanes Method Code	EP074G		EP125G		EP074-WF	EP074G	EP074SIM	
Bromodichloromethane	5		0.1		1	0.5	0.02	
Bromoform	5		0.1		1	0.5	0.02	
Chloroform	5		0.1		1	0.5	0.02	
Dibromochloromethane	5		0.1		1	0.5	0.02	
Total Trihalomathanes (THMs)	5		0.1		1			
Naphthalene Method Code	EP074H		EP125H		EP074-WF	EP074H	EP074SIM	
Naphthalene	7		0.05		5	5	0.05	
Miscellaneous Method Code	EP074K		The K and L Groups only reported when only specific compounds are requested via CoC.					
1,3,5-Trimethylbenzene (NN)	5		-		1			
Total Trimethylbenzene (NN)	5		-		1			
Fuel Oxygenates Method Code	EP074L		EP125L			EP074L	EP074SIM	
Units	µg/L		µg/L		µg/L	mg/kg	mg/kg	
Diisoproply ether (DIPE)	1		-		-	0.1	-	
Ethyl tert-butyl ether (ETBE)	1		-		-	0.1	-	
Methyl tert-butyl ether (MTBE)	1	1	0.1			0.1	-	
tert-Amyl ethyl ether (TAEE)	1		-		-	0.1	-	
tert-Amyl methyl ether (TAME)	1		-		-	0.1	-	
tert-Butyl alcohol(TBA)	5		-		-	0.5	-	

ALS ANALYTES & LORS LISTING

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS							
	Water			Drinking water		Soils		Sediment
	Std VOC		Ultra Trace	Super UT	VOC Trace			
BROMINATED VOCS Method Code	-	EP093						
Units	µg/L	µg/L				mg/kg		
1,1,2,2-Tetrabromoethane	-	1						
1,2-Dibromoethene (total)	-	0.1						
Bromoform	-	0.1						
cis-1,2-Dibromoethene	-	0.1						
Dibromomethane	-	0.1						
trans-1,2-Dibromoethene	-	0.1						
Tribromoethene	-	0.1						
Vinyl Bromide	-	0.1						
VOC - ALKANES Method Code	CM051C							
Decane	10							
Hexane	10							
Heptane	10							
Nonane	10							
Octane	10							
Pentane	10							
VOC – Solvents Method Code	CM051C							
1-Heptane	4							
Butyl acetate	20							
Cyclopentene	4							
Cyclohexane	4							
Ethyl acetate	20							
ALCOHOLS Method Code	EP177							
Ethanol	50							
Isobutanol	50							
Isopropanol	50							
n-Butanol	50							
n-Propanol	50							
GLYCOLS Method Code	EP067	EP261				EP067		
2-Butoxyethanol	2,000	10				2		
2-Ethoxyethyl acetate	2,000	-				2		
Diethylene glycol monobutyl ether	2,000	10				2		
Diethylene glycol	2,000	-				2		
Ethylene glycol	2,000	100				2		
Propylene glycol	2,000	-				2		
Triethylene glycol	2,000	-				2		
C1-C4 GASES Method Code	EP033	EP033LL				*Not reported unless requested		
Butane*	20	1						
Butylene (Butene) *	20	1						
Ethane*	10	1						
Ethylene (Ethene) *	10	1						
Methane	10	1						
Propane*	10	1						
Propylene (Propene)*	10	1						

ALS ANALYTES & LORS LISTING

GROUP ANALYTES	MATRIX / METHOD CODES & LORS							
	Water		Trace and Ultra trace		Soil			Sediments
PAH (POLYAROMATIC HYDROCARBONS)								
Method Code	EP075B(SIM)	EP075BWE	EP132B	EP132LL	EP075B(SIM)	EP075BSC	EP132B	EP132SD
Units	µg/L	µg/L	µg/L	µg/L	mg/kg	mg/kg	µg/kg	µg/kg
2-Methylnaphthalene	-	-	0.1	-	-	-	10	5.0
3-Methylcholanthrene	-	-	0.1	-	-	-	10	4.0
7,12-Dimethylbenz(a)anthracene	-	-	0.1	-	-	-	10	4.0
Acenaphthene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Acenaphthylene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Anthracene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Benz(a)anthracene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Benzo(a)pyrene	0.5	0.2	0.05	0.005	0.5	0.05	10	4.0
Benzo(b&k)fluoranthene	-	-	0.1	-	-	-	10	-
Benzo(b) fluoranthene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Benzo(e)pyrene	-	-	0.1	-	-	-	10	4.0
Benzo(g,h,i)perylene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Benzo(k) fluoranthene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Chrysene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Coronene	-	-	0.1	-	-	-	10	5.0
Dibenz(a,h)anthracene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Fluoranthene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Fluorene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Indeno(1,2,3-cd)pyrene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
N-2-Fluorenyl acetamide	-	-	0.1	-	-	-	100	
Naphthalene	1	0.2	0.1	0.02	0.5	0.05	10	5.0
Perylene	-	-	0.1	-	-	-	10	4.0
Phenanthrene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Pyrene	1	0.2	0.1	0.02	0.5	0.05	10	4.0
Benzo(a)pyrene TEQ	0.5	0.2	0.05	0.005	0.5	0.05	10	4.0
PAH's (total) ^	1	0.2	0.1	0.005	0.5	0.05	10	90
PHENOLS Method Code	EP075ASIM	EP132A			EP075ASIM		EP132A	See EP075A
2,3,4,6-Tetrachlorophenol	-	0.1			-		10	
2,4,5-Trichlorophenol	1	0.1			0.5		10	
2,4,6-Trichlorophenol	1	0.1			0.5		10	
2,4-Dichlorophenol	1	0.1			0.5		10	
2,4-Dimethylphenol	1	0.1			0.5		10	
2,6-Dichlorophenol	1	0.1			0.5		10	
2-Chlorophenol	1	0.05			0.5		10	
2-Methylphenol (o-Cresol)	1	-			0.5		10	
2-Nitrophenol	1	0.1			0.5		100	
3&4-Methylphenol	2	-			1		10	
4-Chloro-3-methylphenol	1	0.05			0.5		10	
4-Nitrophenol	-	0.1			-		10	
Hexachlorophene	-	0.1			-		10	
m-Cresol (3-Methylphenol)	-	0.1			-		10	
o-Cresol (2-Methylphenol)	-	0.1			-		-	
p-Cresol (4-Methylphenol)	-	0.1			-		10	
Pentachlorophenol	2	0.05			1		10	
Phenol	1	0.1			0.5		10	
Tetrachlorophenol	-	0.1			-		-	

GROUP ANALYTES	MATRIX / METHOD CODES & LORS						
					Soil		Sediments
OC PESTICIDES Method Code	EP068A		EP131A	EP131ACM	EP068A	EP131A	EP131A
Units	µg/L			µg/L	mg/kg	µg/kg	µg/kg
Aldrin	0.5		0.01	0.002	0.05	0.5	0.5
a-BHC	0.5		0.01	0.002	0.05	0.5	0.5
b-BHC	0.5		0.01	0.002	0.1	0.5	0.5
d-BHC	0.5		0.01	0.002	0.05	0.5	0.5
g-BHC (Lindane)	0.5		0.01	0.002	0.1	0.5	0.25
Chlordane - cis	0.5		0.01	0.002	0.05	0.5	0.5
Chlordane - trans	0.5		0.01	0.002	0.05	0.5	0.5
Chlordane (Total)	-		-	0.002	-	-	0.25
DDD	0.5		0.01	0.002	0.05	0.5	0.5
DDE	0.5		0.01	0.002	0.05	0.5	0.5
DDT	2		0.01	0.002	0.2	0.5	0.5
Dieldrin	0.5		0.01	0.002	0.05	0.5	0.5
Endosulfan 1	0.5		0.01	0.002	0.05	0.5	0.5
Endosulfan 2	0.5		0.01	0.002	0.05	0.5	0.5
Endosulfan sulfate	0.5		0.01	0.002	0.05	0.5	0.5
Endosulphan (Total)	-		-	0.002	-	-	0.5
Endrin	0.5		0.01	0.002	0.05	0.5	0.5
Endrin aldehyde	0.5		0.01	0.002	0.05	0.5	0.5
Endrin ketone	0.5		0.01	0.002	0.05	0.5	0.5
HCB (Hexachlorobenzene)	0.5		0.01	0.002	0.05	0.5	0.5
Heptachlor	0.5		0.005	0.001	0.05	0.5	0.5
Heptachlor epoxide	0.5		0.01	0.002	0.05	0.5	0.5
Methoxychlor	2		0.01	0.002	0.2	0.5	0.5
Oxychlordane	-		0.01	0.002	-	0.5	0.5
Aldrin + Dieldrin^(Sum of)	0.5		0.01	0.002	-	-	0.5
DDD+DDE+DDT^(Sum of)	0.5		0.01	0.002	-	-	0.5
Method Code	EP066	EP131B	EP131BCM		EP066	See EP131B	EP131B
Units	µg/L	µg/L	µg/L		mg/kg	µg/kg	µg/kg
Total PCB	1	0.1	0.05		0.1		5.0
Aroclor 1016*	1	0.1	0.05		0.1		5.0
Aroclor 1221*	1	0.1	0.05		0.1		5.0
Aroclor 1232*	1	0.1	0.05		0.1		5.0
Aroclor 1242*	1	0.1	0.05		0.1		5.0
Aroclor 1248*	1	0.1	0.05		0.1		5.0
Aroclor 1254*	1	0.1	0.05		0.1		5.0
Aroclor 1260*	1	0.1	0.05		0.1		5.0

GROUP ANALYTES	MATRIX / METHOD CODES & LORS						
					Soil		Sediments
OPPs (ORGANOPHOSPOROUS PESTICIDES)							
Method Code	EP068B	EP130	EP234A	EP234LL	EP068B	See EP130	EP130A
Units	µg/L	µg/L	µg/L	µg/L	mg/kg	µg/kg	µg/kg
Azinphos-ethyl	-	-	0.02	-	-	-	-
Azinphos-methyl	0.5	0.1	0.02	-	0.05	10	10
Bromophos-ethyl	0.5	0.1	0.1	-	0.05	10	10
Carbophenothion	0.5	0.1	0.02	-	0.05	10	10
Chlorfenvinphos	-	-	0.02	-	-	-	-
Chlorfenvinphos E	0.5	0.1	-	-	0.05	10	10
Chlorfenvinphos Z	0.5	0.1	-	-	0.05	10	10
Chlorpyrifos	0.5	0.05	0.02	0.001	0.05	10	10
Chlorpyrifos-methyl	0.5	0.1	0.2	-	0.05	10	10
Coumaphos	-	-	0.01	-	-	-	-
Demeton-O & Demeton-S	-	-	0.02	-	-	-	-
Demeton-S-methyl	0.5	0.1	0.02	-	0.05	10	10
Diazinon	0.5	0.1	0.01	0.0002	0.05	10	10
Dichlorvos	0.5	0.1	0.2	-	0.05	10	10
Dimethoate	0.5	0.1	0.02	-	0.05	10	10
Disulfoton	-	-	0.05	-	-	-	-
Ethion	0.5	0.1	0.02	-	0.05	10	10
Ethoprophos	-	-	0.01	-	-	-	-
Fenamiphos	0.5	0.1	0.01	-	0.05	10	10
Fenchlorphos (Ronnel)	-	-	10	-	-	-	-
Fenitrothion	-	-	2	-	-	-	-
Fensulfothion	-	-	0.01	-	-	-	-
Fenthion	0.5	0.1	0.05	-	0.05	10	10
Malathion	0.5	0.1	0.02	0.001	0.05	10	10
Mevinphos	-	-	0.02	-	-	-	-
Monocroptophos	2	0.1	0.02	-	0.2	10	10
Omethoate	-	-	0.01	-	-	-	-
Parathion	2	0.1	0.2	-	0.2	10	10
Parathion-methyl	2	0.1	2	-	0.2	10	10
Phorate	-	-	0.1	-	-	-	-
Pirimiphos-methyl	-	-	0.01	0.0002	-	-	-
Pirimphos-ethyl	0.5	0.1	0.01	-	0.05	10	10
Profenofos	-	-	0.01	-	-	-	-
Prothiofos	0.5	0.1	0.1	-	0.05	10	10
Sulfotep	-	-	0.005	0.0002	-	-	-
Sulprofos	-	-	0.05	-	-	-	-
Temephos	-	-	0.02	-	-	-	-
Terbufos	-	-	0.01	-	-	-	-
Tetrachlorvinphos	-	-	0.01	-	-	-	-
Triazophos	-	-	0.005	-	-	-	-
Trichlorfon	-	-	0.02	-	-	-	-
Trichloronate	-	-	0.5	-	-	-	-

ALS ANALYTES & LORS LISTING

GROUP ANALYTES	MATRIX / METHOD CODES & LORS							
	Water		Drinking Water		Soil			Sediments
PHENOXY ACID HERBICIDES								
Method Code	EP202	EP202LL	See EP202LL		EP202			
Units	µg/L	µg/L			mg/kg			
2,4,5-T	10	0.01			0.02			
2,4,5-TP	10	0.01			0.02			
2,4,6-T	10	0.1			N/A			
2,4-D	10	0.01			0.02			
2,4-DB	10	0.01			0.02			
2,4-DP	10	0.01			0.02			
2,6-D	10	0.1			N/A			
4-Chlorophenoxyacetic Acid	10	0.01			0.02			
Clopyralid	10	0.05			0.02			
Dicamba	10	0.01			0.02			
MCPA	10	0.01			0.02			
MCPB	10	0.01			0.02			
Mecoprop (MCPP)	10	0.01			0.02			
Fluroxypyr	10	0.05			0.02			
Picloram	10	0.05			0.02			
Triclopyr	10	0.01			0.02			
Bentazone	-	0.01			-			
SYNTHETIC PYRETHROIDS								
Method Code	EP094		EP094LL		EP094			See EP094
Units	µg/L		µg/L		mg/kg			
Allethrin	0.5		-		0.05			
Bifenthrin	0.5		0.2		0.05			
Bioresmethrin	0.5		0.2		0.05			
Cyfluthrin	0.5		0.2		0.05			
Cyhalothrin (Lambda)	0.5		0.2		0.05			
Cypermethrin	0.5		0.2		0.05			
Deltamethrin& Tralomethrin	0.5		0.2		0.05			
Fenvalerate& Esenvalerate	0.5		0.2		0.05			
Permethrin	0.5		0.2		0.05			
Phenothrin	0.5		0.2		0.05			
Tau-fluvalinate	0.5		0.2		0.05			
Tetramethrin	0.5		-		0.05			
Transfluthrin	0.5		-		0.05			
SYNERGIST Piperonyl Butoxide (PBO)	0.5		0.2		0.05			

GROUP / ANALYTES	MATRIX/ METHOD CODES & LORS			
	Abbreviated	Water		Soil
	Name	Standard	Trace	Standard
EXPLOSIVES & MICELLANEOUS ORGANICS				
EXPLOSIVES Method Code		EP0203	EP0203	EP203
Units		µg/L	µg/L	mg/kg
1,3,5-Trinitrobenzene	1,3,5-TNB	20	1	0.1
1,3-Dinitrobenzene	1,3-DNB	20	1	0.1
2,4,6-trinitrotoluene	2,4,6-TNT	20	1	0.1
2,4-Dinitrotoluene	2,4-DNT	20	1	0.1
2,6-Dinitrotoluene	2,6-DNT	20	1	0.1
2,4- & 2,6-DNT(Isomeric Mixture)*	--	20	1	0.1
2-Amino-2,4-dinitrotoluene	2-Am-DNT	20	1	0.1
2-Nitrotoluene	2-NT or o-NT	20	1	0.1
3-Nitrotoluene	3-NT or m-NT	20	1	0.1
4-Amino-2,6-dinitrotoluene	4-Am-DNT	20	1	0.1
4-Am- & 2-Am-DNT (Isomeric Mixture)*	--	20	1	0.1
4-Nitrotoluene	4-NT or p-NT	20	1	0.1
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	20	1	0.1
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	20	1	0.1
Nitrobenzene	NB	20	1	0.1
Nitroglycerine	NG	200	5	1
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	20	1	0.1
Pentaerythritol tetranitrate	PETN	200	5	1
***Results will be replaced as isomeric mixture except where equally high concentrations of both compounds are detected**				
PFOS/PFOA and AFFF				
	Standard	Trace in fresh or saline water		
Method Code	EP231 / EP231PFC	EP231-LL / EP231PFC-LL		EP231/EP231PFC
Units	µg/L	µg/L		mg/kg
Perfluorooctane sulphonate (PFOS)	0.01	0.002		0.0005
Perfluorooctanoic acid (PFOA)	0.01	0.002		0.0005
6:2 Fluorotelomer sulphonate (6:2 FTS)	0.1	0.01		0.005
8:2 Fluorotelomer sulphonate (8:2 FTS)	0.1	0.01		0.001
N-Ethyl-heptadecafluorooctane sulphonamide (N-Et-FOSA)	0.05	0.005		0.001
N-Ethyl-heptadecafluorooctane sulphonamidoethanol (N-Et-FOSE)	1	0.1		0.001
N-Methyl-heptadecafluorooctane sulphonamide (N-Me-FOSA)	0.5	0.05		0.001
N-Methyl-heptadecafluorooctane sulphonamidoethanol (N-Me-FOSE)	1	0.1		0.001
Perfluorobutane sulphonate (PFBS)	0.02	0.002		0.0002
Perfluorodecane sulphonate (PFDcS)	0.02	0.002		0.0002
Perfluorodecanoic acid (PFDcA)	0.02	0.002		0.0002
Perfluorododecanoic acid (PFDoA)	0.05	0.005		0.0002
Perfluoroheptanoic acid (PFHpA)	0.02	0.002		0.0002
Perfluorohexane sulphonate (PFHxS)	0.02	0.002		0.0002
Perfluorohexanoic acid (PFHxA)	0.02	0.002		0.0002
Perfluorononanoic acid (PFNA)	0.02	0.002		0.0002
Perfluorooctane sulphonamide (PFOSA)	0.02	0.002		0.0002
Perfluorotridecanoic acid (PFTriA)	0.05	0.005		0.0002
Perfluorotetradecanoic acid (PFTeA)	0.5	0.05		0.001
Perfluoroundecanoic acid (PFUnA)	0.05	0.005		0.0002

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS			
	Water	Soil		
	Standard	Standard	Full listing	
Units	µg/L	mg/kg	mg/kg	
SEMIVOLATILE ORGANIC COMPOUNDS – USEPA 8270 list				
PHENOLS Method Code	EP075A	EP075A	EP076	
2,4,5-Trichlorophenol	2	0.5	0.5	
2,4,6-Trichlorophenol	2	0.5	0.5	
2,4-Dichlorophenol	2	0.5	0.5	
2,4-Dimethylphenol	2	0.5	0.5	
2,6-Dichlorophenol	2	0.5	0.5	
2-Chlorophenol	2	0.5	0.5	
2-Methylphenol	2	0.5	0.5	
2-Nitrophenol	2	0.5	0.5	
3 & 4-Methylphenol	2	0.5	0.5	
4-Chloro-3-methylphenol	2	0.5	0.5	
Pentachlorophenol	4	1	0.5	
Phenol	2	0.5	0.5	
POLYAROMATIC HYDROCARBONS Method Code	EP075B	EP075B	EP076	
2-Chloronaphthalene	2	0.5	0.5	
2-Methylnaphthalene	2	0.5	0.5	
3-Methylcholanthrene	2	0.5	0.5	
7,12-Dimethylbenz (a)anthracene	2	0.5	0.5	
Acenaphthene	2	0.5	0.5	
Acenaphthylene	2	0.5	0.5	
Anthracene	2	0.5	0.5	
Benzo(a)anthracene	2	0.5	0.5	
Benzo(a)pyrene	2	0.5	0.05	
Benzo(b) & (k) fluoranthene	4	1	0.5	
Benzo(g,h,i)perylene	2	0.5	0.5	
Chrysene	2	0.5	0.5	
Dibenz(a,h)anthracene	2	0.5	0.5	
Fluoranthene	2	0.5	0.5	
Fluorene	2	0.5	0.5	
Indeno(1,2,3-cd)pyrene	2	0.5	0.5	
N-2Fluorenylacetamide	2	0.5	0.5	
Naphthalene	2	0.5	0.5	
Phenanthrene	2	0.5	0.5	
Pyrene	2	0.5	0.5	
Benzo(a)pyrene TEQ (WHO)	2	0.5	0.5	
PHTHALATE ESTERS Method Code	EP75C	EP075C	EP076	
Bis(2-ethylhexyl) adipate	2			
Bis(2-ethylhexyl) phthalate	10	5	0.5	
Butyl benzyl phthalate	2	0.5	0.5	
Di-n-butyl phthalate	2	0.5	0.5	
Di-n-octyl phthalate	2	0.5	0.5	
Diethyl phthalate	2	0.5	0.5	
Dimethyl phthalate	2	0.5	0.5	
NITROSAMINES Method Code	EP075D	EP075D	EP076	

ALS ANALYTES & LORS LISTING

GROUP / ANALYTES		MATRIX / METHOD CODES & LORS			
		Water	Soil		
		Standard	Standard	Full listing	
Diphenylamine & N-Nitrosodiphenylamine		4	1	0.5	
Methapyrilene		2	0.5	0.5	
N-Nitrosodi-n-propylamine		2	0.5	0.5	
N-Nitrosodibutylamine		2	0.5	0.5	
N-Nitrosodiethylamine		2	0.5	0.5	
N-Nitrosomethylethylamine		2	0.5	0.5	
N-Nitrosomorpholine		2	0.5	0.5	
N-Nitrosopiperidine		2	0.5	0.5	
N-Nitrosopyrrolidine		4	1	0.5	
NITROAROMATICS & KETONES	Method Code	EP075E	EP075E	EP076	
1,3,5-Trinitrobenzene		2	0.5	0.5	
1-Naphthylamine		2	0.5	0.5	
2-Picoline		2	0.5	0.5	
2,4-Dinitrotoluene		4	1	0.2	
2,6-Dinitrotoluene		4	1	0.5	
4-Aminobiphenyl		2	0.5	0.5	
4-Nitroquinoline-N-oxide		2	0.5	0.5	
5-Nitro-o-toluidine		2	0.5	0.5	
Acetophenone		2	0.5	0.5	
Azobenzene		2	0.5	0.5	
Chlorobenzilate		2	0.5	0.5	
Dimethylaminoazobenzene		2	0.5	0.5	
Isophorone		2	0.5	0.5	
Nitrobenzene		2	0.5	0.5	
Pentachloronitrobenze		2	0.5	0.5	
Phenacetin		2	0.5	0.5	
Pronamide		2	0.5	0.5	
HALOETHERS	Method Code	EP075F	EP075F	EP076	
4-Bromophenyl phenyl ether		2	0.5	0.5	
4-Chlorophenyl phenyl ether		2	0.5	0.5	
Bis(2-chloroethyl) ether		2	0.5	0.5	
Bis(2-chloroethoxy) methane		2	0.5	0.5	
CHLORINATED HYDROCARBONS	Method Code	EP075G	EP075G	EP076	
1,2,4-Trichlorobenzene		2	0.5	0.5	
1,2-Dichlorobenzene		2	0.5	0.5	
1,3-Dichlorobenzene		2	0.5	0.5	
1,4-Dichlorobenzene		2	0.5	0.5	
Hexachlorobenzene		4	1	0.05	
Hexachlorobutadiene		2	0.5	0.05	
Hexachlorocyclopentadiene		10	2.5	0.5	
Hexachloroethane		2	0.5	0.5	
Hexachloropropylene		2	0.5	0.5	
Pentachlorobenzene		2	0.5	0.5	
ANILINES AND BENZIDINES	Method Code	EP075H	EP075H	EP076	
4-Chloroaniline		2	0.5	0.5	
2-Nitroaniline		4	1	0.5	

GROUP / ANALYTES		MATRIX / METHOD CODES & LORS			
		Water	Soil		
		Standard	Standard	Full listing	
3,3'Dichlorobenzidine		2	0.5	0.5	
3-Nitroaniline		4	1	0.5	
4-Nitroaniline		2	0.5	0.5	
Aniline		2	0.5	0.5	
Carbazole		2	0.5	0.5	
Dibenzofuran		2	0.5	0.5	
ORGANOCHLORINE PESTICIDES	Method Code	EP075I	EP075I	EP076	
	Units	µg/L	mg/kg	mg/kg	
4,4'-DDD		2	0.5	0.05	
4,4-DDE		2	0.5	0.05	
4,4'-DDT		4	1	0.1	
Aldrin		2	0.5	0.05	
alpha-BHC		2	0.5	0.05	
beta & gamma-BHC		2	1	0.05	
delta-BHC		2	0.5	0.05	
Dieldrin		2	0.5	0.05	
Endrin		2	0.5	0.05	
Endosulfan 1		2	0.5	0.05	
Endosulfan 2		2	0.5	0.05	
Endosulfan sulfate		2	0.5	0.05	
Heptachlor		2	0.5	0.05	
Heptachlor epoxide		2	0.5	0.05	
OP PESTICIDES	Method Code	EP075J	EP075J	EP076	
Chlorfenvinphos		2	-	-	
Chlorfenvinphos-E		-	0.5	0.05	
Chlorfenvinphos-Z		-	0.5	0.05	
Chlorpyrifos		2	0.5	0.05	
Chlorpyrifos methyl		2	0.5	0.05	
Diazinon		2	0.5	0.05	
Dichlorvos		2	0.5	0.05	
Dimethoate		2	0.5	0.05	
Ethion		2	0.5	0.05	
Fenthion		2	0.5	0.05	
Malathion		2	0.5	0.05	
Pirimiphos ethyl		2	0.5	0.05	
Prothiofos		2	0.5	0.05	
MISCELLANEOUS	Method Code	EP075K	EP075K	EP076	
1,2,4,5-Tetrachlorobenzene		2	0.5	0.5	
1,3,5-Trichlorobenzene		2	0.5	0.5	
cis-Isosafrole		2	0.5	0.5	
Diallate		2	0.5	0.5	
Methanesulfonate ethyl		2	0.5	0.5	
Methanesulfonate methyl		2	0.5	0.5	
Safrole		2	0.5	0.5	
Tetrachlorophenol		2	0.5	0.5	
trans-Isosafrole		2	0.5	0.5	
K Group is not routinely reported but is available when specific compounds are requested via CoC.					

GROUP / ANALYTES		MATRIX / METHOD CODES & LORS			
		Water	Soil		
		Standard	Standard	Full listing	
SUPER SVOC – additional analytes	Method Code			EP076	
	Units			mg/kg	
1.2.3.4-Tetrachlorobenzene				0.5	
1.2.3-Trichlorobenzene				0.5	
1.2.4-Trichlorobenzene				0.5	
2.3.5.6-Tetrachlorophenol				0.5	
2.3.4.5-Tetrachlorophenol				0.5	
2.3.4.6-Tetrachlorophenol				0.5	
2.3.4-Trichlorophenol				0.5	
2.3.5-Trichlorophenol				0.5	
2.3.6-Trichlorophenol				0.5	
2.3-Dichlorophenol				0.5	
2.5-Dichlorophenol				0.5	
2-Methylanaline				0.5	
3.4.5-Trichlorophenol				0.5	
3-&4-Chlorophenol				0.5	
3.4-Dichlorophenol				0.5	
3.5-Dichlorophenol				0.5	
Azinphos Methyl				0.05	
Bisphenol-A				0.5	
Bromophos-ethyl				0.05	
Carbophenothion				0.05	
cis-Isosafrole				0.5	
cis-Chlordane				0.05	
Demeton-S-methyl				0.05	
Endrin aldehyde				0.05	
Endrin ketone				0.05	
Fenamiphos				0.05	
Methoxychlor				0.2	
Monocrotophos				0.5	
Octachlorostyrene				0.5	
Parathion-methyl				0.2	
Parathion				0.2	
Pyridine				1	
CHLORO-NAPTHALENES					
CHLORINATED NAPHTHALENES	Method Code	EP132C	EP132C		
	Units	µg/L	mg/kg		
1-Chloronaphthalene		0.1	10		
2-Chloronaphthalene		0.1	10		
Chloronaphthalene		0.1	10		
Trichloronaphthalene		0.1	10		
Tetrachloronaphthalene		0.1	10		

ALS ANALYTES & LORS LISTING

GROUP ANALYTES	MATRIX / METHOD CODES & LORS							
					Soil			
PBDEs (Soil) Method Code					EP064			
Units	µg/L	µg/L	µg/L	pg/L	mg/kg	µg/kg	pg/g	µg/kg
DecaBDE (Br10)					0.2			
DiBDE (Br2)					0.05			
HeptaBDE (Br7)					0.05			
HexaBDE (Br6)					0.05			
MonoBDE (Br1)					0.05			
NonaBDE (Br9)					0.2			
OctaBDE (Br8)					0.1			
PentaBDE (Br5)					0.05			
TetraBDE (Br4)					0.05			
TriBDE (Br3)					0.05			
Sum of (Br1 to Br9)					0.05			
Sum of (Br1 to Br10)					0.05			

GROUP ANALYTES	MATRIX / METHOD CODES & LORS			
	Water			Soil
RADIONUCLIDE SCREENS Method Code	EA250			EA250
Units	Bq/L			Bq/kg
Gross alpha (LORs apply to water samples up to a TDS of 400mg/L)	0.05			500
Gross beta (LORs apply to water samples up to a TDS of 400mg/L)	0.10			500
NATURAL RADIONUCLIDES Method Code	EA252			EA252
Ac-227	0.20			1.0
K-40	2.0			10
Pa-231	1.0			5.0
Pb-210	10			50
Ra-223	0.20			1.0
Ra-226	0.20			1.0
Ra-228	0.20			1.0
Th-227	0.20			1.0
Th-228	0.20			1.0
Th-230	10			50
Th-234	2.0			10.0
U-235	0.20			1.0
U-238	-			10.0
ARTIFICIAL RADIONUCLIDES Method Code	EA253			EA253
Cs-134	0.050			1.0
Cs-137	0.050			1.0
I-131	0.050			1.0
RADIUM 226 and RADIUM 228 Method Code	EA251			EA251
Radium 226	0.2			1.0
Radium 228	0.2			1.0

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS							
	Water		Drinking Water		Soil			Sediments
	Standard	Trace	UltraTrace	Super UT	Standard	Trace	Ultra Trace	
CARBAMATES & THIOCARBAMATES								
Method Code	EP201	See EP234B	EP234B	EP234LL	EP201			See EP201
Units	µg/L		µg/L	µg/L	mg/kg	µg/kg		µg/kg
3-Hydroxyl Carbofuran	0.2		0.02	-	0.02			
Aldicarb	0.2		0.05	-	0.02			
Bendiocarb	0.2		0.01	-	0.02			
Benomyl	-		0.02	-				
Carbaryl	0.2		0.02	-	0.02			
Carbofuran	0.2		0.01	-	0.02			
Methiocarb	0.2		0.01	-	0.02			
Methomyl	0.2		0.01	-	0.02			
Molinate	-		0.1	-				
Oxamyl	0.2		0.01	-	0.02			
Thiobencarb	-		0.01	0.0002				
Thiodicarb	0.2		0.01	-	0.02			
OTHER HERBICIDES and DITHIOCARBAMATES								
Units	µg/L	µg/L	µg/L		mg/kg			
QUATERNARY AMMONIUM HERBICIDES								
Method Code	EP205							
Diquat	0.05							
Paraquat	0.1							
Glyphosate Method Code	EP204	EP204LL	EP236					
Glyphosate	10	1	0.1					
AMPA	10	1	0.1					
Sulfonylurea Method Code	EP206	EP206LL						
Metsulfuron Methyl	5	0.1						
MISCELLANEOUS PESTICIDES								
Method Code	EP068D				EP068D			
Cypermethrins (total)	2				0.2			
Method Code	EP068E				EP068E			
Methoprene	0.5				0.5			
DITHIOCARBAMATES Method Code	EP126		See EP126					
Ferbam	-							
Mancozeb	-							
Maneb	-							
Metham-Sodium	-							
Metiram	-							
Nabam	-							
Propineb	-							
Thiram	-							
Zineb	-							
Ziram	-							
Sum of Dithiocarbamates as CS_2	1							

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS							
	Water		Drinking Water		Soil			
	Standard	Trace	UltraTrace	Super UT	Standard	Trace	Ultra Trace	
Units	µg/L	µg/L	µg/L	µg/L	mg/kg			
MULTIRESIDUE PESTICIDES SUITES								
OP PESTICIDES (Organophosphate Pesticides)								
Method Code	EP234A	EP215	EP234A	EP234LL	EP234			
Azinphos-ethyl	0.02	-	0.02	-	0.01			
Azinphos-methyl	0.02	-	0.02	-	0.01			
Bromophos-ethyl	0.1	-	0.1	-	-			
Carbophenothion	0.02	-	0.02	-	-			
Chlorfenvinphos	0.02	-	0.02	-	0.01			
Chlorfenvinphos E	-	-	-	-	-			
Chlorfenvinphos Z	-	-	-	-	-			
Chlorpyrifos	0.02	0.005	0.02	0.001	-			
Chlorpyrifos-methyl	0.2	-	0.2	-	0.05			
Coumaphos	0.01	-	0.01	-	0.01			
Demeton-O & Demeton-S	0.02	-	0.02	-	0.1			
Demeton-S-methyl	0.02	-	0.02	-	0.01			
Diazinon	0.01	0.005	0.01	0.0002	0.01			
Dichlorvos	0.2	-	0.2	-	-			
Dimethoate	0.02	-	0.02	-	0.01			
Disulfoton	0.05	-	0.05	-	0.01			
Ethion	0.02	-	0.02	-	-			
Ethoprophos	0.01	-	0.01	-	0.01			
Fenamiphos	0.01	-	0.01	-	0.01			
Fenchlorphos (Ronnel)	10	-	10	-	-			
Fenitrothion	2	-	2	-	0.5			
Fensulfothion	0.01	-	0.01	-	0.01			
Fenthion	0.05	-	0.05	-	0.01			
Malathion	0.02	0.002	0.02	0.001	0.01			
Mevinphos	0.02	-	0.02	-	0.01			
Monocroptophos	0.02	-	0.02	-	0.01			
Omethoate	0.01	-	0.01	-	0.01			
Parathion	0.2	-	0.2	-	0.05			
Parathion-methyl	2	-	2	-	0.5			
Phorate	0.1	-	0.1	-	0.02			
Pirimiphos-methyl	0.01	-	0.01	0.0002	0.01			
Pirimphos-ethyl	0.01	-	0.01	-	-			
Profenofos	0.01	-	0.01	-	-			
Prothiofos	0.1	-	0.1	-	-			
Sulfotep	0.005	-	0.005	0.0002	0.01			
Sulprofos	0.05	-	0.05	-	-			
Temephos	0.02	-	0.02	0.001	-			
Terbufos	0.01	-	0.01	-	-			
Tetrachlorvinphos	0.01	-	0.01	-	0.01			
Triazophos	0.005	-	0.005	-	0.01			
Trichlorfon	0.02	-	0.02	-	0.01			
Trichloronate	0.5	-	0.5	-	-			
Carbamates & Thiocarbamates					**Carbamates & Thiocarbamates**			
Method Code	EP234B	EP215	EP234B	EP234LL	EP234			
Units	µg/L	µg/L	µg/L	µg/L	mg/kg			

3-Hydroxyl Carbofuran	0.02	-	0.02	-	-			
Aldicarb	0.05	-	0.05	-	0.01			
Bendiocarb	0.01	-	0.01	-	1			
Benomyl	0.02	-	0.02	-	0.01			
Carbaryl	0.02	-	0.02	-	0.01			
Carbofuran	0.01	-	0.01	-	0.01			
Methiocarb	0.01	-	0.01	-	0.01			
Methomyl	0.01	-	0.01	-	0.01			
Molinate	0.1	0.005	0.1	-	0.02			
Oxamyl	0.01	-	0.01	0.0002	0.01			
Thiobencarb	0.01	0.005	0.01	-	0.01			
Thiodicarb	0.01	-	0.01	-	0.01			
Dinitroanilines								
Method Code	EP234C	EP215	EP234C	EP234LL	EP234			
Units	µg/L	µg/L	µg/L	µg/L	mg/kg			
Pendimethalin	0.05	-	0.05	0.001	-			
Trifluralin	10	0.005	10	-	-			
Triazinone Herbicides								
Method Code	EP234D		EP234D	EP234LL	EP234			
Units	µg/L		µg/L	µg/L	mg/kg			
Hexazinone	0.02	-	0.02	0.0002	0.01			
Metribuzine	0.02	-	0.02		0.01			
Conazole, Triazole & Aminopyrimidine Fungicides								
Method Code	EP234E		EP234E	EP234LL	EP234			
Units	µg/L		µg/L	µg/L	mg/kg			
Cyproconazole	0.02	-	0.02	-	0.01			
Cyprodinil	0.01	-	0.01	-	0.01			
Difenoconazole	0.02	-	0.02	0.0002	-			
Flusilazole	0.02	-	0.02	0.0002	0.01			
Hexaconazole	0.02	-	0.02	0.0002	0.01			
Paclobutrazole	0.05	-	0.05	-	0.01			
Penconazole	0.01	-	0.01	0.0002	0.01			
Propiconazole	0.05	-	0.05	0.0002	0.01			
Pyrimethanil	0.02	-	0.02	-	0.01			
Tebuconazole	0.01	-	0.01	0.0002	0.01			
Phenylurea, Thiaziadolurea, Uracil & Sulfonyl Urea Herbicides								
Method Code	EP234F	EP215	EP234F	EP234LL	EP234			
Units	µg/L	µg/L	µg/L	µg/L	mg/kg			
Bromacil	0.02	-	0.02	-	0.01			
Chlorsulfuron	0.2	-	0.2	-	0.05			
Diuron	0.02	0.005	0.02	0.0002	0.01			
Fluometuron	0.01	-	0.01	-	0.01			
Tebuthiuron	0.02	-	0.02	-	0.01			
Chloracetanilides								
Method Code	EP234G	EP215	EP234G	EP234LL	EP234			
Units	µg/L	µg/L	µg/L	µg/L	mg/kg			
Metolachlor	0.01	0.005	0.01	0.001	0.01			
Triazine Herbicides								
Method Code	EP234H	EP215	EP234H	EP234LL	EP234			
Units	µg/L	µg/L	µg/L	µg/L	mg/kg			
Ametryn	0.01	-	0.01	0.0002	0.01			
Atrazine	0.01	0.005	0.01	0.0002	0.01			

Cyanazine	0.02	-	0.02	0.0002	0.01				
Cyromazine	0.05	-	0.05	-	0.01				
Irgarol	0.002	-	0.002	-	0.01				
Prometryn	0.01	-	0.01	0.0002	0.01				
Propazine	0.01	-	0.01	0.0002	0.01				
Simazine	0.02	0.005	0.02	0.0002	0.01				
Terbuthylazine	0.01	-	0.01	0.0002	0.01				
Terbutryn	0.01	-	0.01	0.0002	0.1				
Miscellaneous ESI Positive Pesticides									
Method Code	EP234I		EP234I		EP234				
Units	µg/L		µg/L		mg/kg				
Diclofop-methyl	0.05		0.05		-				
EPN	0.05		0.05		-				
Fenarimol	0.02		0.02		0.01				
Oxyfluorfen	1		1		-				
Thiamethoxam	0.02		0.02		0.01				
Miscellaneous ESI Negative Pesticides									
Method Code	EP234J		EP234J						
Units	µg/L		µg/L						
Asulam	2		2						
Brodifacoum	0.05		0.05						
Bromoxynil	0.05		0.05						
Chlorothalonil	2		2						
Diflufenican	0.02		0.02						
Fipronil	0.01		0.01						
Iprodione	0.05		0.05						
Oryzalin	0.05		0.05						

ALS ANALYTES & LORS LISTING

GROUP ANALYTES	MATRIX / METHOD CODES & LORS
STEROIDS & PHARMACEUTICAL PERSONAL CARE PRODUCTS	
STEROIDS – A Method Code	EP240A
Units	ng/L
19-Norethindrone	3
Progesterone	1
Testosterone	1
STEROIDS – B Method Code:	EP240B
Units	ng/L
17α-Estradiol	3
17β-Estradiol	3
17α-Ethynylestradiol	1
Equilenin	1
Equilin	1
Estriol	1
Estrone	1
PPCP - A Method Code:	EP241A
Units	µg/L
1,7-dimethylxanthine	0.5
Azithromycin	40
Bezafibrate	1
Caffeine	0.3
Carbamazepine	1
Ciprofloxacin	2
Clarithromycin	10
Clindamycin	1
Coumarin	1
Diazepam	0.5
Enrofloxacin	40
Erythromycin	1
Ifosfamide	0.5
Indomethacin	1
Ketoprofen	0.5
Lincomycin	0.5
Methotrexate	1
Metoprolol	1
Nalidixic acid	1
Norfloxacin	1
Paracetamol	1
Roxithromycin	40
Sulfadimethoxine	1
Sulfamethazine	1
Sulfamethizole	1
Sulfamethoxazole	1
Tolefanamic Acid	1
Trimethoprim	1
Tylosin	40

GROUP ANALYTES	MATRIX / METHOD CODES & LORS
STEROIDS & PHARMACEUTICAL PERSONAL CARE PRODUCTS	
PPCP – B Method Code	EP241B
Units	µg/L
Bezafibrate	1
Chloramphenicol	1
Chlorophene	0.3
Clofibric Acid	1
Diclofenac	1
Gemfibrozil	1
Ibuprofen	2
Tolfenamic Acid	1
Triclosan	0.3
TETRACYCLINES Method Code	EP242
Units	µg/L
Chlorotetracycline	1
Demeclocycline	1
Doxycycline	1
Oxytetracycline	1
Tetracycline	1
POTENTIAL ENDOCRINE DISRUPTING COMPOUNNDS PHENOLS	
Method Code	EP244
Units	µg/L
4 Tert Octyl Phenol	2
Bisphenol A	2
Diethylstilbestrol	2
Nonyl-phenol (4-N-nonylphenol)	2
SAXITOXINS Method Code:	EP263
Units	µg/L
Decarbamoylgonyautoxin-2 (deGTX2)	2
Decarbamoylgonyautoxin-3 (deGTX3)	0.5
Gonyautoxin-2 (GTX2)	2
Gonyautoxin-3 (GTX3)	1
Neosaxitoxin	0.5
N-sulfocarbamoyl-gonyautoxin-2 (C1)	2
N-sulfocarbamoyl-gonyautoxin-3 (C2)	1
Saxitoxin (STX)	1
Other Algal Toxins	
Method Code:	EP248
Units	µg/L
Anatoxin-a	0.1
Cylindrospermopsin	0.05
Deoxycylindrospermopsim	0.05

ALS ANALYTES & LORS LISTING

GROUP ANALYTES		MATRIX / METHOD CODES & LORS
DISINFECTION BY-PRODUCTS		Drinking Water
TRIHALOMETHANES	Method Code:	EP074G
Units		µg/L
Chloroform		5
Bromodichloromethane		5
Bromoform		5
Dibromochloromethane		5
Total Trihalomethanes		5
CHLOROACETIC ACIDS	Method Code:	EP120-1
Units		µg/L
Monochloroacetic Acid		1
Dichloroacetic Acid		1
Trichloroacetic Acid		1
EPICHLOROHYDRIN	Method Code:	EP081
Units		mg/L
Epichlorohydrin		0.00005
ALDEHYDES	Method Code:	EP121
Units		µg/L
Formaldehyde		2
Acetaldehyde		2
Propionaldehyde		2
Acrolein (Propenal)		2
Butyraldehyde		2
HALOACETIC ACIDS	Method Code	EP120
	Units	µg/L
Monochloroacetic Acid		1
Dichloroacetic Acid		1
Trichloroacetic Acid		1
Bromoacetic Acid		5
Bromochloroacetic Acid		1
Bromodichloroacetic Acid		1
Dibromoacetic Acid		1
Dibromochloroacetic Acid		10
Tribromoacetic Acid		10
Specialist Organics, Phenols & Dalapon		
	Method Code	EP247
2,4-Dinitrophenol		0.01
2-Methyl-4.6-dinitrophenol		0.05
4-Nonylphenol (mixture of isomers)		0.1
Hexachlorophene		0.1
4-Nitrophenol		0.1
4-Chloro-3-methylphenol		0.1
Pentachlorophenol		0.1
Dinoseb		0.1
Dalapon		0.1
Bisphenol-A		0.05

GROUP ANALYTES		MATRIX / METHOD CODES & LORS
DISINFECTION BY-PRODUCTS		Drinking Water
NITROSAMINES	Method Code:	EP239
Units		µg/L
N-Nitrosodimethylamine (NDMA)		0.003
N-Nitrosomethylethylamine (NMEA)		0.003
N-Nitrosodiethylamine (NDEA)		0.01
N-Nitrosodi-n-propylamine (NDPA)		0.003
1-Nitrosopiperidine (NPip)		0.003
Nitrosomorpholine (NMorA)		0.003
1-Nitrosopyrrolidine (NPyr)		0.01
NDBA	Method Code:	EP239B
Units		µg/L
N-Nitrodosi-n-butylamine (NDBA)		0.02
Volatile Disinfection byproducts	Method Code:	EP239
Units		mg/L
Haloacetonitriles		
Chloroacetonitrile		0.005
Dichloroacetonitrile		0.005
Trichloroacetonitrile		0.005
Bromoacetonitrile		0.005
Bromochloroacetonitrile		0.005
Dibromoacetonitrile		0.005
Chlorinated Propanones		
1,1-Dichloro-2-propanone		0.005
1,3-Dichloro-2-propanone		0.005
1,1,3-Trichloro-2-propanone		0.005
1,1,1-Trichloro-2-propanone		0.005
Chloronitromethanes		
Chloropicrin		0.005
Other Volatile DBPs		
Chloral hydrate		0.005
Trichloroacetaldehyde		0.005
MISCELLANEOUS ORGANICS	Method Code:	EP200
	Units	µg/L
Octyl Phenol Ethoxylates		5
Nonyl Phenol Ethoxylates		5
Nonylphenol monoethoxylate (mixture of isomers)		
Nonylphenol diethoxylate (mixture of isomers)		
Nonylphenol triethoxylate (mixture of isomers)		
Nonylphenol tetraethoxylate (mixture of isomers)		
Nonylphenol Ethoxylates	Method Code:	EP260
	Units	µg/L
Nonylphenol monoethoxylate		100
Nonylphenol diethoxylate		100
Nonylphenol triethoxylate		100
Nonylphenol tetraethoxylate		100

GROUP ANALYTES	MATRIX / METHOD CODES & LORS						
DIOXINS, FURANS and PCBS and PBDEs BY HR/GC/MS							
PCDDs (POLYCHLORINATED DIBENZO-P-DIOXINS) by HRMS							
Method Code	EP300				EP300		
Units	pg/L				pg/g		
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)	5				0.5		
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin (PeCDD)	25				2.5		
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD)	25				2.5		
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD)	25				2.5		
1,2,3,7,8,9-Hexachloroibenzo-*p*-dioxin (HxCDD)	25				2.5		
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (HpCDD)	25				2.5		
Octachlorodibenzo-*p*-dioxin (OCDD)	100				10.0		
POLYCHLORINATED DIBENZOFURANS (PCDFs) by HRMS							
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	5				0.5		
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	25				2.5		
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	25				2.5		
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	25				2.5		
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	25				2.5		
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	25				2.5		
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	25				2.5		
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	25				2.5		
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	25				2.5		
Octachlorodibenzofuran (OCDF)	50				5.0		
Total Tetrachlorodibenzo-*p*-dioxin (TCDD)	5				0.5		
Total Pentachlorodibenzo-*p*-dioxin (PeCDD)	25				2.5		
Total Hexachlorodibenzo-*p*-dioxin (HxCDD)	25				2.5		
Total Heptachlorodibenzo-*p*-dioxin (HpCDD)	25				2.5		
Octachlorodibenzo-*p*-dioxin (OCDD)	100				10		
Total Tetrachlorodibenzofuran (TCDF)	5				0.5		
Total Pentachlorodibenzofuran (PeCDF)	25				2.5		
Total Hexachlorodibenzofuran (HxCDF)	25				2.5		
Total Heptachlorodibenzofuran (HpCDF)	25				2.5		
Octachlorodibenzofuran (OCDF)	50				5.0		
Σ TEQ (I-TEQ) LOR	50.1				5.01		
Σ TEQ (WHO-TEQ) LOR	62.5				6.25		
PCBs by HRMS Method Code	EP301				EP301		
Units	pg/L				pg/g		
PCB 77	5.0				2.5		
PCB 81	2.0				1.0		
PCB 105	2.0				1.0		
PCB 114	2.0				1.0		
PCB 118	10.0				-		
PCB 123	2.0				5.0		
PCB 126	2.0				1.0		
PCB 156	2.0				1.0		
PCB 157	2.0				-		
PCB 168	2.0				-		
PCB 169	2.0				1.0		
PCB 189	2.0				1.0		
Σ TEQ (WHO-TEQ) LOR	0.23				0.11		
TRACE PBDES by HRMS Method Code — MDL^{EPA}	LOQ						
Units — pg/L	Pg/sample						

BR2-DPE-7	6	8						
BR2-DPE-8/11	15	16						
BR2-DPE-10	10	8						
BR2-DPE-12/13	6	16						
BR2-DPE-15	4	8						
BR3-DPE-17/25	11	16						
BR3-DPE-28/33	10	16						
BR3-DPE-30	5	8						
BR3-DPE-32	6	8						
BR3-DPE-35	11	8						
BR3-DPE-37	4	8						
BR4-DPE-47	32	8						
BR4-DPE-49	11	8						
BR4-DPE-51	4	8						
BR4-DPE-66	10	8						
BR4-DPE-71	10	8						
BR4-DPE-75	5	8						
BR4-DPE-77	6	8						
BR4-DPE-79	8	8						
BR5-DPE-85	12	12						
BR5-DPE-99	30	12						
BR5-DPE-100	20	12						
BR5-DPE-105	16	12						
BR5-DPE-116	18	12						
BR5-DPE-118	30	12						
BR5-DPE-119/120	8	24						
BR5-DPE-126	12	12						
BR6-DPE-128	22	16						
BR6-DPE-138/166	9	32						
BR6-DPE-140	12	16						
BR6-DPE-153	12	16						
BR6-DPE-154	20	16						
BR6-DPE-155	14	16						
BR6-DPE-156	n/a	16						
BR7-DPE-181	30	20						
BR7-DPE-183	16	20						
BR7-DPE-184	n/a	20						
BR7-DPE-190	30	20						
BR7-DPE-191	n/a	20						
BR8-DPE-196	n/a	20						
BR8-DPE-197	n/a	20						
BR8-DPE-203	14	20						
BR9-DPE-206	80	80						
BR9-DPE-207	50	80						
BR9-DPE-208	60	80						
BR10-DPE-209	200	80						
Pentabromoethylbenzene [PBEB]	5	8						
Hexabromobenzene [HBB]	11	8						

GROUP ANALYTES	MATRIX / METHOD CODES & LORS					
	Ambient Air		Soil Gas / Landfill Gas		Passive Samplers	Occ Hygiene
VOLATILE ORGANICS	**PASSIVATED (STEEL) CANISTERS**				**CHARCOAL SORBENTS**	
Method Code	EP101 (-14, -15, -15X)		EP101 (-14, -15, -15X)-SG		EP091	
Units	ppbv	µg/m³	ppmv	mg/m³	µg	µg
Freon 12	0.5	2.5	0.05	0.25	-	-
Chloromethane	0.5	1.0	0.05	0.10	-	-
Freon 114	0.5	3.5	0.05	0.35	-	-
Vinyl chloride	0.5	1.3	0.002	0.005	2	2
Bromomethane	0.5	1.9	0.05	0.19	2	2
Chloroethane	0.5	1.3	0.05	0.13	-	-
Freon 11	0.5	2.8	0.05	0.28	1	1
1.1-Dichloroethene	0.5	2.0	0.05	0.20	-	-
Dichloromethane	0.5	1.7	0.05	0.17	-	-
Freon 113	0.5	3.8	0.05	0.38	-	-
1.1-Dichloroethane	0.5	2.0	0.05	0.20	0.5	0.5
cis-1.2-Dichloroethene	0.5	2.0	0.005	0.02	0.5	0.5
Chloroform	0.5	2.4	0.05	0.24	0.5	0.5
1.2-Dichloroethane	0.5	2.0	0.05	0.20	0.5	0.5
1.1.1-Trichloroethane	0.5	2.7	0.05	0.27	0.5	0.5
Benzene	0.5	1.6	0.030	0.10	0.5	0.5
Carbon Tetrachloride	0.5	3.1	0.05	0.31	0.5	0.5
1.2-Dichloropropane	0.5	2.3	0.05	0.23	0.5	0.5
Trichloroethene	0.5	2.7	0.001	0.005	0.5	0.5
cis-1.3-Dichloropropylene	0.5	2.3	0.05	0.23	0.5	0.5
trans-1.3-Dichloropropene	0.5	2.3	0.05	0.23	0.5	0.5
1.1.2-Trichloroethane	0.5	2.7	0.05	0.27	0.5	0.5
Toluene	0.5	1.9	0.05	0.19	0.5	0.5
1.2-Dibromoethane (EDB)	0.5	3.8	0.05	0.38	0.5	0.5
Tetrachloroethene	0.5	3.4	0.05	0.34	0.5	0.5
Chlorobenzene	0.5	2.3	0.05	0.23	0.5	0.5
Ethylbenzene	0.5	2.2	0.05	0.22	0.5	0.5
meta- & para-Xylene	1	4.3	0.05	0.43	1.0	1.0
Styrene	0.5	2.1	0.05	0.21	0.5	0.5
1.1.2.2-Tetrachloroethane	0.5	3.4	0.05	0.34	0.5	0.5
ortho-Xylene	0.5	2.2	0.05	0.22	0.5	0.5
4-Ethyltoluene	0.5	2.4	0.05	0.24	-	-
Total Xylenes	1.5	6.5	0.15	0.65	1.5	1.5
1.3.5-Trimethylbenzene	0.5	2.4	0.05	0.24	0.5	0.5
1.2.4-Trimethylbenzene	0.5	2.4	0.05	0.24	0.5	0.5
1.3-Dichlorobenzene	0.5	3.0	0.05	0.30	0.5	0.5
Benzylchloride	0.5	2.6	0.05	0.26	-	-
1.4-Dichlorobenzene	0.5	3.0	0.05	0.30	0.5	0.5

GROUP ANALYTES	MATRIX / METHOD CODES & LORS					
	Ambient Air		Soil Gas / Landfill Gas		Passive Samplers	Occ Hygiene
VOLATILE ORGANICS	**PASSIVATED (STEEL) CANISTERS**				**CHARCOAL SORBENTS**	
1.2-Dichlorobenzene	0.5	3.0	0.05	0.30	0.5	0.5
1.2.4-Trichlorobenzene	0.5	3.7	0.05	0.37	0.5	0.5
Hexachlorobutadiene	0.5	5.3	0.05	0.53	0.5	0.5
Method Code	EP101 (-15, -15X)		EP101 (-15, -15X)-SG		EP091	
Units	ppbv	µg/m³	ppmv	mg/m³	µg	µg
Acetone	0.5	1.2	0.05	0.12	0.5	0.5
Bromodichloromethane	0.5	3.4	0.05	0.34	0.5	0.5
1.3-Butadiene	0.5	1.1	0.05	0.11	-	-
Carbon disulfide	0.5	1.6	0.05	0.16	-	-
2-Chlorotoluene	0.5	2.6	0.05	0.26	0.5	0.5
1-Chloro-2-propene (Allyl chloride)	0.5	1.6	0.05	0.16	-	-
Cyclohexane	0.5	1.7	0.05	0.17	0.5	0.5
Dibromochloromethane	0.5	4.3	0.05	0.43	0.5	0.5
1.4-Dioxane	0.5	1.8	0.05	0.18	-	-
Ethylacetate	0.5	1.8	0.05	0.18	-	-
trans-1.2-Dichloroethene	0.5	2.0	0.05	0.20	0.5	0.5
Heptane	0.5	2.0	0.05	0.20	0.5	0.5
Hexane	0.5	1.8	0.05	0.18	0.5	0.5
Isooctane	0.5	2.3	0.05	0.23	0.5	0.5
Isopropyl Alcohol	0.5	1.2	0.05	0.12	-	-
2-Butanone (MEK)	0.5	1.5	0.05	0.15	0.5	0.5
Methyl iso-Butyl ketone	0.5	2.0	0.05	0.20	0.5	0.5
2-Hexanone (MBK)	0.5	2.0	0.05	0.20	0.5	0.5
Propene	0.5	0.9	0.05	0.09	-	-
Methyl tert-Butyl Ether (MTBE)	0.5	1.8	0.05	0.18	-	-
Tetrahydrofuran	0.5	1.5	0.05	0.15	-	-
Bromoform	0.5	5.2	0.05	0.52	0.5	0.5
Vinyl Acetate	0.5	1.8	0.05	0.18	-	-
Vinyl bromide	0.5	2.2	0.05	0.22	-	-
Method Code	EP101 (-15X)		EP101 (-15X)-SG		EP091	
Units	ppbv	µg/m³	ppmv	mg/m³	µg	µg
Ethanol	0.5	0.9	0.05	0.090	-	-
Acetonitrile	0.5	0.8	0.05	0.080	-	-
Acrolein	0.5	1.1	0.05	0.110	-	-
Acrylonitrile	0.5	1.1	0.05	0.110	-	-
tert-Butyl alcohol	0.5	1.5	0.05	0.150	-	-
2-Chloro-1.3-butadiene	0.5	1.8	0.05	0.180	-	-
Di-isopropyl Ether	0.5	2.1	0.05	0.210	-	-
Ethyl tert-Butyl Ether (ETBE)	0.5	2.1	0.05	0.210	-	-
tert-Amyl Methyl Ether (TAME)	0.5	2.1	0.05	0.210	-	-

ALS ANALYTES & LORS LISTING

GROUP ANALYTES	MATRIX / METHOD CODES & LORS					
	Ambient Air		Soil Gas / Landfill Gas		Passive Samplers	Occ Hygiene
VOLATILE ORGANICS	**PASSIVATED (STEEL) CANISTERS**				**CHARCOAL SORBENTS**	
Methyl Methacrylate	0.5	2.1	0.05	0.210	-	-
1.1.1.2-Tetrachloroethane	0.5	3.4	0.05	0.340	0.5	0.5
Isopropylbenzene	0.5	2.4	0.05	0.250	0.5	0.5
n-Propylbenzene	0.5	2.4	0.05	0.250	0.5	0.5
tert-Butylbenzene	0.5	2.7	0.05	0.270	0.5	0.5
sec-Butylbenzene	0.5	2.7	0.05	0.270	0.5	0.5
2-isopropyltoluene	0.5	2.7	0.05	0.270	-	-
n-Butylbenzene	0.5	2.7	0.05	0.270	0.5	0.5
Naphthalene	0.5	2.6	0.019	0.100	0.5	0.5
HYDROCARBONS						
Method Code	EP101-H		EP101-HSG		EP091	
Units	ppbv	µg/m³	ppmv	mg/m³	µg	µg
Propene	0.5	0.9	0.05	0.09	-	-
Propane	0.5	0.9	0.05	0.09	-	-
2-Methylpropane	0.5	1.2	0.05	0.12	-	-
1-Butene	0.5	1.1	0.05	0.11	-	-
n-Butane	0.5	1.2	0.05	0.12	-	-
trans-2-Butene	0.5	1.1	0.05	0.11	-	-
cis-2-Butene	0.5	1.1	0.05	0.11	-	-
2-Methylbutane	0.5	1.5	0.05	0.15	-	-
1-Pentene	0.5	1.4	0.05	0.14	-	-
n-Pentane	0.5	1.5	0.05	0.14	-	-
trans-2-Pentene	0.5	1.4	0.05	0.13	-	-
cis-2-Pentene	0.5	1.4	0.05	0.14	-	-
2-Methyl-1.3-butadiene	0.5	1.3	0.05	0.13	-	-
2.2-Dimethylbutane	0.5	1.8	0.05	0.18	-	-
2.3-Dimethylbutane	0.5	1.8	0.05	0.18	-	-
2-Methylpentane	0.5	1.8	0.05	0.18	-	-
Cyclopentane	0.5	1.4	0.05	0.14	-	-
3-Methylpentane	0.5	1.8	0.05	0.18	-	-
1-Hexene	0.5	1.7	0.05	0.17	-	-
n-Hexane	0.5	1.8	0.05	0.18	0.5	0.5
2.4-Dimethylpentane	0.5	2	0.05	0.2	-	-
Methylcyclopentane	0.5	1.7	0.05	0.17	-	-
2-Methylhexane	0.5	2	0.05	0.2	-	-
2.3-Dimethylpentane	0.5	2	0.05	0.2	-	-
Cyclohexane	0.5	1.7	0.05	0.17	0.5	0.5
3-Methylhexane	0.5	2	0.05	0.2	-	-
Isooctane	0.5	2.3	0.05	0.23	0.5	0.5
Benzene	0.5	1.6	0.03	0.1	0.5	0.5

ALS ANALYTES & LORS LISTING

GROUP ANALYTES	MATRIX / METHOD CODES & LORS					
	Ambient Air		Soil Gas / Landfill Gas		Passive Samplers	Occ Hygiene
VOLATILE ORGANICS	**PASSIVATED (STEEL) CANISTERS**				**CHARCOAL SORBENTS**	
n-Heptane	0.5	2	0.05	0.2	0.5	0.5
Methylcyclohexane	0.5	2	0.05	0.2	-	-
2.3.4-Trimethylpentane	0.5	2.3	0.05	0.23	-	-
2-Methylheptane	0.5	2.3	0.05	0.23	-	-
3-Methylheptane	0.5	2.3	0.05	0.23	-	-
n-Octane	0.5	2.3	0.05	0.23	0.5	0.5
Toluene	0.5	1.9	0.05	0.19	0.5	0.5
n-Nonane	0.5	2.6	0.05	0.26	0.5	0.5
Ethylbenzene	0.5	2.2	0.05	0.22	0.5	0.5
meta- & para-Xylene	1	4.3	0.1	0.43	1	1
ortho-Xylene	0.5	2.2	0.05	0.22	0.5	0.5
Styrene	0.5	2.1	0.05	0.21	0.5	0.5
Isopropylbenzene	0.5	2.4	0.05	0.24	0.5	0.5
n-Propylbenzene	0.5	2.4	0.05	0.24	0.5	0.5
2-Ethyltoluene	0.5	2.4	0.05	0.24	-	-
n-Decane	0.5	2.9	0.05	0.29	0.5	0.5
4-Ethyltoluene	0.5	2.5	0.05	0.24	-	-
1.3.5-Trimethylbenzene	0.5	2.4	0.05	0.24	0.5	0.5
3-Ethyltoluene	0.5	2.4	0.05	0.24	-	-
1.2.4-Trimethylbenzene	0.5	2.4	0.05	0.24	0.5	0.5
1.2.3-Trimethylbenzene	0.5	2.4	0.05	0.24	-	-
1.4-Diethylbenzene	0.5	2.7	0.05	0.27	-	-
1.3-Diethylbenzene	0.5	2.7	0.05	0.27	-	-
n-Undecane	0.5	3.2	0.05	0.32	-	-
n-Dodecane	0.5	3.5	0.05	0.35	-	-
Naphthalene	0.5	2.6	0.02	0.26	0.5	0.5
SULPHUR GASES IN PASSIVATED CANISTERS						
Method Code	EP101-S		EP101-S			
Units	ppbv	µg/m³	ppmv	mg/m³		
Hydrogen Sulphide	20	30	0.05	0.08	-	-
Carbonyl Sulfide	5	10	0.05	0.10	-	-
Dimethyl Sulfide	0.5	1.0	0.005	0.01	-	-
Carbon disulfide	0.5	1.8	0.005	0.02	-	-
Methanethiol	5	10	0.05	0.10	-	-
Ethanethiol	5	10	0.05	0.10	-	-
TPH						
Method Code	EP103-PH		EP103-PSG		EP091-S	
Units	ppbv	µg/m³	ppmv	mg/m³	µg	µg
C6 - C9 Fraction	50	200	5	20	50	200
C10 - C14 Fraction	50	350	5	35	50	350

ALS ANALYTES & LORS LISTING

GROUP ANALYTES	MATRIX / METHOD CODES & LORS					
	Ambient Air		Soil Gas / Landfill Gas		Passive Samplers	Occ Hygiene
VOLATILE ORGANICS	**PASSIVATED (STEEL) CANISTERS**				**CHARCOAL SORBENTS**	
C6 - C10 Fraction	50	200	5	20	50	200
C6 - C10 Fraction minus BTEX (F1)	50	200	5	20	50	200
>C10 - C16 Fraction	50	400	5	40	50	400
>C10 - C16 Fraction minus Naphthalene (F2)	50	400	5	40	50	400
TRH SPECIATION CWG - Volatile Method Code	EP103-S		EP103-SSG		EP091-S	
Aliphatic >C5-C6	50	165	5	16.5	50	165
Aliphatic >C6-C8	50	200	5	20	50	200
Aliphatic >C8-C10	50	250	5	25	50	250
Aliphatic >C10-C12	50	300	5	30	50	300
Aromatic >C5-C7	0.5	1.6	0.05	0.16	0.5	1.6
Aromatic >C7-C8	0.5	1.9	0.05	0.19	0.5	1.9
Aromatic >C8-C10	2.5	12.5	0.25	1.25	2.5	12.5
Aromatic >C10-C12	5	25	0.5	2.5	5	25
TRH SPECIATION CWG Semi Vol' Method Code			EP103-SV[PN]			
Aliphatic >C12-C16			10	81		
Aliphatic >C16-C21			25	274		
Aromatic >C12-C16			5	37		
Aromatic >C16-C21			5	50		
Light Hydrocarbons and Gases Method Code	EP104G	EP104				
Units	%	ppmV	%	ppmV		
Helium	0.005	50	0.005	50		
Oxygen	0.1	1000	0.1	1000		
Carbon Dioxide	0.005	50	0.005	50		
Carbon Monoxide	0.0005	5	0.0005	5		
Hydrogen	0.005	50	0.005	50		
Inert Gases (Nitrogen+Argon calc' by difference)	0.1	1000	0.1	1000		
Methane			0.05	500		
Ethane			0.01	100		
Ethene			0.01	100		
Propane			0.01	100		
Propene			0.01	100		
1-Butene			0.05	500		
Butane			0.05	500		
CRC PVI Key indicators Method Code	EP104-PVI	EP104-PVI				
Methane	0.5	5000	0.5	5000		
Oxygen	0.1	1000	0.1	1000		
Carbon Dioxide	0.05	500	0.05	500		

ALS ANALYTES & LORS LISTING

GROUP / ANALYTES	MATRIX / METHOD CODES & LORS							
	XAD-2	PUF	HVAS	PTFE filters	HVAS (Low Level)	Trap	Passivated Canisters	
POLYNUCLEAR AROMATIC HYDROCARBONS								
Method Code	EP077A				EP077-L	EP077-LL	EP101-SV	
Units	µg/Tube	µg/Filter	µg/Paper*	µg/Filter	µg/Paper*	ng/trap	ppmv	mg/m³
Naphthalene	0.1	0.1	0.1	0.1	0.01	2,500	2.5	13
2-Methylnaphthalene	-	-	-	-	-	100	-	-
Acenaphthylene	0.1	0.1	0.1	0.1	0.01	100	2.5	16
Acenaphthene	0.1	0.1	0.1	0.1	0.01	100	2.5	16
Fluorene	0.1	0.1	0.1	0.1	0.01	100	2.5	17
Phenanthrene	0.1	0.1	0.1	0.1	0.01	100	2.5	18
Anthracene	0.1	0.1	0.1	0.1	0.01	100	5	36
Fluoranthene	0.1	0.1	0.1	0.1	0.01	100	-	-
Pyrene	0.1	0.1	0.1	0.1	0.01	100	-	-
Chrysene	0.1	0.1	0.1	0.1	0.01	100	-	-
Benzo[a] anthracene	0.1	0.1	0.1	0.1	0.01	100	-	-
Benzo[b] fluoranthene	0.1	0.1	0.1	0.1	0.01	100	-	-
Benzo[k] fluoranthene	0.1	0.1	0.1	0.1	0.01	100	-	-
Benzo[a]pyrene	0.1	0.1	0.1	0.1	0.01	100	-	-
Indeno[1,2,3,cd] pyrene	0.1	0.1	0.1	0.1	0.01	100	-	-
Dibenz[a,h] anthracene	0.1	0.1	0.1	0.1	0.01	100	-	-
Benzo[g,h,I] perylene	0.1	0.1	0.1	0.1	0.01	100	-	-
CHLORINATED PHENOLIC COMPOUNDS								
Method Code	EP077B							
Units	µg/Tube	µg/Filter	µg/Paper*	µg/Filter				
2,4-Dichlorophenol	0.1	0.1	0.1	0.1				
2,6-Dichlorophenol	0.1	0.1	0.1	0.1				
2,4,6-Trichlorophenol	0.1	0.1	0.1	0.1				
2,4,5-Trichlorophenol	0.1	0.1	0.1	0.1				
2,3,4,6-Tetrachlorophenol	0.2	0.2	0.2	0.2				
Pentachlorophenol	0.5	0.5	0.5	0.5				
CHLORINATED AROMATIC COMPOUNDS								
Method Code	EP077C							
Units	µg/Tube	µg/Filter	µg/Paper*	µg/Filter	µg/Paper*			
1,2,4-Trichlorobenzene	0.1	0.1	0.1	0.1	0.01			
1,2,3,4 - & 1,2,3,5-Tetrachlorobenzene	0.2	0.2	0.2	0.2	0.02			
1,2,4,5-Tetrachlorobenzene	0.1	0.1	0.1	0.1	0.01			
Pentachlorobenzene	0.1	0.1	0.1	0.1	0.01			
Hexachlorobenzene	0.1	0.1	0.1	0.1	0.01			

***LORs are based on analysis of the whole filter. If filters are sub-sampled, LORs will be increased proportionally**.

(Excluding WRG)

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Chinchilla QLD 4413
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9th May 2014

ALS Environmental

Recommended Holding Times and Preservations for Soil and Air

APPLICABLE LOCATIONS

The bottles, preservation and holding times following are for the ALS Environmental operations excluding the ALS Water Resources Group (WRG). The ALS operations covered by this document include;

Adelaide
Unit 2, 1 Burma Road
Pooraka, Adelaide, SA 5095
P +6- 8-8162-5130
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Brisbane
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Darwin
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Woolner, NT 0820
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Gladstone
46 Callemondah Drive
Clinton Gladstone, QLD 4680
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Mackay
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Melbourne
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Springvale VIC 3171
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Mudgee
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Newcastle
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SOIL AND SEDIMENT SAMPLE CHILLING AND SUBMISSION

Most soils should be chilled to <4˚C or <6˚C (guideline dependent) and transported to the laboratory within 24 hours. Sediments may also benefit from being frozen. ALS recommends placing samples on ice immediately upon sampling for best practice chilling with either repacking into another esky or draining of free water and replacement of ice just prior to dispatch. Chilling overnight in a fridge may also benefit. The post-chilling addition of ice bricks is also recommended where samples are air freighted or dispatched long distance and where couriers will not freight ice.

Please note that where possible samples should be submitted to the laboratory with at least half the recommended holding time remaining and it is preferable to avoid submitting holding time critical tests and full VOC suites late on Fridays without prior arrangement.

GENERAL NOTES

The following soil testing services are centralized in specialist laboratory locations. These tests require additional separate jars or bags to optimize service delivery and holding time compliance;

- Dioxins, Total S, TOC, TBT (Brisbane),
- PFOS/PFOA/AFFFs, PBDEs, Explosives, Herbicides, Pesticides and Ultra trace Organics (Sydney).
- Sizings, Asbestos and Foreign Materials Testing (Newcastle);
- TRH Speciation (Perth and Melbourne),
- ASS/AMD (Perth and Brisbane).

KEY

G	Glass	**G(T)**	Glass Jar with Teflon Lined Lid
(ZH)	Zero Headspace required	**PB**	Plastic (Polyethylene) Bag
HVAS	High Volume Air Sampler Paper	**PTFE**	Polytetrafluoroethylene Filter
PUF	Polyurethane Filter	**P**	Plastic Container

SOIL SAMPLES

Parameter		ALS Preferred Container	Preservation	Holding Time	Reference
INORGANICS, METALS, RADIONUCLIDES, ACID SULFATE SOILS AND PHYSICAL PARAMETERS					
General Anions and Cations: Chloride, Bromide, Fluoride, Sulfate, CEC & exchangeable Cations		PB, P or G	Chill, preferably to <6˚C	28 days [4]	NEPM 2013
Asbestos		PB (double bagged)	Nil	Indefinite	AS4964-2004
Cyanide		P or G	Chill, Store in dark	14 days [4]	NEPM 2013
Electrical conductivity		PB, P or G	Chill, preferably to <6˚C	7 days [4]	NEPM 2013
Gross alpha, Gross beta		PB, P or G	Nil	180 days	ISO9696, ISO9697, ASTM D7283-06.
Hexavalent Chromium (Alkali extract)		P or G	Chill, Store in dark	28 days (plus 7 for extract)	NEPM 2013
Metals - General		PB, P or G	Nil	6 months	NEPM 2013
Mercury		P or G	Chill, Store in dark	28 days	NEPM 2013
Methyl Mercury	Option 1	G(T)	Chill, Store in dark	40 days	Horvat et al, 1993
	Option 2	G(T)	Freeze, Store in dark	8 months	Horvat et al, 1993
Moisture Content		PB, P or G	Chill, preferably to <6˚C	14 days	NEPM 2013
Organic Carbon / TOC	Option 1	G	Chill, to <6˚C store in dark	28 days	NEPM 2013
	Option 2	G	Freeze for sediments	6 months	NAGD 2009
pH		PB, P or G	Chill, preferably to <6˚C	7 days	NEPM 2013
Radium 226, 228		PB or G	Nil	180 days	ISO10703, ASTM D7283-06.
SPOCAS, TOS, Chromium Suite	Option 1	PB (exclude air)	Freeze	Indefinite	AS4969.1-2008
	Option 2		Chill, preferably to <6˚C	24 hours	
	Option 3		Dry at 80˚C	Indefinite	
Sizings and Foreign Material Tests		PB or G	Nil for sediments	Indefinite	NAGD 2009
Sulfur - total		PB or G	Chill, preferably to <6˚C	7 days (6 months once prepared)	NEPM 2013 plus in house
Sulfide		PB or G	Chill, preferably to <6˚C	28 days (if Total S hold' time met)	NEPM 2013 plus in house
ORGANICS - SEMIVOLATILE COMPOUNDS (SVOCS)					
General less persistent Semi-Volatile Organic chemicals including: • Carbamate Pesticides • Explosive residues • OC, OP Pesticides & PCBs • Phenoxy acid Herbicides • General Herbicides • TRH/TPH (C_{10}-C_{40}), • PAHs and Phenols • Phthalate Esters • Pyrethroids (Synthetic) • Semi Volatile Chlorinated Compound • Tributyl Tin (TBT)		G(T)	Place immediately in the esky and chill to <6˚C using ice. Avoid exposure to light	14 days (plus holding of extracts typically for up to 40 days)	NEPM 2013
Dioxins & Furans & PCBs		G(T)		1 year in dark, freeze to -10°C	USEPA 1613
PBDEs		G(T)		1 year in dark, freeze to -10°C	USEPA 1614
PFOS & PFOA/ 6:2-FtS / AFFFs		G(T)		6 months	In house - POPs
Tributyl Tin, OCPs, OPPs, Phenols, PAHs and PCBs		G(T)	Freeze within 12 hours of sampling for sediments	56 days (plus 40 days for extracts)	NAGD 2009
ORGANICS - VOLATILE COMPOUNDS (VOCS)					
VOCs *except* vinyl chloride, styrene and/or 2-chloroethyl vinyl ether		G(T)	Rapidly sample, minimize headspace and Chill to <6˚C. Avoid exposure to light	14 days	NEPM 2013
Vinyl chloride and styrene		G(T)		**7 days** ***(Previously 14 days under NEPM 1999)***	NEPM 2013

AMBIENT AIR, SOIL GAS AND OCCUPATIONAL HYGIENE

ORGANICS - VOLATILE AND SEMIVOLATILE COMPOUNDS

Parameter	Media	Preservation	Holding Time	Reference
VOCs in whole air samples	Silonite Canister	Nil	30 days	USEPA TO15r
VOCs on Sorbents	Charcoal Tubes/ Passive Badge	Nil	30 Days	NIOSH 1500/1501/1003
Semi-Volatile Organics including: PAHs Chlorinated Benzenes Chlorinated Phenols	XAD-2 Resin	Protect from light. Store in the dark submit as soon as possible	7-14 Days	USEPA TO4A/TO10A/TO13A NIOSH 5515/5517
	PTFE/GFF/MCE Filters		7 Days	NIOSH 5515/5517
	PUF		7 Days	USEPA TO4A/TO13A
	HVAS		7 Days	USEPA TO4A/TO13A

NOTES

1. Samples for ZHE TCLP or ASLP require a separate additional jar.
2. TCLP and other leaching procedures need to be conducted within the solid sample holding time of the analyte of interest.
3. When a moisture determination is used for dry weight basis reporting, no holding time applies when performed on the same day as the chemical analytes of interest.
4. Holding times for extracted parameters (e.g. Chloride, Bromide, EC, Sulfate, Sulfide & Cyanide) are until extraction. Extract solution holding times also apply.

ALS RECOMMENDED HOLDING TIMES AND PRESERVATIONS FOR WATER

Version 2 January 2013

APPLICABLE LOCATIONS
The bottles, preservation and holding times following are for the ALS Environmental operations excluding the ALS Water Resources Group Victoria and ACT operations (WRG). The ALS operations covered by this document include;

Adelaide
Unit 2, 1 Burma Road
Pooraka, Adelaide, SA 5095
Phone: 61-8-8162 5130
Email: ALSEnviro.Adelaide@alsglobal.com

Brisbane
2 Byth Street (Corner Byth and Shand St)
Stafford QLD 4053
Phone: 61-7-3243 7222
Email: ALSEnviro.Brisbane@alsglobal.com

Darwin
4/16 Charlton Court
Woolner, NT 0820
Phone: 61-488 073 271
Email: ALSEnviro.Darwin@alsglobal.com

Gladstone
46 Callemondah Drive
Clinton Gladstone, QLD 4680
Phone: 61-7-4971 5600
Email: ALSEnviro.Gladstone@alsglobal.com

Mackay
78 Harbour Road
Mackay, QLD 4740
Phone: 61-7-4944 0177
Email: ALSEnviro.Mackay@alsglobal.com

Melbourne
2 - 4 Westall Road
Springvale VIC 3171
Phone: 61-3-8549 9600
Email: ALSEnviro.Melbourne@alsglobal.com

Mudgee
27 Sydney Road
Mudgee NSW 2850
Phone: 61-2-6372 6735
Email: ALSEnviro.Mudgee@alsglobal.com

Newcastle
5 Rosegum Close
Warabrook NSW 2304
Phone: 61-2-4968 9433
Email: ALSEnviro.Newcastle@alsglobal.com

Nowra
4/13 Geary Place
North Nowra NSW 2541
Phone: 61-2-4423 2063
ALSEnviro.Nowra@alsglobal.com

Perth
10 Hod Way
Malaga WA 6090
Phone: 61-8-9209 7655
Email: ALSEnviro.Perth@alsglobal.com

Roma
Lot 4, 73 Beaumont Drive
Roma QLD 4455
Phone: 61-7-4622 8978
Email: ALSEnviro.Roma@alsglobal.com

Sydney
277-289 Woodpark Road
Smithfield NSW 2164
Phone: 61-2-8784 8555
Email: ALSEnviro.Sydney@alsglobal.com

Townsville
14-15 Desma Court
Bohle, QLD 4818
Phone: 61-7-4796 0600
Email: ALSEnviro.Townsville@alsglobal.com

Wollongong
99 Kenny Street
Wollongong NSW 2500
Phone : 61-2-4225 3125
Email: ALSEnviro.Wollongong@alsglobal.com

SAMPLE PRESERVATION, CHILLING AND SUBMISSION

Care must be taken not to rinse out or spill preservatives during sampling for OH&S reasons and to avoid cross contaminating other bottles (e.g. Nitric acid used for metals can contaminate nitrate analysis). Field filtration is mandatory or recommended for many tests and other tests must have exposure to air minimized to avoid analyte losses. Samples should generally be chilled to <4ºC or <6ºC (guideline dependent) and transported to the laboratory within 24 hours. ALS recommends placing samples in ice immediately upon sampling for best practice chilling with either repacking into another esky or draining of free water and replacement of ice just prior to dispatch. Chilling overnight in a fridge may also benefit. The post-chilling addition of ice bricks is also recommended where samples are air freighted or dispatched long distance and where couriers will not freight ice.
Samples taken from chlorinated water sources require the addition of sodium thiosulfate for microbiological, volatile organics and semi volatile organics. Please advise ALS accordingly to facilitate supply of appropriate containers.
Please note that where possible samples should be submitted to the laboratory with at least half the recommended holding time remaining and it is preferable to avoid submitting holding time critical tests late on Fridays without prior arrangement.

Parameter		Container	Preservation	Holding Time	Reference
GENERAL INORGANICS (METALS, NUTRIENTS, CATIONS, ANIONS, PHYSICAL TESTS)					
Acidity / Alkalinity		P	Chill	14 days	APHA Table 1060:I
Ammonia Nitrogen	Option 1	P	H_2SO_4 to pH<2, Chill	28 days	APHA Table 1060:I
	Option 2	P	Chill	1 day	APHA Table 1060:I
Anions General: Chloride, Sulfate, Fluoride, Bromide		P	Chill	28 days	APHA Table 1060:I
BOD		P	Chill	2 days	APHA Table 1060:I
Cations & Hardness: (Calcium, Magnesium, Sodium, Potassium)	Option 1	P	HNO_3 to pH<2, Chill	28 days (All)	AS/NZS 5667.1:1998
	Option 2	P	Nil, Chill	7 days (Ca, Mg, Hardness) 28 days (Na, K)	AS/NZS 5667.1:1998
Carbon Total Organic (TOC)		G	H_2SO_4 to pH<2, Chill	28 days	APHA Table 1060:I
Carbon Dissolved Organic (DOC)		G	H_2SO_4 to pH<2, Field filter(2), Chill	28 days	APHA Table 1060:I
Chlorophyll a		P - Opaque	Chill, Store in dark	2 days	APHA Table 1060:I
			(filter, store filtrate frozen in foil)	28 days	
Chromium VI		P	NaOH, Chill	28 days	USEPA 1669
COD		P	H_2SO_4 to pH<2, Chill	28 days	APHA Table 1060:I
Colour		P	Chill	2 days	APHA Table 1060:I
Conductivity (EC)		P	Chill	28 days	APHA Table 1060:I
Cyanide		P - Opaque	NaOH to pH>12, Chill (1)	14 days	APHA 1060:I
Ferrous (Fe^{2+})		P (A)	HCl to pH<2. (ZH), Field filter(2), Chill	7 days	ISO 5667-3:2003
Formaldehyde		P	Chill	2 days	ASTM D6303-98
Mercury	Option 1	P (A)	HNO_3 to pH<2, Chill (2)	28 days	APHA Table 1060:I
	Option 2	P (A)	Nil – Lab Acidify in <14 days, Chill (2)	28 days	USEPA 200.8
Metals General	Option 1	P (A)	HNO_3 to pH<2, Chill (2)	6 months	APHA Table 1060:I
	Option 2	P (A)	Nil - Lab Acidify in <14 days, Chill (2)	6 months	USEPA 200.8
Nitrate Nitrogen		P	Chill	2 days	APHA Table 1060:I
Nitrite Nitrogen		P	Chill	2 days	APHA Table 1060:I
Nitrogen - Oxidised Nitrogen (NOx)		P	H_2SO_4 to pH<2, Chill Chill	28 days 2 days	APHA Table 1060:I/ AS/NZS 5667.1:1998
Nitrogen and Phosphorous - Total (Persulfate Method)		P	Nil, Chill	1 day	AS/ NZS 5667.1:1998
Nitrogen - Total		P	H_2SO_4 to pH<2, Chill	28 days	APHA Table 1060:I
Oil & Grease		G	$NaHSO_4$ or H_2SO_4 to pH<2,Chill	28 days	APHA Table 1060:I
Perchlorate		P	Filter, Chill, Store in dark	28 days	USEPA 6850
pH		P	Nil	6 hours	AS/NZS 5667.1:1998
Phenols - Total		P, G	H_2SO_4 to pH<2, Chill	28 days	APHA Table 1060:I
Phosphorus - Reactive		P	Nil, Chill	2 days	APHA Table 1060:I
Phosphorus - Total		P	H_2SO_4 to pH<2, Chill	28 days	AS/NZS 5667.1:1998
Radionuclides incl' Gross alpha, Gross beta & Radium 226, 228		P, G	Lab Acidify in <5 days, Chill or HNO_3 to pH<2, Chill	6 months	APHA 7010B
Solids (TS, TSS, TDS)		P	Chill	7 days	APHA Table 1060:I
Surfactants (NIS, MBAS)		G	Chill Chill, submit in 2 days, preserve in Lab	2 days 4 days (MBAS) 28 days (NIS)	AS/NZS 5667.1:1998
Silica		P	Chill	28 days	APHA Table 1060:I
Sulfide		P	Zn Acetate/NaOH, Chill	7 days	AS/NZS 5667.1:1998
Sulfite		P	EDTA/Zn Acetate, Chill	2 days	AS/NZS 5667.1:1998
Speciated Arsenic and Selenium		P (A)	HCl to pH<2, Chill, (Zero Headspace)	28 days	USEPA1632-2001
Thiocyanate		P	HNO_3 to pH<2, Chill	6 months	APHA 4500CN M
TKN (Total Kjeldahl Nitrogen)		P	H_2SO_4 to pH<2, Chill	28 days	APHA Table 1060:I
Turbidity		P	Store in dark, Chill	2 days	APHA Table 1060:I
ALGAE AND MICROBIOLOGICAL TESTS					
Algae Analysis	Option 1	P	Lugols at 1% v/v ratio	6 months	Hotzel and Croome 1999
	Option 2	P	Nil	48 hours	Hotzel and Croome 1999
General Microbiological Tests (e.g. Faecal coliforms, E-coli, HPC etc)		P (sterile)	$Na_2S_2O_3$,(if chlorinated)/ Chill	1 day	APHA 9060B

NOTES

(1) When samples are suspected of containing Sulfide, a Sulfide Pre-treatment bottle (containing Lead Acetate) should be used to remove Sulfide prior to decanting into the 'Cyanide' bottle.

(2) Dissolved Metals, Ferrous Iron and DOC should be field filtered using a 0.45µm filter prior to placing in the container.

KEY			
G	Glass	Amber (T)	Amber Glass Bottle with Teflon Lined Lid
P (A)	Plastic (verified metal free)	P	Plastic (Polyethylene)
(TS)	40mL Vial with Teflon Lined Septum	(ZH)	Zero Headspace required

ORGANICS - SEMIVOLATILE COMPOUNDS (SVOCS)				
Parameter	**Container**	**Preservation**	**Holding Time**	**Reference**
Acrylamide	Amber (T)	Chill	7 days	USEPA SW846 8316 1998
Alkyl phenol Ethoxylates	Amber (T)	Chill	2 days	AS/NZS 5667.1:1998
		Chill, submit in 2 days, preserve in Lab	7 days	In house
Carbamates	Amber (T)	Chill	7 days (3)	USEPA 632
Chlorinated Hydrocarbons (SV)	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
Dioxins	Amber (T)	Chill	1 year	USEPA 1613.B
Explosives	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
Glyphosate	Amber (T)	Chill	14 days (2)	USEPA 547
Glycols	Vial (TS)	Chill	7 days	USEPA SW846 2007
Herbicides (Phenoxy Acid)	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
N-Nitrosodimethylamine (NDMA)	Amber (T)	Chill	7 days (3)	USEPA 607
Organochlorine Pesticides & PCBs	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
Organophosphorus Pesticides	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
Paraquat/Diquat	P	Chill	7 days (3)	USEPA SW846 2007
Petroleum Hydrocarbons (C_{10}-C_{40})	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
Phenols and Phthalate Esters	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
PFOS & PFOA/ 6:2-FTS and AFFFs	P (PTFE free)	Chill	6 months	In house - POPs
Polyaromatic Hydrocarbons (PAHs)	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
PPCPs	Amber (T)	Nil	7 days (3)	AGWR 2008, USEPA 1694
Synthetic Pyrethroids	Amber (T)	Chill	7 days (3)	USEPA SW846-8270D
Tributyl Tin (TBT)	Amber (T)	Chill	7 days (3)	USEPA SW846 2007
ORGANICS - VOLATILE COMPOUNDS (VOCS) / DISSOLVED GASES				
Parameter	**Container**	**Preservation**	**Holding Time**	**Reference**
BTEXN plus TRH/TPH Hydrocarbons (C_6-C_{10})	Vial (TS)	H_2SO_4 or $NaHSO_4$ to pH<2, Chill, (ZH)	14 days	USEPA SW846 2007
C_1-C_4 Gases (including Methane)	Vial (TS)	H_2SO_4 or $NaHSO_4$ to pH<2, Chill, (ZH)	14 days	USEPA SW846 2007/ NATATTEN.WPD 2002
Chloroacetic Acids	Vial (TS)	NH_4Cl, Chill, (ZH)	28 days	USEPA 552.1
Acrylonitrile, 1,4-Dioxane, Pyridine	Vial (TS)	H_2SO_4 or $NaHSO_4$ to pH<2, Chill, (ZH)	14 days	USEPA 603, 1671 & 524.2, USEPA SW846 2007
Acrolein	Vial (TS)	Chill, (ZH)	3 days	USEPA 603
		Chill, submit in 3 days, preserve in Lab	14 days	
Halo Acetic Acids	Vial (TS)	NH_4Cl, Chill, (ZH)	28 days	USEPA 552.1
MIB/Geosmin	Vial (TS)	Chill, (ZH)	3 days	APHA 6040
		Chill, submit in 3 days, preserve in Lab	7 days	
VOCs including: Halogenated Aliphatics, Aromatics, Monocyclic Aromatics (MAHs), Trihalomethanes (THMs) and Alcohols	Vial (TS)	H_2SO_4 or $NaHSO_4$ to pH<2, Chill, (ZH)	14 days	USEPA SW846 2007

KEY			
G	Glass	Amber (T)	Amber Glass Bottle with Teflon Lined Lid
P (A)	Plastic (verified metal free)	P	Plastic (Polyethylene)
(TS)	40mL Vial with Teflon Lined Septum	(ZH)	Zero Headspace required

NOTES

(3) Samples can also be extracted within 7 days and the resulting extracts analysed within 40 days.

QUALITY CONTROL REPORT

Work Order	: **EM1512039**	Page	: 1 of 11
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR JOSEPH MCDERMOTT	Contact	:
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: joseph@aargus.net	E-mail	:
Telephone	: +61 1300137038	Telephone	: +61-3-8549 9600
Facsimile	: +61 1300136038	Facsimile	: +61-3-8549 9601
Project	: ES6302 DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 15-Jul-2015
C-O-C number	: ----	Date Analysis Commenced	: 15-Jul-2015
Sampler	: JOSEPH MCDERMOTT	Issue Date	: 29-Jul-2015
Site	: Macquarie Park	No. of samples received	: 2
Quote number	: ----	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
Eric Chau	Metals Team Leader	Melbourne Inorganics
Steven McGrath	Technical Manager - Client Services	Melbourne Inorganics
Steven McGrath	Technical Manager - Client Services	Melbourne Organics

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 155797)									
EM1511938-020	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	12.1	11.2	8.04	0% - 50%
EM1512043-004	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	19.1	19.0	0.769	0% - 50%
EA055: Moisture Content (QC Lot: 156023)									
EM1512027-034	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	8.5	10.3	18.8	0% - 50%
EM1512051-005	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	2.3	1.5	41.2	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 156379)									
EM1512040-004	Anonymous	EG005T: Copper	7440-50-8	5	mg/kg	7440	6850	8.18	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	34900	39700	12.8	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	138000	119000	14.5	0% - 20%
EM1511936-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	5	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	4	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	25	24	4.96	No Limit
EM1512040-004	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	485	496	2.27	0% - 20%
		EG005T: Chromium	7440-47-3	2	mg/kg	9	7	24.1	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	866	862	0.513	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 156378)									
EM1512040-004	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	10.2	8.7	16.1	0% - 20%
EM1511936-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 155108)									
EM1512013-015	Anonymous	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.00	No Limit
EM1512004-001	Anonymous	EK026SF: Total Cyanide	57-12-5	1	mg/kg	1	1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 155884)									
EM1511938-020	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1512054-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 155887)									
EM1511938-020	Anonymous	EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068A: Organochlorine Pesticides (OC) (QC Lot: 155887) - continued									
EM1511938-020	Anonymous	EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EM1512054-001	Anonymous	EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 155886)									
EM1511938-020	Anonymous	EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)A: Phenolic Compounds (QC Lot: 155886) - continued									
EM1511938-020	Anonymous	EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit
EM1512054-001	Anonymous	EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 155886)									
EM1511938-020	Anonymous	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 155886) - continued									
EM1512054-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 155220)									
EM1512004-002	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 155885)									
EM1511938-020	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1512054-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 155220)									
EM1512004-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 155885)									
EM1511938-020	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1512054-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 155220)									
EM1512004-002	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 156379)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	99.4	79	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	95.0	87	115
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	96.2	89	113
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	96.4	90	116
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	98.3	85	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	92.0	89	111
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	90.4	89	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 156378)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	94.8	85	103
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 155108)								
EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	20 mg/kg	102	82	106
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 155884)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	117	55	135
EP068A: Organochlorine Pesticides (OC) (QCLot: 155887)								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	102	50	134
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.7	51	131
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	94.5	38	140
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	93.0	52	128
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	92.9	45	133
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	57	135
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	94.2	46	134
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	98.9	52	132
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	87.5	51	131
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	85.4	52	128
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	82.3	51	131
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	102	50	132
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	94.4	41	141
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	94.6	38	130
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	98.6	52	132
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.3	49	133
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.6	48	128
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	92.7	52	130
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	89.1	43	133
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	92.2	41	141

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 155887) - continued								
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	94.8	51	131
EP075(SIM)A: Phenolic Compounds (QCLot: 155886)								
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	3 mg/kg	89.5	57	119
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	3 mg/kg	83.1	54	120
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	3 mg/kg	89.6	61	117
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	3 mg/kg	93.7	66	114
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	3 mg/kg	98.7	65	117
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	3 mg/kg	95.5	67	113
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	3 mg/kg	95.5	66	114
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	3 mg/kg	88.9	56	116
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	6 mg/kg	101	62	122
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	3 mg/kg	93.7	57	119
EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	6 mg/kg	46.2	16	124
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	3 mg/kg	94.4	65	113
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 155886)								
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	98.2	68	114
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	90.1	61	125
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	85.1	68	116
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	89.5	62	116
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	82.4	64	114
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	79.6	64	114
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	89.5	59	117
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	93.1	67	115
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	101	63	119
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	87.4	62	114
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	100	67	115
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	90.0	62	120
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	84.2	62	116
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	101	65	119
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	97.2	69	113
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	99.1	66	116
EP080/071: Total Petroleum Hydrocarbons (QCLot: 155220)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	97.2	66	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 155885)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	658 mg/kg	106	65	131
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3160 mg/kg	104	70	126

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 155885) - continued								
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1448 mg/kg	106	70	122
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 155220)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	93.2	64	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 155885)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	1051 mg/kg	105	68	130
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	4124 mg/kg	103	72	116
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	161 mg/kg	122	38	132
EP080: BTEXN (QCLot: 155220)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	94.0	74	124
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	90.4	72	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	94.0	72	132
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	85.4	66	132
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	91.6	76	130
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	101	75	129

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG005T: Total Metals by ICP-AES (QCLot: 156379)							
EM1512026-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	106	78	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	96.5	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	96.5	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	97.2	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	# 77.0	76	124
		EG005T: Nickel	7440-02-0	50 mg/kg	86.9	78	120
		EG005T: Zinc	7440-66-6	50 mg/kg	# 120	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 156378)							
EM1512026-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	93.8	76	116
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 155108)							
EM1511977-005	Anonymous	EK026SF: Total Cyanide	57-12-5	20 mg/kg	107	77	113
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 155884)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 155884) - continued							
EM1512038-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	105	44	144
EP068A: Organochlorine Pesticides (OC) (QCLot: 155887)							
EM1512005-002	Anonymous	EP068: 4.4`-DDT	50-29-3	0.5 mg/kg	83.1	20	133
		EP068: Aldrin	309-00-2	0.5 mg/kg	85.1	23	136
		EP068: Dieldrin	60-57-1	0.5 mg/kg	84.3	42	136
		EP068: Endrin	72-20-8	0.5 mg/kg	89.2	23	146
		EP068: gamma-BHC	58-89-9	0.5 mg/kg	102	22	139
		EP068: Heptachlor	76-44-8	0.5 mg/kg	89.1	18	130
EP075(SIM)A: Phenolic Compounds (QCLot: 155886)							
EM1511938-024	Anonymous	EP075(SIM): 2-Chlorophenol	95-57-8	3 mg/kg	97.1	65	123
		EP075(SIM): 2-Nitrophenol	88-75-5	3 mg/kg	81.0	40	134
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	3 mg/kg	102	56	122
		EP075(SIM): Pentachlorophenol	87-86-5	3 mg/kg	53.3	15	139
		EP075(SIM): Phenol	108-95-2	3 mg/kg	97.6	63	117
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 155886)							
EM1511938-024	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	100	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	114	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 155220)							
EM1512004-003	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	97.9	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 155885)							
EM1511938-021	Anonymous	EP071: C10 - C14 Fraction	----	658 mg/kg	108	53	123
		EP071: C15 - C28 Fraction	----	3160 mg/kg	104	70	124
		EP071: C29 - C36 Fraction	----	1448 mg/kg	104	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 155220)							
EM1512004-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	91.7	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 155885)							
EM1511938-021	Anonymous	EP071: >C10 - C16 Fraction	>C10_C16	1051 mg/kg	106	65	123
		EP071: >C16 - C34 Fraction	----	4124 mg/kg	104	67	121
		EP071: >C34 - C40 Fraction	----	161 mg/kg	97.5	44	126
EP080: BTEXN (QCLot: 155220)							
EM1512004-003	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	114	50	136
		EP080: Toluene	108-88-3	2 mg/kg	119	56	139

ALS Environmental

QA/QC Compliance Assessment for DQO Reporting

Work Order	: **EM1512039**	Page	: 1 of 6
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR JOSEPH MCDERMOTT	Telephone	: +61-3-8549 9600
Project	: ES6302 DSI	Date Samples Received	: 15-Jul-2015
Site	: Macquarie Park	Issue Date	: 29-Jul-2015
Sampler	: JOSEPH MCDERMOTT	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Miscellaneous							
EG005T: Total Metals by ICP-AES	EM1512026--001	Anonymous	**Lead**	7439-92-1	77.0 %	76-124%	
EG005T: Total Metals by ICP-AES	EM1512026--001	Anonymous	**Zinc**	7440-66-6	120 %	74-128%	

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*		*Sample Date*	*Extraction / Preparation*			*Analysis*		
			Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055-103) SS1,	SS2	**09-Jul-2015**	----	----	----	**16-Jul-2015**	23-Jul-2015	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T) SS1,	SS2	**09-Jul-2015**	**17-Jul-2015**	05-Jan-2016	✓	**17-Jul-2015**	05-Jan-2016	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) SS1,	SS2	**09-Jul-2015**	**17-Jul-2015**	06-Aug-2015	✓	**17-Jul-2015**	06-Aug-2015	✓
EK026SF: Total CN by Segmented Flow Analyser								
Soil Glass Jar - Unpreserved (EK026SF) SS2		**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**16-Jul-2015**	29-Jul-2015	✓
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066) SS2		**09-Jul-2015**	**16-Jul-2015**	23-Jul-2015	✓	**17-Jul-2015**	25-Aug-2015	✓
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068) SS1,	SS2	**09-Jul-2015**	**16-Jul-2015**	23-Jul-2015	✓	**17-Jul-2015**	25-Aug-2015	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071) SS2		**09-Jul-2015**	**16-Jul-2015**	23-Jul-2015	✓	**17-Jul-2015**	25-Aug-2015	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) SS2		**09-Jul-2015**	**16-Jul-2015**	23-Jul-2015	✓	**17-Jul-2015**	25-Aug-2015	✓

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
SS2	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**16-Jul-2015**	23-Jul-2015	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	2	14	**14.29**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	16	**12.50**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	2	11	**18.18**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	2	12	**16.67**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	3	20	**15.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	13	**15.38**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	**7.14**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	16	**6.25**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.09**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	13	**7.69**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	**7.14**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	16	**6.25**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.09**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	13	**7.69**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	14	**7.14**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	16	**6.25**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.09**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	13	**7.69**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In-house. A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	SOIL	In house: Referenced to APHA 4500-CN-O. Caustic leachates of soil samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.

Preparation Methods	Method	Matrix	Method Descriptions
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Tumbler Extraction of Solids	ORG17	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

QUALITY CONTROL REPORT

Work Order	: **ES1526003**	Page	: 1 of 15
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JOSEPH MCDERMOTT	Contact	:
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: joseph@aargus.net	E-mail	:
Telephone	: +61 1300137038	Telephone	: +61-2-8784 8555
Facsimile	: +61 1300136038	Facsimile	: +61-2-8784 8500
Project	: ES6302 DSI	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 14-Jul-2015
C-O-C number	: ----	Date Analysis Commenced	: 14-Jul-2015
Sampler	: JOSEPH MCDERMOTT	Issue Date	: 22-Jul-2015
Site	: MACQUARIE PARK	No. of samples received	: 31
Quote number	: ----	No. of samples analysed	: 30

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	**Client sample ID**	**Method: Compound**	**CAS Number**	**LOR**	**Unit**	**Original Result**	**Duplicate Result**	**RPD (%)**	**Recovery Limits (%)**
EA055: Moisture Content (QC Lot: 153906)									
ES1525994-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	17.7	19.7	10.9	0% - 50%
ES1525995-007	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	25.5	24.2	4.86	0% - 20%
EA055: Moisture Content (QC Lot: 153907)									
ES1526003-008	BH4 0.2-0.35	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	7.3	8.2	11.6	No Limit
ES1526003-020	BH9 0.05-0.2	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	19.0	20.5	7.64	0% - 20%
EA055: Moisture Content (QC Lot: 153908)									
ES1526003-029	D3	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	15.5	17.5	11.8	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 155116)									
ES1525997-004	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	23	23	0.00	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	9	8	17.2	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	14	13	8.92	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	21	22	6.59	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	18	15	16.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	79	82	4.32	0% - 50%
ES1526003-010	BH5 0.45-0.6	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	17	17	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	9	9	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	7	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 155118)									
ES1526003-021	BH9 0.80-0.95	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	20	25	20.5	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	8	10	26.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	11	12	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.00	No Limit
ES1526063-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	8	32.7	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	4	32.6	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	5	9	47.8	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG005T: Total Metals by ICP-AES (QC Lot: 155118) - continued									
ES1526063-002	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	9	23	85.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	23	43	59.4	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 155117)									
ES1525997-004	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1526003-010	BH5 0.45-0.6	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 155119)									
ES1526003-021	BH9 0.80-0.95	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1526063-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 155121)									
ES1526003-009	BH5 0.05-0.2	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 154029)									
ES1526003-028	D2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1526003-009	BH5 0.05-0.2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 154026)									
ES1526003-028	D2	EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1526003-009	BH5 0.05-0.2	EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068A: Organochlorine Pesticides (OC) (QC Lot: 154026) - continued									
ES1526003-009	BH5 0.05-0.2	EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 154028)									
ES1526003-028	D2	EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit
ES1526003-009	BH5 0.05-0.2	EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)A: Phenolic Compounds (QC Lot: 154028) - continued									
ES1526003-009	BH5 0.05-0.2	EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 154028)									
ES1526003-028	D2	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1526003-009	BH5 0.05-0.2	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 154028) - continued									
ES1526003-009	BH5 0.05-0.2	EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 153970)									
ES1525956-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1526003-022	BH10 0.05-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 154027)									
ES1526003-028	D2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1526003-009	BH5 0.05-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 153970)									
ES1525956-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1526003-022	BH10 0.05-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 154027)									
ES1526003-028	D2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.00	No Limit
ES1526003-009	BH5 0.05-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	180	170	5.83	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 153970)									
ES1525956-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1526003-022	BH10 0.05-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 154074)									
ES1526008-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.862	0.878	1.73	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.001	0.003	79.2	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.018	0.016	11.3	No Limit
ES1526005-016	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0075	0.0073	2.79	0% - 20%
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.020	0.020	0.00	0% - 50%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.179	0.173	3.45	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.132	0.132	0.789	0% - 20%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.610	0.625	2.39	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 154105)									
ES1525793-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1525951-002	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 154673)									
ES1525951-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<0.02	<20	0.00	No Limit
ES1526077-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 154673)									
ES1525951-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<0.02	<20	0.00	No Limit
ES1526077-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 154673)									
ES1525951-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<0.001	<1	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<0.002	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<0.002	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<0.002	<2	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<0.002	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<0.005	<5	0.00	No Limit
ES1526077-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 155116)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	113	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	104	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	113	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	107	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	105	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	110	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	106	81	133
EG005T: Total Metals by ICP-AES (QCLot: 155118)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	119	92	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	87	121
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	110	80	136
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	104	93	127
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	108	86	124
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	107	93	131
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	107	81	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 155117)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	87.6	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 155119)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	86.3	70	105
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 155121)								
EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	20 mg/kg	109	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 154029)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	95.2	57	117
EP068A: Organochlorine Pesticides (OC) (QCLot: 154026)								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	103	76	120
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	103	69	117
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	98.0	67	127
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	68	118
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	96.3	71	113
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.2	69	119
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	104	69	119
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	101	76	120
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	98.9	67	121

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP068A: Organochlorine Pesticides (OC) (QCLot: 154026) - continued								
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	78.8	65	113
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	95.9	66	118
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	106	60	124
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	67	123
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	95.8	57	115
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	102	65	123
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	71	115
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	95.3	68	116
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	98.6	68	116
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	106	66	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	104	65	129
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	102	68	120
EP075(SIM)A: Phenolic Compounds (QCLot: 154028)								
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	6 mg/kg	89.8	69	112
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	6 mg/kg	85.3	57	111
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	6 mg/kg	90.0	68	112
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	6 mg/kg	92.4	69	117
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	6 mg/kg	88.6	73	117
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	6 mg/kg	97.8	74	116
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	6 mg/kg	96.0	72	116
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	6 mg/kg	86.2	60	117
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	12 mg/kg	92.0	69	123
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	6 mg/kg	90.4	76	114
EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	12 mg/kg	37.8	10	57
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	6 mg/kg	94.8	74	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 154028)								
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	102	79	123
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	86.8	77	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	92.4	79	123
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	89.6	73	121
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	93.0	76	122
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	87.6	70	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	88.1	72	114
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	92.0	77	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	92.3	81	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	89.7	72	113
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	94.3	79	123
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	98.6	77	123

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 154028) - continued								
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	88.4	71	113
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	97.9	80	124
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	96.0	79	123
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	96.4	79	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 153970)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	76.0	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 154027)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	108	71	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	250 mg/kg	115	74	138
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	111	64	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 153970)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	74.4	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 154027)								
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	103	70	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	118	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	200 mg/kg	94.8	63	131
EP080: BTEXN (QCLot: 153970)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	79.8	62	116
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	73.0	58	118
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	74.6	60	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	68.9	62	138
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	75.0	60	120
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	80.7	62	128

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EG020T: Total Metals by ICP-MS (QCLot: 154074)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	93.0	79	121
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	90.2	83	113
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	93.0	84	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	93.9	83	117
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.8	84	116
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	91.0	84	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	90.4	77	117
EG035T: Total Recoverable Mercury by FIMS (QCLot: 154105)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	92.7	77	115

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	LCS Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 154067)								
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	66.9	62	113
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	72.0	64	114
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	85.8	64	116
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	85.0	64	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	89.6	63	117
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	89.9	62	119
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	88.7	59	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	88.3	62	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	85.2	63	116
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	92.1	61	117
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	99.4	64	118
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	75.7	64	115
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	90.6	60	118
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	63.9	59	119
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	84.2	63	116
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	101	63	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 154066)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	90.0	59	129
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	90.9	71	131
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	95.4	62	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 154673)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	88.1	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 154066)								
EP071: >C10 - C16 Fraction	>C10_C16	100	µg/L	<100	2500 µg/L	89.1	59	131
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	90.8	74	138
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	104	67	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 154673)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	88.2	75	127
EP080: BTEXN (QCLot: 154673)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	89.1	70	124
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	92.5	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	92.2	69	121
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	93.3	70	124
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	94.9	72	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	97.4	65	129

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG005T: Total Metals by ICP-AES (QCLot: 155116)							
EM1511848-008	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	107	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	105	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	108	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	106	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	104	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	101	70	130
EG005T: Total Metals by ICP-AES (QCLot: 155118)							
ES1526003-020	BH9 0.05-0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	111	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	105	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	113	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	110	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	106	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	100	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	105	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 155117)							
ES1525997-004	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	100	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 155119)							
ES1526003-021	BH9 0.80-0.95	EG035T: Mercury	7439-97-6	5 mg/kg	102	70	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 155121)							
ES1526003-009	BH5 0.05-0.2	EK026SF: Total Cyanide	57-12-5	20 mg/kg	86.2	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 154029)							
ES1526003-009	BH5 0.05-0.2	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	98.8	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 154026)							
ES1526003-009	BH5 0.05-0.2	EP068: 4.4`-DDT	50-29-3	2 mg/kg	96.7	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	103	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	97.0	70	130
		EP068: Endrin	72-20-8	2 mg/kg	95.7	70	130
		EP068: gamma-BHC	58-89-9	0.5 mg/kg	102	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	89.8	70	130
EP075(SIM)A: Phenolic Compounds (QCLot: 154028)							
ES1526003-009	BH5 0.05-0.2	EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	86.9	70	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP075(SIM)A: Phenolic Compounds (QCLot: 154028) - continued							
ES1526003-009	BH5 0.05-0.2	EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	75.9	60	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	79.4	70	130
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	79.5	20	130
		EP075(SIM): Phenol	108-95-2	10 mg/kg	85.4	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 154028)							
ES1526003-009	BH5 0.05-0.2	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	86.4	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	99.4	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 153970)							
ES1525956-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	92.4	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 154027)							
ES1526003-009	BH5 0.05-0.2	EP071: C10 - C14 Fraction	----	523 mg/kg	98.7	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	105	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	118	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 153970)							
ES1525956-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	88.6	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 154027)							
ES1526003-009	BH5 0.05-0.2	EP071: >C10 - C16 Fraction	>C10_C16	860 mg/kg	101	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	116	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	96.7	52	132
EP080: BTEXN (QCLot: 153970)							
ES1525956-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	82.6	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	80.5	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	81.0	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	72.6	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	82.5	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	84.1	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020T: Total Metals by ICP-MS (QCLot: 154074)							
ES1526005-016	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	106	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	95.1	70	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	94.0	70	130
		EG020A-T: Copper	7440-50-8	1 mg/L	94.9	70	130
		EG020A-T: Lead	7439-92-1	1 mg/L	96.2	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020T: Total Metals by ICP-MS (QCLot: 154074) - continued							
ES1526005-016	Anonymous	EG020A-T: Nickel	7440-02-0	1 mg/L	84.8	70	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	86.3	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 154105)							
ES1525812-001	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	79.9	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 154673)							
ES1525951-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	112	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 154673)							
ES1525951-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	109	70	130
EP080: BTEXN (QCLot: 154673)							
ES1525951-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	82.3	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	89.1	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	87.6	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	91.1	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	91.9	70	130
		EP080: Toluene	108-88-3	25 µg/L	85.9	70	130

QA/QC Compliance Assessment for DQO Reporting

Work Order	: **ES1526003**	Page	: 1 of 9
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JOSEPH MCDERMOTT	Telephone	: +61-2-8784 8555
Project	: ES6302 DSI	Date Samples Received	: 14-Jul-2015
Site	: MACQUARIE PARK	Issue Date	: 22-Jul-2015
Sampler	: JOSEPH MCDERMOTT	No. of samples received	: 31
Order number	: ----	No. of samples analysed	: 30

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	3	0.00	10.00	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	0	4	0.00	10.00	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	3	0.00	5.00	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	0	4	0.00	5.00	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055-103)								
BH1 0.05-0.2,	BH1 0.2-0.35,	**09-Jul-2015**	**----**	----	----	**14-Jul-2015**	23-Jul-2015	✓
BH2 0.05-0.2,	BH2 0.2-0.35,							
BH3 0.2-0.35,	BH4 0.2-0.35,							
BH5 0.05-0.2,	BH5 0.45-0.6,							
BH6 0.05-0.2,	BH6 0.85-1.0,							
BH7 0.05-0.2,	BH7 0.4-0.55,							
BH7 0.6-0.75,	BH7 0.9-1.05,							
BH8 0.15-0.3,	BH8 0.75-0.90,							
BH9 0.05-0.2,	D1,							
D2,	D3,							
BH9 0.80-0.95,								
BH10 0.05-0.2,	BH10 0.3-0.45,							
BH10 0.50-0.65,	BH11 0.05-0.2,							
BH11 0.25-0.4,	TRIP BLANK							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH1 0.05-0.2,	BH1 0.2-0.35,	**09-Jul-2015**	**15-Jul-2015**	05-Jan-2016	✓	**16-Jul-2015**	05-Jan-2016	✓
BH2 0.05-0.2,	BH2 0.2-0.35,							
BH3 0.2-0.35,	BH4 0.2-0.35,							
BH5 0.05-0.2,	BH5 0.45-0.6,							
BH6 0.05-0.2,	BH6 0.85-1.0,							
BH7 0.05-0.2,	BH7 0.4-0.55,							
BH7 0.6-0.75,	BH7 0.9-1.05,							
BH8 0.15-0.3,	BH8 0.75-0.90,							
BH9 0.05-0.2,	D1,							
D2,	D3,							
BH9 0.80-0.95,								
BH10 0.05-0.2,	BH10 0.3-0.45,							
BH10 0.50-0.65,	BH11 0.05-0.2,							
BH11 0.25-0.4								
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH1 0.05-0.2,	BH1 0.2-0.35,	**09-Jul-2015**	**15-Jul-2015**	06-Aug-2015	✓	**17-Jul-2015**	06-Aug-2015	✓
BH2 0.05-0.2,	BH2 0.2-0.35,							
BH3 0.2-0.35,	BH4 0.2-0.35,							
BH5 0.05-0.2,	BH5 0.45-0.6,							
BH6 0.05-0.2,	BH6 0.85-1.0,							
BH7 0.05-0.2,	BH7 0.4-0.55,							
BH7 0.6-0.75,	BH7 0.9-1.05,							
BH8 0.15-0.3,	BH8 0.75-0.90,							
BH9 0.05-0.2,	D1,							
D2,	D3,							
BH9 0.80-0.95,								
BH10 0.05-0.2,	BH10 0.3-0.45,							
BH10 0.50-0.65,	BH11 0.05-0.2,							
BH11 0.25-0.4								
EK026SF: Total CN by Segmented Flow Analyser								
Soil Glass Jar - Unpreserved (EK026SF)								
BH5 0.05-0.2,	BH6 0.05-0.2,	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**20-Jul-2015**	29-Jul-2015	✓
BH8 0.15-0.3,	BH9 0.05-0.2,							
D2,	D3							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
BH5 0.05-0.2,	BH6 0.05-0.2,	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**15-Jul-2015**	24-Aug-2015	✓
BH7 0.05-0.2,	BH8 0.15-0.3,							
BH9 0.05-0.2,	BH10 0.05-0.2,							
BH11 0.05-0.2,	D2,							
D3								
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
BH1 0.05-0.2,	BH2 0.05-0.2,	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**15-Jul-2015**	24-Aug-2015	✓
BH5 0.05-0.2,	BH6 0.05-0.2,							
BH7 0.05-0.2,	BH8 0.15-0.3,							
BH9 0.05-0.2,	BH10 0.05-0.2,							
BH11 0.05-0.2,	D1,							
D2,	D3							
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
BH5 0.05-0.2,	BH6 0.05-0.2,	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**15-Jul-2015**	24-Aug-2015	✓
BH7 0.05-0.2,	BH8 0.15-0.3,							
BH9 0.05-0.2,	BH10 0.05-0.2,							
BH11 0.05-0.2,	D2,							
D3								
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH5 0.05-0.2,	BH6 0.05-0.2,	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**15-Jul-2015**	24-Aug-2015	✓
BH7 0.05-0.2,	BH8 0.15-0.3,							
BH9 0.05-0.2,	BH10 0.05-0.2,							
BH11 0.05-0.2,	D2,							
D3								
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
BH5 0.05-0.2,	BH6 0.05-0.2,	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**15-Jul-2015**	23-Jul-2015	✓
BH7 0.05-0.2,	BH8 0.15-0.3,							
BH9 0.05-0.2,	BH10 0.05-0.2,							
BH11 0.05-0.2,	D2,							
D3,	TRIP SPIKE,							
TRIP BLANK,	TSC							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
R1	**09-Jul-2015**	**14-Jul-2015**	05-Jan-2016	✓	**14-Jul-2015**	05-Jan-2016	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T)							
R1	**09-Jul-2015**	----	----	----	**16-Jul-2015**	06-Aug-2015	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
R1	**09-Jul-2015**	**15-Jul-2015**	16-Jul-2015	✓	**15-Jul-2015**	24-Aug-2015	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
R1	**09-Jul-2015**	**15-Jul-2015**	16-Jul-2015	✓	**16-Jul-2015**	24-Aug-2015	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080)							
R1	**09-Jul-2015**	**15-Jul-2015**	23-Jul-2015	✓	**15-Jul-2015**	23-Jul-2015	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	2	12	**16.67**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	2	15	**13.33**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	2	12	**16.67**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	12	**16.67**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	2	8	**25.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Polychlorinated Biphenyls (PCB)	EP066	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	3	**0.00**	**10.00**	×	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	12	**16.67**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	0	4	**0.00**	**10.00**	×	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	19	**10.53**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	**33.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	4	**25.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	**33.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	4	**25.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	3	**0.00**	**5.00**	×	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	**8.33**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	0	4	**0.00**	**5.00**	×	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In-house. A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	SOIL	In house: Referenced to APHA 4500-CN-O. Caustic leachates of soil samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)

APPENDIX N

LABORATORY CERTIFICATES

Aargus

AUSTRALIAN SAFER ENVIRONMENT & TECHNOLOGY PTY LTD

ABN 36 088 095 112

Our ref: ASET63150 / 66330 / 1 - 7
Your ref: ES7155/2 - DSI - Bellevue Hill
NATA Accreditation No: 14484

16 March 2018

Aargus Pty Ltd.
6 Carter Street
Lidcombe NSW 2141

Accredited for compliance with ISO/IEC 17025.

Attn: Mr Mark Kelly

Dear Mark

Asbestos Identification
This report presents the results of seven samples, forwarded by Aargus Pty Ltd. on 14 March 2018, for analysis for asbestos.

1.Introduction: Seven samples forwarded were examined and analysed for the presence of asbestos.

2. Methods: The samples were examined under a Stereo Microscope and selected fibres were analysed by Polarized Light Microscopy in conjunction with Dispersion Staining method **(Australian Standard AS 4964 - 2004 and Safer Environment Method 1 as the supplementary work instruction) (Qualitative Analysis only).**

The report also provides approximate weights and percentages, categories of asbestos forms appearing in the sample, such as **AF** (Asbestos Fines), **FA** (Friable Asbestos) and **ACM** (Asbestos Containing Material), also satisfying the requirements of the WA/ NEPM Guidelines.

3. Results: **Sample No. 1. ASET63150 / 66330 / 1. BH1 - 0.4-0.5.**
Approx dimensions 10.0 cm x 10.0 cm x 9. cm
Approx. total dry weight of soil = 910.0g
The sample consisted of a mixture of sandy soil, stones, sandstone, plant matter and fragments of cement.
No asbestos detected.

Sample No. 2. ASET63150 / 66330 / 2. BH2 - 0.4-0.5.
Approx dimensions 10.0 cm x 10.0 cm x 8.6 cm
Approx. total dry weight of soil = 872.0g
The sample consisted of a mixture of sandy soil, stones, sandstone, plant matter, fragments of cement and corroded metal.
No asbestos detected.

Sample No. 3. ASET63150 / 66330 / 3. BH3 - 0.2-0.3.
Approx dimensions 10.0 cm x 10.0 cm x 8.3 cm
Approx. total dry weight of soil = 857.0g
The sample consisted of a mixture of sandy soil, stones, sandstone and plant matter.
No asbestos detected.

Sample No. 4. ASET63150 / 66330 / 4. BH4 - 0.2-0.3.
Approx dimensions 10.0 cm x 10.0 cm x 8.7 cm
Approx. total dry weight of soil = 883.0g
The sample consisted of a mixture of sandy soil, stones, sandstone, plant matter and fragments of cement.
No asbestos detected.

Sample No. 5. ASET63150 / 66330 / 5. BH5 - 0.2-0.3.
Approx dimensions 10.0 cm x 10.0 cm x 8.3 cm
Approx. total dry weight of soil = 840.0g
The sample consisted of a mixture of sandy soil, stones, sandstone, plant matter and fragments of cement.
No asbestos detected.

Sample No. 6. ASET63150 / 66330 / 6. BH6 - 0.2-0.3.
Approx dimensions 10.0 cm x 10.0 cm x 8.7 cm
Approx. total dry weight of soil = 837.0g
The sample consisted of a mixture of soil, stones, sandstone and fragments of cement.
No asbestos detected.

Sample No. 7. ASET63150 / 66330 / 7. D1.
Approx dimensions 10.0 cm x 10.0 cm x 9.0 cm
Approx. total dry weight of soil = 927.0g
The sample consisted of a mixture of sandy soil, stones, sandstone, plant matter and fragments of cement.
No asbestos detected.

Analysed and reported by,

Chamath Annakkage. BSc
Analyst / Approved Identifier

Mahen De Silva. BSc, MSc, Grad Dip (Occ Hyg)
Occupational Hygienist / Approved Signatory

NATA
WORLD RECOGNISED
ACCREDITATION

Accredited for compliance with ISO/IEC 17025.

This report is consistent with the analytical procedures and reporting recommendations in the Western Australia Guidelines for the Assessment Remediation and Management of Asbestos contaminated sites in Western Australia and it also satisfies the requirements of the current NEPM Guidelines. NATA Accreditation does not cover the performance of this service (NATA ISO/IEC17025 AUG 2014).

Disclaimers;

The approx; weights given above can be used only as a guide. They do not represent absolute weights of each kind of asbestos, as it is impossible to extract all loose fibres from soil and other asbestos containing building material samples using this method. However above figures may be used as closest approximations to the exact values in each case. Estimation and/ or reporting of asbestos fibre weights

in asbestos containing materials and soil is out of the Scope of the NATA Accreditation. NATA Accreditation only covers the qualitative part of the results reported. This weight disclaimer also covers weight / weight percentages given.

The results contained in this report relate only to the sample/s submitted for testing. Australian Safer Environment & Technology accepts no responsibility for whether or not the submitted sample/s is/are representative. Results indicating "No asbestos detected" indicates a reporting limit specified in AS4964 -2004 which is 0.1g/ Kg (0.01%). Any amounts detected at assumed lower level than that would be reported, however those assumed lower levels may be treated as "No asbestos detected" as specified and recommended by AS4964-2004. Trace / respirable level asbestos will be reported only when detected.

Estimation of asbestos weights involves the use of following assumptions;
Volume of each kind of Asbestos present in broken edges have been visually estimated and its been assumed that volumes remain similar throughout the binding matrix and those volumes are only approximate and not exact. Material densities have been assumed to be similar to commonly found similar materials and may not be exact.

ACM - Asbestos Containing Material - Products or materials that contain asbestos in an inert bound matrix such as cement or resin. Here taken to be sound material, even as fragments and not fitting through a 7mm X 7 mm sieve.

AF -Includes asbestos free fibres, small fibre bundles and also ACM fragments that pass through a 7mm X 7 mm sieve.

FA -Friable asbestos material such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products.

^ denotes loose fibres of relevant asbestos types detected in soil/dust
*** denotes asbestos detected in ACM in bonded form (< 7 mm or > 7 mm)**
 # denotes friable asbestos as soft fibro plaster and/or highly weathered ACM that will easily crumble

All samples indicating "No asbestos detected" are assumed to be less than 0.001 % unless the actual approximate weight is given.

ASE163150/66330/1-7

AARGUS PTY LTD

446 Parramatta Road
PETERSHAM NSW 2049

P O Box 398 Tel: 1300 137 038
DRUMMOYNE NSW 1470 Fax: 1300 136 038

Laboratory Test Request / Chain of Custody Record

Email to: cynthia@aargus.net; dereck@aargus.net; mark.kelly@aargus.net; ningye@aargus.net; Allen@aargus.net Setareh@aargus.net

TO: ASET - Australian Safer Environment & Technology Pty Ltd, Sydney Suite 710 / 90 George Street PO Box 1644 HORNSBY, NSW 2077 HORNSBY WESTFIELD NSW 1635		Sampling Date: 11.03.2018	Job No: ES7155/2
		Sampled By: LC	Project: DSI
PH: 02 9987 2183	FAX: 02 9987 2151	Project Manager: MK	Location: Bellevue Hill
ATTN: Samples Receipt	EMAIL aset@bigpond.net.au		

Sampling details			Sample type	Results required by: (Standard Turnaround)										
Location	Depth (m)	Date	Soil Samples	Asbestos %w/w										KEEP SAMPLE?
1 BH1	0.4-0.5	11.03.2018	DSP	V										YES
2 BH2	0.4-0.5	11.03.2018	DSP	V										YES
3 BH3	0.2-0.3	11.03.2018	DSP	V										YES
4 BH4	0.2-0.3	11.03.2018	DSP	V										YES
5 BH5	0.2-0.3	11.03.2018	DSP	V										YES
6 BH6	0.2-0.3	11.03.2018	DSP	V										YES
7 D1		11.03.2018	DSP	V										YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
Lance	LC	12.03.2018	SW	SW	14/3 530PM

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sample (glass jar)	DSP	Disturbed soil sample (small plastic bag)
WP	Water sample, plastic bottle	DSG	Disturbed soil sample (glass jar)	✓	Test required
GV	Glass vial	OTH	Other	ACAN	Air sample, canister

® mole H^+/tonne

RECEIVED 14 MAR 2018 BY: SW

RECEIVED 14 MAR 2018 BY: SW

CERTIFICATE OF ANALYSIS

Work Order	: **EM1804559**	Page	: 1 of 7
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR MARK KELLY	Contact	: Customer Services EM
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: 1300137038	Telephone	: +61-3-8549 9600
Project	: ES7155/2	Date Samples Received	: 14-Mar-2018 10:05
Order number	: ----	Date Analysis Commenced	: 15-Mar-2018
C-O-C number	: ----	Issue Date	: 27-Mar-2018 12:21
Sampler	: LC		
Site	: Bellevue Hill		
Quote number	: SY/258/14 V2		
No. of samples received	: 1		
No. of samples analysed	: 1		

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
- Descriptive Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Emily Daos	Approved Asbestos Identifier	Melbourne Asbestos, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

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.

- EG005T: EM1804521_059 Poor duplicate precision for Manganese due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EG035T: EM1804513 #35, Poor matrix spike recovery for Mercury due to matrix effects.
- EA200N: Asbestos weights and percentages are not covered under the Scope of NATA Accreditation.
  Weights of Asbestos are based on extracted bulk asbestos, fibre bundles, and/or ACM and do not include respirable fibres (if present)
  The Asbestos (Fines and Fibrous) weight is calculated from the extracted Fibrous Asbestos and Asbestos Fines as an equivalent weight of 100% Asbestos
  Percentages for Asbestos content in ACM are based on the 2013 NEPM default values.
  All calculations of percentage Asbestos under this method are approximate and should be used as a guide only.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- EA200N: ALS laboratory procedures and methods used for the identification and quantitation of asbestos are consistent with AS4964-2004 and the requirements of the 2013 NEPM for Assessment of Site Contamination
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR.
  Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SSI	----	----	----	----
			Client sampling date / time	11-Mar-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1804559-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**7.7**	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**No**	----	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	**No**	----	----	----	----
Asbestos Type	1332-21-4	-	--	-	----	----	----	----
Sample weight (dry)	----	0.01	g	**902**	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	**E.DAOS**	----	----	----	----
EA200N: Asbestos Quantification (non-NATA)								
ø Asbestos (Fines and Fibrous <7mm)	1332-21-4	0.0004	g	<0.0004	----	----	----	----
ø Asbestos (Fines and Fibrous FA+AF)	----	0.001	% (w/w)	<0.001	----	----	----	----
ø Asbestos Containing Material	1332-21-4	0.1	g	<0.1	----	----	----	----
ø Asbestos Containing Material (as 15% Asbestos in ACM >7mm)	1332-21-4	0.01	% (w/w)	<0.01	----	----	----	----
ø Weight Used for % Calculation	----	0.0001	kg	**0.902**	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	<2	----	----	----	----
Copper	7440-50-8	5	mg/kg	<5	----	----	----	----
Lead	7439-92-1	5	mg/kg	<5	----	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**6**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SSI	----	----	----	----
			Client sampling date / time	11-Mar-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1804559-001	--------	--------	--------	--------
				Result	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SSI	----	----	----	----
			Client sampling date / time	11-Mar-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1804559-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**99.0**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**85.1**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Client sample ID	SSI	----	----	----	----
			Client sampling date / time	11-Mar-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1804559-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.5	%	**99.3**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**100**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**71.7**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**108**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	**108**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**106**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**70.4**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	**88.4**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**70.6**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	SSI - 11-Mar-2018 00:00	Brown sandy soil.

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	38	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	33	139
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1804559**	Page	: 1 of 9
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR MARK KELLY	Contact	: Customer Services EM
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: 1300137038	Telephone	: +61-3-8549 9600
Project	: ES7155/2	Date Samples Received	: 14-Mar-2018
Order number	: ----	Date Analysis Commenced	: 15-Mar-2018
C-O-C number	: ----	Issue Date	: 27-Mar-2018
Sampler	: LC		
Site	: Bellevue Hill		
Quote number	: SY/258/14 V2		
No. of samples received	: 1		
No. of samples analysed	: 1		

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Emily Daos	Approved Asbestos Identifier	Melbourne Asbestos, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1497377)									
EM1804535-013	Anonymous	EA055: Moisture Content	----	1	%	9.9	9.4	4.99	No Limit
EM1804559-001	SSI	EA055: Moisture Content	----	1	%	7.7	7.5	3.36	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1504670)									
EM1804513-034	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	32	32	0.00	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	18	16	8.99	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	9	12	23.8	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	22	21	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	42	39	9.47	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	44	40	10.7	No Limit
EM1804521-059	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	37	40	9.32	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	47	44	6.40	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	12	12	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	8	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	14	16	7.29	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1504671)									
EM1804513-034	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1804521-059	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1504772)									
EM1804355-046	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1504772) - continued									
EM1804355-046	Anonymous	EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1504771)									
EM1804521-062	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM1804355-046	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1504771) - continued									
EM1804355-046	Anonymous	EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1500588)									
EM1804559-001	SSI	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1804582-010	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1504770)									
EM1804521-062	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1804355-046	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1500588)									
EM1804559-001	SSI	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1804582-010	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1504770)									
EM1804521-062	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EM1804355-046	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 1500588)									
EM1804559-001	SSI	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080: BTEXN (QC Lot: 1500588) - continued									
EM1804559-001	SSI	EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EM1804582-010	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1504670)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	85.0	79	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	96.6	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	86.9	83	109
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	85.0	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	87.2	78	106
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	91.3	82	111
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	89.3	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1504671)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.9	77	104
EP068A: Organochlorine Pesticides (OC) (QCLot: 1504772)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	94.0	65	120
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	95.8	68	121
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	93.1	70	121
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	64	119
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	84.7	56	121
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.0	63	114
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	94.3	64	121
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	96.6	68	120
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	97.9	72	124
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	69	125
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	98.6	71	123
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	73.6	59	123
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	95.7	70	123
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.4	64	119
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	96.3	69	124
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	98.3	66	128
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	95.4	62	121
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.1	57	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	91.1	60	124
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	96.0	73	120
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	79.4	61	121
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1504771)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	111	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	101	70	132

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1504771) - continued								
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	110	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	107	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	112	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.8 mg/kg	109	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	112	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	114	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	108	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	114	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	101	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	104	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	92.8	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	97.4	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	99.1	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	95.8	68	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1500588)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	99.7	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1504770)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	86.2	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	100	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	91.9	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1500588)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	95.8	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1504770)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	90.2	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	99.2	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	85.8	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1500588)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	97.3	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	112	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	99.8	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	107	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	107	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	94.3	66	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1504670)							
EM1804513-035	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	92.4	78	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	85.9	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	84.1	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	86.4	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	112	76	124
		EG005T: Nickel	7440-02-0	50 mg/kg	82.7	78	120
		EG005T: Zinc	7440-66-6	50 mg/kg	102	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1504671)							
EM1804513-035	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	# 75.5	76	116
EP068A: Organochlorine Pesticides (OC) (QCLot: 1504772)							
EM1804355-053	Anonymous	EP068: gamma-BHC	58-89-9	0.5 mg/kg	101	22	139
		EP068: Heptachlor	76-44-8	0.5 mg/kg	93.1	18	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	113	23	136
		EP068: Dieldrin	60-57-1	0.5 mg/kg	103	42	136
		EP068: Endrin	72-20-8	0.5 mg/kg	105	23	146
		EP068: 4.4`-DDT	50-29-3	0.5 mg/kg	89.0	20	133
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1504771)							
EM1804513-043	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	112	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	116	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1500588)							
EM1804561-001	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	70.5	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1504770)							
EM1804513-041	Anonymous	EP071: C10 - C14 Fraction	----	806 mg/kg	86.1	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	98.2	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	91.5	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1500588)							
EM1804561-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	98.7	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1504770)							
EM1804513-041	Anonymous	EP071: >C10 - C16 Fraction	----	1160 mg/kg	89.4	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	97.7	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	85.8	44	126
EP080: BTEXN (QCLot: 1500588)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 1500588) - continued							
EM1804561-001	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	104	50	136
		EP080: Toluene	108-88-3	2 mg/kg	70.3	56	139

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1804559**	Page	: 1 of 6
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR MARK KELLY	Telephone	: +61-3-8549 9600
Project	: ES7155/2	Date Samples Received	: 14-Mar-2018
Site	: Bellevue Hill	Issue Date	: 27-Mar-2018
Sampler	: LC	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG035T: Total Recoverable Mercury by FIMS	EM1804513--035	Anonymous	**Mercury**	7439-97-6	75.5 %	76-116%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) SSI	**11-Mar-2018**	**----**	----	----	**15-Mar-2018**	25-Mar-2018	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag: Separate bag received (EA200) SSI	**11-Mar-2018**	**----**	----	----	**15-Mar-2018**	07-Sep-2018	✓
EA200N: Asbestos Quantification (non-NATA)							
Snap Lock Bag: Separate bag received (EA200N) SSI	**11-Mar-2018**	**----**	----	----	**15-Mar-2018**	07-Sep-2018	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) SSI	**11-Mar-2018**	**19-Mar-2018**	07-Sep-2018	✓	**19-Mar-2018**	07-Sep-2018	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) SSI	**11-Mar-2018**	**19-Mar-2018**	08-Apr-2018	✓	**20-Mar-2018**	08-Apr-2018	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) SSI	**11-Mar-2018**	**19-Mar-2018**	25-Mar-2018	✓	**20-Mar-2018**	28-Apr-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) SSI	**11-Mar-2018**	**19-Mar-2018**	25-Mar-2018	✓	**20-Mar-2018**	28-Apr-2018	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) SSI	**11-Mar-2018**	**16-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	25-Mar-2018	✓
Soil Glass Jar - Unpreserved (EP071) SSI	**11-Mar-2018**	**19-Mar-2018**	25-Mar-2018	✓	**20-Mar-2018**	28-Apr-2018	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) SSI	**11-Mar-2018**	**16-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	25-Mar-2018	✓
Soil Glass Jar - Unpreserved (EP071) SSI	**11-Mar-2018**	**19-Mar-2018**	25-Mar-2018	✓	**20-Mar-2018**	28-Apr-2018	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) SSI	**11-Mar-2018**	**16-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	25-Mar-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Asbestos Classification and Quantitation per NEPM 2013	* EA200N	SOIL	Asbestos Classification and Quantitation per NEPM 2013 with Confirmation of Identification by AS 4964 - 2004 Gravimetric determination of Asbestos Containing Material, Fibrous Asbestos, Asbestos Fines and sample weight and calculation of percentage concentrations per NEPM protocols. Asbestos (Fines and Fibrous FA+AF) is reported as the equivalent weight in the sample received after accounting for sub-sampling (where applicable for the <7mm and/or <2mm fractions).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.

Preparation Methods	Method	Matrix	Method Descriptions
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM1804559**

Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR MARK KELLY	Contact	: Customer Services EM
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: mark.kelly@aargus.net	E-mail	: MelbourneEnviroSer@alsglobal.com
Telephone	: 1300137038	Telephone	: +61-3-8549 9600
Facsimile	: 1300136038	Facsimile	: +61-3-8549 9601
Project	: ES7155/2	Page	: 1 of 3
Order number	: ----	Quote number	: ES2014AARGUS0129 (SY/258/14 V2)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Bellevue Hill		
Sampler	: LC		

Dates

Date Samples Received	: 14-Mar-2018 10:05	Issue Date	: 15-Mar-2018
Client Requested Due Date	: 21-Mar-2018	Scheduled Reporting Date	: **21-Mar-2018**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 5.5°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA055-103 Moisture Content	SOIL - EA200N Asbestos in Soils - (<1kg samples ONLY)	SOIL - EP068A (solids) Organochlorine Pesticides by GCMS	SOIL - S-26 8 metals/TRH/BTEXN/PAH
EM1804559-001	11-Mar-2018 00:00	SSI	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALL REPORTS (CYNTHIA)		
- *AU Certificate of Analysis - NATA (COA)	Email	cynthia@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	cynthia@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	cynthia@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	cynthia@aargus.net
- A4 - AU Tax Invoice (INV)	Email	cynthia@aargus.net
- Chain of Custody (CoC) (COC)	Email	cynthia@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	cynthia@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	cynthia@aargus.net
- EDI Format - XTab (XTAB)	Email	cynthia@aargus.net
ANIKA		
- A4 - AU Tax Invoice (INV)	Email	anika@aargus.net
DERECK		
- *AU Certificate of Analysis - NATA (COA)	Email	dereck@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	dereck@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	dereck@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	dereck@aargus.net
- A4 - AU Tax Invoice (INV)	Email	dereck@aargus.net
- Chain of Custody (CoC) (COC)	Email	dereck@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	dereck@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	dereck@aargus.net
- EDI Format - XTab (XTAB)	Email	dereck@aargus.net
MARK KELLY		
- *AU Certificate of Analysis - NATA (COA)	Email	mark.kelly@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mark.kelly@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mark.kelly@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mark.kelly@aargus.net
- A4 - AU Tax Invoice (INV)	Email	mark.kelly@aargus.net
- Chain of Custody (CoC) (COC)	Email	mark.kelly@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	mark.kelly@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	mark.kelly@aargus.net
- EDI Format - XTab (XTAB)	Email	mark.kelly@aargus.net
NINGYE ZHANG		
- *AU Certificate of Analysis - NATA (COA)	Email	ningye@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ningye@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ningye@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ningye@aargus.net
- A4 - AU Tax Invoice (INV)	Email	ningye@aargus.net
- Chain of Custody (CoC) (COC)	Email	ningye@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	ningye@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	ningye@aargus.net
- EDI Format - XTab (XTAB)	Email	ningye@aargus.net
SETAREH		
- *AU Certificate of Analysis - NATA (COA)	Email	setareh@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	setareh@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	setareh@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	setareh@aargus.net
- Chain of Custody (CoC) (COC)	Email	setareh@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	setareh@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	setareh@aargus.net
- EDI Format - XTab (XTAB)	Email	setareh@aargus.net

Environmental Division
Melbourne
Work Order Reference
EM1804559

Telephone : +61-3-8549 9600

AARGUS PTY LTD

Laboratory Test Request / Chain of Custody Record

446 Parramatta Road
PETERSHAM NSW 2049

P O Box 398 Tel: 1300 137 038
DRUMMOYNE NSW 1470 Fax: 1300 136 038

Email reports: cynthia@aargus.net; mark.kelly@aargus.net; dereck@aargus.net; ningye@aargus.net setareh@aargus.net
Email invoices: anika@aargus.net; cynthia@aargus.net; mark.kelly@aargus.net; dereck@aargus.net; ningye@aargus.net

TO: ALS (Australian Laboratory Services) | Environmental
2-4 Westall Road
SPRINGVALE VIC 3171

PH: 03 8549 9600 FAX: 03 8549 9601
ATTN: Samples Receipt

Sampling Date: 11.03.2018 Job No: ES7155/2
Sampled By: LC Project: DSI
Project Manager: MK Location: Bellevue Hill

PLEASE FORWARD TO MELBOURNE Results required by: Standard
Quotation Number (if applicable): SY/258/14 V2

Sampling details			Sample type														
Location	Depth (m)	Date	Soil	Water	Metals (As, Cd, Cr, Cu, Hg, Pb, Ni, Zn)	TPH & BTEX	PAH	OC	PAH						Asbestos %w/w	Analysis Suite(s)	KEEP SAMPLE ?
1 SS1	-	11.03.2018	DSG/DSP		✓	✓	✓	✓	✓						✓	S8	YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
Lance	LC	12.03.2018			

Legend:
WG Water sample, glass bottle
WP Water sample, plastic bottle
GV Glass vial
USG Undisturbed soil sample (glass jar)
DSG Disturbed soil sample (glass jar)
OTH Other
DSP Disturbed soil sample (small plastic bag)
✓ Test required
ACAN Air sample, canister
ø mole H^+/tonne

ANDREW
5:57pm
12/3/18

Rul Amy
14/3/18 @ 10:05am

CERTIFICATE OF ANALYSIS

Work Order	: **ES1807476**	Page	: 1 of 17
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR MARK KELLY	Contact	: Customer Services ES
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 1300137038	Telephone	: +61-2-8784 8555
Project	: ES7155/2 DSI	Date Samples Received	: 12-Mar-2018 17:55
Order number	: ----	Date Analysis Commenced	: 13-Mar-2018
C-O-C number	: ----	Issue Date	: 19-Mar-2018 17:35
Sampler	: ----		
Site	: Bellevue Hill		
Quote number	: SY/258/14 V2		
No. of samples received	: 17		
No. of samples analysed	: 17		

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
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, 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.

- EP080: The trip spike and its control have been analysed for volatile TPH and BTEX only. The trip spike and control were prepared in the lab using reagent grade sand spiked with petrol. The spike was dispatched from the lab and the control retained.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH1 0.4-0.5	BH1 0.6-0.7	BH2 0.4-0.5	BH2 0.6-0.7	BH3 0.2-0.3
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-001	ES1807476-002	ES1807476-003	ES1807476-004	ES1807476-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.1	3.3	6.4	6.8	5.8
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	4	<2	<2	<2	<2
Copper	7440-50-8	5	mg/kg	9	7	<5	8	<5
Lead	7439-92-1	5	mg/kg	8	6	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	4	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	18	8	8	9	6
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH1 0.4-0.5	BH1 0.6-0.7	BH2 0.4-0.5	BH2 0.6-0.7	BH3 0.2-0.3
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-001	ES1807476-002	ES1807476-003	ES1807476-004	ES1807476-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	----	<0.2
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	----	**0.6**	----	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	----	**1.2**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg	<50	----	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg	<100	----	<100	----	<100
C29 - C36 Fraction	----	100	mg/kg	<100	----	<100	----	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	<50	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH1 0.4-0.5	BH1 0.6-0.7	BH2 0.4-0.5	BH2 0.6-0.7	BH3 0.2-0.3
Client sampling date / time				11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
				ES1807476-001	ES1807476-002	ES1807476-003	ES1807476-004	ES1807476-005
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	<10	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	----	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	----	<100	----	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	----	<100	----	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	<50	----	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	<50	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	<0.2	----	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	----	<1	----	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**97.7**	----	**93.9**	----	**104**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**104**	----	**91.4**	----	**109**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**96.1**	----	**89.8**	----	**101**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**71.4**	----	**70.1**	----	**70.0**
2-Chlorophenol-D4	93951-73-6	0.5	%	**76.3**	----	**74.8**	----	**74.7**
2.4.6-Tribromophenol	118-79-6	0.5	%	**59.0**	----	**57.5**	----	**56.8**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**82.4**	----	**80.9**	----	**80.5**
Anthracene-d10	1719-06-8	0.5	%	**79.4**	----	**79.2**	----	**77.9**
4-Terphenyl-d14	1718-51-0	0.5	%	**70.2**	----	**70.1**	----	**68.9**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**106**	----	**128**	----	**123**

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

			Client sample ID	BH1 0.4-0.5	BH1 0.6-0.7	BH2 0.4-0.5	BH2 0.6-0.7	BH3 0.2-0.3
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-001	ES1807476-002	ES1807476-003	ES1807476-004	ES1807476-005
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued								
Toluene-D8	2037-26-5	0.2	%	112	----	128	----	123
4-Bromofluorobenzene	460-00-4	0.2	%	109	----	125	----	122

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

			Client sample ID	BH3 0.4-0.5	BH4 0.2-0.3	BH4 0.4-0.5	BH5 0.2-0.3	BH5 0.4-0.5
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-006	ES1807476-007	ES1807476-008	ES1807476-009	ES1807476-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	2.4	7.2	3.8	3.1	6.6
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	<2	<2	<2	<2	<2
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg	7	<5	<5	6	<5
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	9	5	6	11	6
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	<0.05	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	<0.05	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	----	<0.05	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	----	<0.05	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	----	<0.05	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	<0.05	----	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg	----	<0.05	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg	----	<0.05	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	<0.05	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	----	<0.05	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	----	<0.05	----	<0.05	----
Endrin	72-20-8	0.05	mg/kg	----	<0.05	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	<0.05	----	<0.05	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	----	<0.05	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	----	<0.05	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	<0.05	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	<0.05	----	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH3 0.4-0.5	BH4 0.2-0.3	BH4 0.4-0.5	BH5 0.2-0.3	BH5 0.4-0.5
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-006	ES1807476-007	ES1807476-008	ES1807476-009	ES1807476-010
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	0.2	mg/kg	----	<0.2	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	----	<0.05	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	----	<0.2	----	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	----	<0.05	----	<0.05	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	----	<0.05	----	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	----	<0.5	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	----	<0.5	----	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	**0.6**	----	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	**1.2**	----	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	----	<10	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	----	<50	----
C15 - C28 Fraction	----	100	mg/kg	----	<100	----	<100	----
C29 - C36 Fraction	----	100	mg/kg	----	<100	----	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	----	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH3 0.4-0.5	BH4 0.2-0.3	BH4 0.4-0.5	BH5 0.2-0.3	BH5 0.4-0.5
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-006	ES1807476-007	ES1807476-008	ES1807476-009	ES1807476-010
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	----	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	----	<10	----
>C10 - C16 Fraction	----	50	mg/kg	----	<50	----	<50	----
>C16 - C34 Fraction	----	100	mg/kg	----	<100	----	<100	----
>C34 - C40 Fraction	----	100	mg/kg	----	<100	----	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	<50	----	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	<50	----	<50	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg	----	<0.5	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	----	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	----	<0.2	----
^ Total Xylenes	----	0.5	mg/kg	----	<0.5	----	<0.5	----
Naphthalene	91-20-3	1	mg/kg	----	<1	----	<1	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	**88.5**	----	**87.2**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	**80.6**	----	**83.2**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	**85.9**	----	**88.4**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	**71.1**	----	**72.5**	----
2-Chlorophenol-D4	93951-73-6	0.5	%	----	**76.1**	----	**77.5**	----
2.4.6-Tribromophenol	118-79-6	0.5	%	----	**56.4**	----	**50.4**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	**81.7**	----	**84.2**	----
Anthracene-d10	1719-06-8	0.5	%	----	**79.0**	----	**80.9**	----
4-Terphenyl-d14	1718-51-0	0.5	%	----	**70.1**	----	**72.3**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	**119**	----	**131**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH3 0.4-0.5	BH4 0.2-0.3	BH4 0.4-0.5	BH5 0.2-0.3	BH5 0.4-0.5
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-006	ES1807476-007	ES1807476-008	ES1807476-009	ES1807476-010
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued								
Toluene-D8	2037-26-5	0.2	%	----	**119**	----	**130**	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	**122**	----	**128**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		BH6 0.2-0.3	BH6 0.4-0.5	D1	Trip Spike	Trip Blanks
		Client sampling date / time		11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	07-Mar-2018 00:00	07-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-011	ES1807476-012	ES1807476-013	ES1807476-014	ES1807476-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**6.3**	**4.5**	**7.3**	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	<2	<2	<2	----	----
Copper	7440-50-8	5	mg/kg	<5	<5	<5	----	----
Lead	7439-92-1	5	mg/kg	**8**	<5	<5	----	----
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	----	----
Zinc	7440-66-6	5	mg/kg	**8**	**6**	**6**	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH6 0.2-0.3	BH6 0.4-0.5	D1	Trip Spike	Trip Blanks
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	07-Mar-2018 00:00	07-Mar-2018 00:00
Compound	*CAS Number*	*LOR*	*Unit*	ES1807476-011	ES1807476-012	ES1807476-013	ES1807476-014	ES1807476-015
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	----	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	----	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	<10	**15**	<10
C10 - C14 Fraction	----	50	mg/kg	<50	----	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH6 0.2-0.3	BH6 0.4-0.5	D1	Trip Spike	Trip Blanks
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	07-Mar-2018 00:00	07-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-011	ES1807476-012	ES1807476-013	ES1807476-014	ES1807476-015
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	<10	**20**	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	----	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	----	<0.5	**4.2**	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	<0.5	**0.8**	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	<0.5	**4.4**	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	<0.5	**2.0**	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	<0.2	**11.4**	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	<0.5	**6.4**	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	----	<1	<1	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**103**	----	**97.1**	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**96.8**	----	**84.8**	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**103**	----	**91.5**	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**69.2**	----	**68.1**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**73.9**	----	**72.9**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**53.6**	----	**53.1**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**80.1**	----	**79.5**	----	----
Anthracene-d10	1719-06-8	0.5	%	**77.6**	----	**76.3**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**69.1**	----	**67.8**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**120**	----	**115**	**123**	**125**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH6 0.2-0.3	BH6 0.4-0.5	D1	Trip Spike	Trip Blanks
			Client sampling date / time	11-Mar-2018 00:00	11-Mar-2018 00:00	11-Mar-2018 00:00	07-Mar-2018 00:00	07-Mar-2018 00:00
Compound	CAS Number	LOR	Unit	ES1807476-011	ES1807476-012	ES1807476-013	ES1807476-014	ES1807476-015
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued								
Toluene-D8	2037-26-5	0.2	%	**123**	----	**118**	**122**	**128**
4-Bromofluorobenzene	460-00-4	0.2	%	**121**	----	**113**	**122**	**127**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	TSC	----	----	----	----
			Client sampling date / time	07-Mar-2018 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1807476-016	--------	--------	--------	--------
				Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	**20**	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	**26**	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	**12**	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	**5.4**	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	**0.9**	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	**5.0**	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	**2.2**	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	**13.5**	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg	**7.2**	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**121**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	**125**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**118**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**R1**	----	----	----	----
			Client sampling date / time	11-Mar-2018 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES1807476-017**	--------	--------	--------	--------
				Result	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QUALITY CONTROL REPORT

Work Order	: **ES1807476**	Page	: 1 of 10
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR MARK KELLY	Contact	: Customer Services ES
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 1300137038	Telephone	: +61-2-8784 8555
Project	: ES7155/2 DSI	Date Samples Received	: 12-Mar-2018
Order number	: ----	Date Analysis Commenced	: 13-Mar-2018
C-O-C number	: ----	Issue Date	: 19-Mar-2018
Sampler	: ----		
Site	: Bellevue Hill		
Quote number	: SY/258/14 V2		
No. of samples received	: 17		
No. of samples analysed	: 17		

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, 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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1496024)									
ES1807437-003	Anonymous	EA055: Moisture Content	----	1	%	15.6	16.1	3.28	0% - 50%
ES1807449-007	Anonymous	EA055: Moisture Content	----	1	%	<1.0	<1.0	0.00	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1496025)									
ES1807476-004	BH2 0.6-0.7	EA055: Moisture Content	----	1	%	6.8	6.4	4.45	No Limit
ES1807479-002	Anonymous	EA055: Moisture Content	----	1	%	24.1	27.7	13.7	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1498769)									
ES1807447-035	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	23	29	23.0	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	12	9	29.4	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	54	44	19.2	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	137	137	0.00	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	144	127	12.6	0% - 20%
ES1807476-004	BH2 0.6-0.7	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	8	8	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	9	10	12.8	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1498768)									
ES1807447-035	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1807476-004	BH2 0.6-0.7	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1490695)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 1490695) - continued									
ES1807476-001	BH1 0.4-0.5	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1807482-004	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1490694)									
ES1807476-001	BH1 0.4-0.5	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
ES1807482-004	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP068A: Organochlorine Pesticides (OC) (QC Lot: 1490694) - continued									
ES1807482-004	Anonymous	EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1490693)									
ES1807476-001	BH1 0.4-0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1807482-004	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1490693) - continued									
ES1807482-004	Anonymous	EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1490692)									
ES1807476-001	BH1 0.4-0.5	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1807482-004	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1491208)									
ES1807382-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1807476-001	BH1 0.4-0.5	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1490692)									
ES1807476-001	BH1 0.4-0.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1807482-004	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1491208)									
ES1807382-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1807476-001	BH1 0.4-0.5	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 1491208)									
ES1807382-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1807476-001	BH1 0.4-0.5	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP080: BTEXN (QC Lot: 1491208) - continued									
ES1807476-001	BH1 0.4-0.5	EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG020T: Total Metals by ICP-MS (QC Lot: 1500142)									
ES1807439-007	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.007	0.007	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.018	0.019	7.20	0% - 50%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.014	0.012	14.1	0% - 50%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.056	0.055	0.00	0% - 50%
ME1800345-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.001	0.002	0.00	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.006	0.007	0.00	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.003	0.00	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.004	0.005	0.00	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.050	0.052	4.29	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1500962)									
ES1807439-010	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	0.0002	0.0003	0.00	No Limit
WN1801153-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1498769)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	124	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	96.1	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	85.3	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	115	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	95.6	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	96.6	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	99.8	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1498768)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	76.5	70	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1490695)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	119	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 1490694)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	90.4	69	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	90.6	65	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	94.2	67	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.5	68	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.1	65	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	89.7	67	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	90.8	69	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	90.6	62	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	89.9	63	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.9	66	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	88.5	64	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	66	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	67	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.7	67	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	94.0	69	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.9	69	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	90.5	56	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.4	62	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	91.3	66	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	92.6	64	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	90.2	54	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1490693)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1490693) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	101	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	100	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	101	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	102	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	104	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	106	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	106	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	107	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	94.5	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	98.6	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	90.0	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	98.9	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	94.6	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	91.3	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	93.4	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	84.7	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1490692)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	92.7	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	109	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	98.8	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1491208)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	118	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1490692)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	111	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	115	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	106	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1491208)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	117	68	128
EP080: BTEXN (QCLot: 1491208)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	113	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	112	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	109	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	112	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	112	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	87.3	63	119

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1500142)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	97.4	82	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.4	84	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	98.6	86	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.2	83	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.4	85	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	97.5	84	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	79	117
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1500962)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.5	77	111

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1498769)							
ES1807447-035	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	116	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	93.4	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	72.9	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	114	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	75.7	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	86.8	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	107	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1498768)							
ES1807447-035	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	80.2	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 1490695)							
ES1807476-001	BH1 0.4-0.5	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	129	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 1490694)							
ES1807476-001	BH1 0.4-0.5	EP068: gamma-BHC	58-89-9	0.5 mg/kg	93.4	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	80.0	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	86.8	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	92.2	70	130
		EP068: Endrin	72-20-8	2 mg/kg	91.4	70	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	90.7	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1490693)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1490693) - continued							
ES1807476-001	BH1 0.4-0.5	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	116	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	120	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1490692)							
ES1807476-001	BH1 0.4-0.5	EP071: C10 - C14 Fraction	----	523 mg/kg	99.4	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	118	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	118	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1491208)							
ES1807382-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	123	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1490692)							
ES1807476-001	BH1 0.4-0.5	EP071: >C10 - C16 Fraction	----	860 mg/kg	90.0	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	111	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	99.7	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1491208)							
ES1807382-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	116	70	130
EP080: BTEXN (QCLot: 1491208)							
ES1807382-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	122	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	114	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	108	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	110	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	106	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	92.6	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1500142)							
ES1807439-007	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	109	70	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	102	70	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	96.8	70	130
		EG020A-T: Copper	7440-50-8	1 mg/L	105	70	130
		EG020A-T: Lead	7439-92-1	1 mg/L	112	70	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	104	70	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	103	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1500962)							
EP1803498-002	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	83.4	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1807476**	Page	: 1 of 8
Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR MARK KELLY	Telephone	: +61-2-8784 8555
Project	: ES7155/2 DSI	Date Samples Received	: 12-Mar-2018
Site	: Bellevue Hill	Issue Date	: 19-Mar-2018
Sampler	: ----	No. of samples received	: 17
Order number	: ----	No. of samples analysed	: 17

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			**Date extracted**	*Due for extraction*	*Evaluation*	**Date analysed**	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH1 - 0.4-0.5,	BH1 - 0.6-0.7,	**11-Mar-2018**	**----**	----	----	**14-Mar-2018**	25-Mar-2018	✓
BH2 - 0.4-0.5,	BH2 - 0.6-0.7,							
BH3 - 0.2-0.3,	BH3 - 0.4-0.5,							
BH4 - 0.2-0.3,	BH4 - 0.4-0.5,							
BH5 - 0.2-0.3,	BH5 - 0.4-0.5,							
BH6 - 0.2-0.3,	BH6 - 0.4-0.5,							
D1								
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH1 - 0.4-0.5,	BH1 - 0.6-0.7,	**11-Mar-2018**	**15-Mar-2018**	07-Sep-2018	✓	**15-Mar-2018**	07-Sep-2018	✓
BH2 - 0.4-0.5,	BH2 - 0.6-0.7,							
BH3 - 0.2-0.3,	BH3 - 0.4-0.5,							
BH4 - 0.2-0.3,	BH4 - 0.4-0.5,							
BH5 - 0.2-0.3,	BH5 - 0.4-0.5,							
BH6 - 0.2-0.3,	BH6 - 0.4-0.5,							
D1								
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH1 - 0.4-0.5,	BH1 - 0.6-0.7,	**11-Mar-2018**	**15-Mar-2018**	08-Apr-2018	✓	**15-Mar-2018**	08-Apr-2018	✓
BH2 - 0.4-0.5,	BH2 - 0.6-0.7,							
BH3 - 0.2-0.3,	BH3 - 0.4-0.5,							
BH4 - 0.2-0.3,	BH4 - 0.4-0.5,							
BH5 - 0.2-0.3,	BH5 - 0.4-0.5,							
BH6 - 0.2-0.3,	BH6 - 0.4-0.5,							
D1								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP066: Polychlorinated Biphenyls (PCB)								
Soil Glass Jar - Unpreserved (EP066)								
BH1 - 0.4-0.5,	BH2 - 0.4-0.5,	**11-Mar-2018**	**14-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	23-Apr-2018	✓
BH3 - 0.2-0.3,	BH4 - 0.2-0.3,							
BH5 - 0.2-0.3,	BH6 - 0.2-0.3,							
D1								
EP068A: Organochlorine Pesticides (OC)								
Soil Glass Jar - Unpreserved (EP068)								
BH1 - 0.4-0.5,	BH2 - 0.4-0.5,	**11-Mar-2018**	**14-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	23-Apr-2018	✓
BH3 - 0.2-0.3,	BH4 - 0.2-0.3,							
BH5 - 0.2-0.3,	BH6 - 0.2-0.3,							
D1								
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH1 - 0.4-0.5,	BH2 - 0.4-0.5,	**11-Mar-2018**	**14-Mar-2018**	25-Mar-2018	✓	**15-Mar-2018**	23-Apr-2018	✓
BH3 - 0.2-0.3,	BH4 - 0.2-0.3,							
BH5 - 0.2-0.3,	BH6 - 0.2-0.3,							
D1								
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
Trip Spike,	Trip Blanks,	**07-Mar-2018**	**13-Mar-2018**	21-Mar-2018	✓	**16-Mar-2018**	21-Mar-2018	✓
TSC								
Soil Glass Jar - Unpreserved (EP080)								
BH1 - 0.4-0.5,	BH2 - 0.4-0.5,	**11-Mar-2018**	**13-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	25-Mar-2018	✓
BH3 - 0.2-0.3,	BH4 - 0.2-0.3,							
BH5 - 0.2-0.3,	BH6 - 0.2-0.3,							
D1								
Soil Glass Jar - Unpreserved (EP071)								
BH1 - 0.4-0.5,	BH2 - 0.4-0.5,	**11-Mar-2018**	**14-Mar-2018**	25-Mar-2018	✓	**15-Mar-2018**	23-Apr-2018	✓
BH3 - 0.2-0.3,	BH4 - 0.2-0.3,							
BH5 - 0.2-0.3,	BH6 - 0.2-0.3,							
D1								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) Trip Spike, TSC	Trip Blanks,	**07-Mar-2018**	**13-Mar-2018**	21-Mar-2018	✓	**16-Mar-2018**	21-Mar-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH1 - 0.4-0.5, BH3 - 0.2-0.3, BH5 - 0.2-0.3, D1	BH2 - 0.4-0.5, BH4 - 0.2-0.3, BH6 - 0.2-0.3,	**11-Mar-2018**	**13-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	25-Mar-2018	✓
Soil Glass Jar - Unpreserved (EP071) BH1 - 0.4-0.5, BH3 - 0.2-0.3, BH5 - 0.2-0.3, D1	BH2 - 0.4-0.5, BH4 - 0.2-0.3, BH6 - 0.2-0.3,	**11-Mar-2018**	**14-Mar-2018**	25-Mar-2018	✓	**15-Mar-2018**	23-Apr-2018	✓
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) Trip Spike, TSC	Trip Blanks,	**07-Mar-2018**	**13-Mar-2018**	21-Mar-2018	✓	**16-Mar-2018**	21-Mar-2018	✓
Soil Glass Jar - Unpreserved (EP080) BH1 - 0.4-0.5, BH3 - 0.2-0.3, BH5 - 0.2-0.3, D1	BH2 - 0.4-0.5, BH4 - 0.2-0.3, BH6 - 0.2-0.3,	**11-Mar-2018**	**13-Mar-2018**	25-Mar-2018	✓	**16-Mar-2018**	25-Mar-2018	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unspecified (EG020A-T) R1	**11-Mar-2018**	**16-Mar-2018**	07-Sep-2018	✓	**16-Mar-2018**	07-Sep-2018	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unspecified (EG035T) R1	**11-Mar-2018**	**----**	----	----	**16-Mar-2018**	08-Apr-2018	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type / *Analytical Methods*	*Method*	*Count: QC*	*Count: Regular*	***Rate (%): Actual***	***Rate (%): Expected***	*Evaluation*	*Quality Control Specification*
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type / *Analytical Methods*	*Method*	*Count: QC*	*Count: Regular*	***Rate (%): Actual***	***Rate (%): Expected***	*Evaluation*	*Quality Control Specification*

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1807476**

Client	: **AARGUS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR MARK KELLY	Contact	: Customer Services ES
Address	: PO BOX 398 DRUMMOYNE NSW, AUSTRALIA 2047	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: mark.kelly@aargus.net	E-mail	: ALSEnviro.Sydney@alsglobal.com
Telephone	: 1300137038	Telephone	: +61-2-8784 8555
Facsimile	: 1300136038	Facsimile	: +61-2-8784 8500
Project	: ES7155/2 DSI	Page	: 1 of 3
Order number	: ----	Quote number	: ES2014AARGUS0129 (SY/258/14 V2)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Bellevue Hill		
Sampler	:		

Dates

Date Samples Received	: 12-Mar-2018 17:55	Issue Date	: 12-Mar-2018
Client Requested Due Date	: 20-Mar-2018	Scheduled Reporting Date	: **20-Mar-2018**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 4.1' C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 16 / 16

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample #5: BH3 0.2-0.3 on the COC was received labelled BH3 0.6-0.7 on the jar**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- Sample R1 was not received.
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA055-103 Moisture Content	SOIL - S-02 8 Metals (incl. Digestion)	SOIL - S-08 TRH/BTEXN/PAH/OC/PCB/8 Metals	SOIL - S-18 (NO MOIST) TRH(C6-C9)/BTEXN with No Moisture for TBs
ES1807476-001	11-Mar-2018 00:00	BH1 0.4-0.5	✓		✓	
ES1807476-002	11-Mar-2018 00:00	BH1 0.6-0.7	✓	✓		
ES1807476-003	11-Mar-2018 00:00	BH2 0.4-0.5	✓		✓	
ES1807476-004	11-Mar-2018 00:00	BH2 0.6-0.7	✓	✓		
ES1807476-005	11-Mar-2018 00:00	BH3 0..6-0.7	✓		✓	
ES1807476-006	11-Mar-2018 00:00	BH3 0.4-0.5	✓	✓		
ES1807476-007	11-Mar-2018 00:00	BH4 0.2-0.3	✓		✓	
ES1807476-008	11-Mar-2018 00:00	BH4 0.4-0.5	✓	✓		
ES1807476-009	11-Mar-2018 00:00	BH5 0.2-0.3	✓		✓	
ES1807476-010	11-Mar-2018 00:00	BH5 0.4-0.5	✓	✓		
ES1807476-011	11-Mar-2018 00:00	BH6 0.2-0.3	✓		✓	
ES1807476-012	11-Mar-2018 00:00	BH6 0.4-0.5	✓	✓		
ES1807476-013	11-Mar-2018 00:00	D1	✓		✓	
ES1807476-014	07-Mar-2018 00:00	Trip Spike				✓
ES1807476-015	07-Mar-2018 00:00	Trip Blanks				✓
ES1807476-016	07-Mar-2018 00:00	TSC				✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	anika@aargus.net
ALL REPORTS (CYNTHIA)		
- *AU Certificate of Analysis - NATA (COA)	Email	cynthia@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	cynthia@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	cynthia@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	cynthia@aargus.net
- A4 - AU Tax Invoice (INV)	Email	cynthia@aargus.net
- Chain of Custody (CoC) (COC)	Email	cynthia@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	cynthia@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	cynthia@aargus.net
- EDI Format - XTab (XTAB)	Email	cynthia@aargus.net
DERECK		
- *AU Certificate of Analysis - NATA (COA)	Email	dereck@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	dereck@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	dereck@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	dereck@aargus.net
- Chain of Custody (CoC) (COC)	Email	dereck@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	dereck@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	dereck@aargus.net
- EDI Format - XTab (XTAB)	Email	dereck@aargus.net
JIA		
- *AU Certificate of Analysis - NATA (COA)	Email	jia@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jia@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jia@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jia@aargus.net
- Chain of Custody (CoC) (COC)	Email	jia@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	jia@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	jia@aargus.net
- EDI Format - XTab (XTAB)	Email	jia@aargus.net
MARK KELLY		
- *AU Certificate of Analysis - NATA (COA)	Email	mark.kelly@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mark.kelly@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mark.kelly@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mark.kelly@aargus.net
- A4 - AU Tax Invoice (INV)	Email	mark.kelly@aargus.net
- Chain of Custody (CoC) (COC)	Email	mark.kelly@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	mark.kelly@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	mark.kelly@aargus.net
- EDI Format - XTab (XTAB)	Email	mark.kelly@aargus.net
NINGYE ZHANG		
- *AU Certificate of Analysis - NATA (COA)	Email	ningye@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ningye@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ningye@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ningye@aargus.net
- A4 - AU Tax Invoice (INV)	Email	ningye@aargus.net
- Chain of Custody (CoC) (COC)	Email	ningye@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	ningye@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	ningye@aargus.net
- EDI Format - XTab (XTAB)	Email	ningye@aargus.net
SETAREH		
- *AU Certificate of Analysis - NATA (COA)	Email	setareh@aargus.net
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	setareh@aargus.net
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	setareh@aargus.net
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	setareh@aargus.net
- Chain of Custody (CoC) (COC)	Email	setareh@aargus.net
- EDI Format - ENMRG (ENMRG)	Email	setareh@aargus.net
- EDI Format - ESDAT (ESDAT)	Email	setareh@aargus.net
- EDI Format - XTab (XTAB)	Email	setareh@aargus.net

Environmental Division
Sydney
Work Order Reference
ES1807476

Telephone : + 61-2-8784 8555

AARGUS PTY LTD

446 Parramatta Road
PETERSHAM NSW 2049 DRUMMOYNE NSW 1470 Fax: 1300 136 038

Laboratory Test Request / Chain of Custody Record

Email reports: cynthia@aargus.net; dereck@aargus.net; mark.kelly@aargus.net;ningye@aargus.net; jla@aargus.net Setareh@aargus.net
Email Invoices: anika@aargus.net; cynthia@aargus.net; dereck@aargus.net; mark.kelly@aargus.net; ningye@aargus.net

TO:	ALS (Australian Laboratory Services) | Environmental 277 - 289 Woodpark Road SMITHFIELD, NSW 2164	Sampling Date: 11.03.2018	Job No: ES7155/2
		Sampled By: LC	Project: DSI
PH:	02 8784 8555 FAX: 02 8784 8500	Project Manager: MK	Location: Bellevue Hill
ATTN:	Samples Receipt		

Results required by: Standard
Quotation Number (if applicable): SY/258/14 V2

Sampling details			Sample type													Analysis Suite(s)	KEEP SAMPLE?
Location	Depth (m)	Date	Soil	Water	Air	Metals (As, Cd, Cr, Cu, Hg, Pb, Ni, Zn)	TPH & BTEX	PAH	OC	PCB							
BH1 1	0.4-0.5	11.03.2018	DSG			✓	✓	✓	✓	✓						S8	YES
BH1 2	0.6-0.7	11.03.2018	DSG			✓										S2	YES
BH2 3	0.4-0.5	11.03.2018	DSG			✓	✓	✓	✓	✓						S8	YES
BH2 4	0.6-0.7	11.03.2018	DSG			✓										S2	YES
BH3 5	0.2-0.3	11.03.2018	DSG			✓	✓	✓	✓	✓						S8	YES
BH3 6	0.4-0.5	11.03.2018	DSG			✓										S2	YES
BH4 7	0.2-0.3	11.03.2018	DSG			✓	✓	✓	✓	✓						S8	YES
BH4 8	0.4-0.5	11.03.2018	DSG			✓										S2	YES
BH5 9	0.2-0.3	11.03.2018	DSG			✓	✓	✓	✓	✓						S8	YES
BH5 10	0.4-0.5	11.03.2018	DSG			✓										S2	YES
BH6 11	0.2-0.3	11.03.2018	DSG			✓	✓	✓	✓	✓						S8	YES
BH6 12	0.4-0.5	11.03.2018	DSG			✓										S2	YES
D1 13	-	11.03.2018	DSG			✓	✓	✓	✓	✓						S8	YES
SNR R1	-	11.03.2018	WG/WP/GV			✓										W2	YES
14 Trip Spike	7.3.18		DSG			Please test for BTEX and TRH F1											YES
15 Trip Blanks	-	7.3.18	DSG														YES
16 TSC	7.3.18																

Relinquished by			Received by		
Name	Signature	Date	Name		Date
Seterah	SP	11.03.2018	SCS	Ael	12/3/18 1755

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sample (glass jar)	DSP	Disturbed soil sample (small plastic bag)
WP	Water sample, plastic bottle	DSG	Disturbed soil sample (glass jar)	✓	Test required
GV	Glass vial	OTH	Other	ACAN	Air sample, canister

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ES1807476

APPENDIX O

QA/QC ASSESSMENT

1 FIELD DATA QUALITY ASSESSMENT SOILS

1.1 Field Data Completeness

Field Sample Category - Soils	Number (Target)	Non-conformances	Number (Useable)	Overall Completeness %
Primary Samples	12	0	12	100%
Intra-Lab Duplicates	1	0	1	100%
Inter-Lab Duplicates	1	0	1	100%
Rinsate Blanks	1	0	1	100%
Trip Spikes	1	0	1	100%
Trip Blank	1	0	1	100%

Note: (*) – Overall Completeness is calculated as a percentage of the number of useable samples over the target number of samples required. The required percentage completeness is specified in the DQOs.

Field Consideration	Yes / No	Comments / Non-Conformances
Were all critical locations sampled?	Y	All critical locations were sampled as per the DQOs.
Were all samples collected from critical densities and depths?	Y	All sampled were recovered as per DQOs.
Were the Standard Operating Procedures (SOPs) appropriate and complied with?	Y	The Aargus Fieldwork Protocols were appropriate and complied with.
Were the samplers adequately experienced?	Y	Sampling was conducted by Aargus Environmental Scientist, Lance Chen and Setareh Kazemi.
Was field documentation complete and correct?	Y	Field records can be found within their respective appendices of the report.
Were an adequate number of intra-laboratory duplicate samples collected?	Y	100% of intra-laboratory duplicate samples required were collected as the table above.
Were an adequate number of inter-laboratory duplicate samples collected?	Y	100% of inter-laboratory duplicate samples required were collected as per the table above.
Were an adequate number of rinsate samples collected?	Y	100% of rinsate samples required were collected as per the table above.
Were an adequate number of trip blanks collected?	Y	100% of trip blanks required were collected as per the table above.
Were an adequate number of trip spikes collected?	Y	100% of trip spikes required were collected as per the table above.

1.2 Field Data Comparability

Field Consideration	Yes / No	Comments / Non-Conformances
Were the same SOPs used on each occasion?	Y	Aargus Fieldwork Protocols were utilised throughout each sampling event.
Was all sampling undertaken by the same person?	Y	Sampling was undertaken by the same scientist.
Could climatic conditions (such as temperature, rainfall, etc.) influence data comparability?	N	All sampling was undertaken on days without rain.
Were the same types of samples collected (filtered, size, fractions, etc.) for each media?	Y	Samples were collected in the same types of containers provided by the laboratory.
Was each field parameter measured using the same equipment?	Y	Headspace analysis was carried out using the same PID meter.
Was the same method and equipment used for extraction of samples?	Y	The same method and equipment was used for the extraction of samples.

1.3 Field Data Representativeness

Laboratory Batch	Laboratory	Sample Medium	Container Breakages	Sample Preservation	Headspace / Temperature
ES1807476	ALS Sydney	Soil and Water (rinsate)	Compliant	Compliant	Compliant
EM1804559	ALS Melbourne	Soil	Compliant	Compliant	Compliant
ASET63150	ASET Sydney	Soil	Compliant	Compliant	Compliant

Field Consideration	Yes / No	Comments / Non-Conformances
Was appropriate media sampled in accordance with the DQOs?	Y	All soil samples were sampled in accordance with the DQOs.
Was all media identified in the DQOs sampled?	Y	All soil samples specified in the DQO were sampled.
Were all samples the samples appropriately handled?	Y	All samples collected were received by the laboratories intact.
Were all samples preserved appropriately?	Y	All samples collected were received by laboratories in the correct temperature. Where relevant, samples were stored in acid-preserved containers supplied by laboratories.

1.4 Field Data Precision

Field Consideration	Yes / No	Comments / Non-Conformances
Were the SOPs appropriate and complied with?	Y	The recovery of field duplicates was conducted in accordance with Aargus Fieldwork Protocols to allow for the assessment of field precision.

1.5 Field Data Accuracy

Field Consideration	Yes / No	Comments / Non-Conformances
Were the SOPs appropriate and complied with?	Y	The recovery of trip blanks and rinsate blanks was conducted in accordance with Aargus Fieldwork Protocols to allow for the assessment of field accuracy.

2 LABORATORY DATA QUALITY ASSESSMENT

2.1 Laboratory Data Completeness

Laboratory Considerations	Yes / No	Comments / Non-Conformances
Were all critical samples analysed according to the DQOs?	Y	All critical samples analysed according to DQOs.
Were all analytes analysed according to the DQOs?	Y	All analytes analysed according to DQOs.
Were the laboratory methods and PQLs appropriate?	Y	US EPA Analytical Methods were used. PQLs were below their respective assessment criteria
Was sample documentation complete?	Y	The sample documentation was correctly completed on the COC's.
Were sample holding times complied with?	Y	All the samples were within holding time for soil samples.
Were an adequate number of laboratory duplicates analysed?	Y	An adequate number of laboratory duplicates were analysed.
Were an adequate number of laboratory blank samples analysed?	Y	An adequate number of laboratory blank samples were analysed.
Were an adequate number of Laboratory Control Samples analysed?	Y	An adequate number of Laboratory Control Samples were analysed.
Were an adequate number of laboratory matrix spikes/duplicates analysed?	Y	An adequate number of laboratory matrix spikes/duplicates were analysed.
Were an adequate number of surrogates analysed?	Y	An adequate number of surrogates were analysed.

2.2 Laboratory Data Comparability

Laboratory Considerations	Yes / No	Comments / Non-Conformances
Were the same analytical methods used for each analyte?	Y	All analytical methods used between laboratories were based on the USEPA/APHA methods.
Were the PQLs used for each analyte less than 20% of their respective assessment criteria?	Y	The PQLs for analytes in soil samples were below 20% of their respective assessment criteria.
Were the sample PQLs used for each analyte the same?	Y	Sample PQL's were the same within each laboratory and between the primary and secondary laboratories.
Were the same laboratories used for analyses of each contaminant type?	Y	ALS Environmental Sydney was the primary laboratory. ALS Environmental Sydney ALS Melbourne was the secondary laboratories. Australian Safer Environment & Technology Pty Ltd is the tertiary Laboratory.
Were the units reported for each analyte the same?	Y	Analytical units of measurement for soil were mg/kg.

2.3 Laboratory Data Representativeness

Laboratory Considerations	Yes / No	Comments / Non-Conformances
Were all samples analysed according to the DQOs?	Y	The majority of the samples were analysed according to the proposal.

2.4 Laboratory Data Precision

Laboratory Considerations	Yes / No	Comments / Non-Conformances
Were the RPDs of the field duplicates within control limits?	Y	The RPDs of the field duplicates were within control limits
Were the RPDs of the laboratory duplicates within control limits?	Y	The RPDs of all laboratory duplicates were within control limits, no duplicate outliers occur.

Note: Please refer to the tables attached at the end of this QA/QC assessment for calculations of the field RPDs.

2.5 Laboratory Data Accuracy

Laboratory Considerations	Yes / No	Comments / Non-Conformances
Were the rinsates free of contaminants?	Y	The concentrations of the analytes were below the PQLs, the data set was considered to be adequately accurate.
Were the trip blanks free of contaminants?	Y	The test results for the trip blank samples, reported concentrations to be less than the PQL's, therefore cross contamination has not occurred.
Were the laboratory blanks free of contaminants?	Y	Laboratory blanks were free of contaminants.
Were the surrogate spikes within control limits?	Y	Surrogate spikes were within control limits.
Were laboratory control samples within control limits?	Y	Laboratory control samples were within control limits.
Were matrix spike recoveries within control limits?	N	Matrix spike were within control limits, with the exception of Total Recoverable Mercury by FIMS in SS1. Given that the majority of matix spike were within control limits, the data set is considered to be adequately accurate.
Were the trip spike recoveries within the control limits?	Y	The results show a recovery of trip spike concentrations, ranging between 70-100%. Based on the above, it is considered that no loss of volatiles from the recovered samples occurred.

Note: Please refer to the tables attached at the end of this QA/QC assessment for tables showing results of field blanks.

TABLE A: Intra-Laboratory Duplicates Summary Tables

ANALYTE	BH4 0.2-0.3 mg/kg	DUPLICATE D1 mg/kg	RELATIVE PERCENTAGE DIFFERENCE %
HEAVY METALS			
Arsenic	<5	<5	-
Cadmium	<1	<1	-
Chromium	<2	<2	-
Copper	<5	<5	-
Mercury	<5	<5	-
Nickel	<0.1	<0.1	-
Lead	<2	<2	-
Zinc	6	6	0
TOTAL PETROLEUM HYDROCARBONS (TPH)			
C6 - C10	<10	<10	-
C10 - C16	<50	<50	-
C16 - C34	<100	<100	-
C34-C40	100	<100	-
BTEX			
Naphthalene	<1	<1	-
Benzene	< 0.2	<0.2	-
Toluene	< 0.5	<0.5	-
Ethyl Benzene	<0.5	<0.5	-
Total Xylenes	<0.5	<0.5	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
B(a)P as TEQ	0.6	0.6	0
Total PAH	<0.5	<0.5	-
Benzo(a)pyrene	<0.5	<0.5	-
Naphthalene	<0.5	<0.5	-
ORGANOCHLORINE PESTICIDES (OCP)			
DDD + DDE + DDT	<0.05	<0.05	-
Aldrin + Dieldrin	<0.05	<0.05	-
Chlordane	<0.05	<0.05	-
Endosulfan	<0.05	<0.05	-
Endrin	<0.05	<0.05	-
Heptachlor	<0.05	<0.05	-
HCB	<0.05	<0.05	-
Methoxychlor	<0.2	<0.2	-
Polychlorinated Biphenyls (PCB)			
PCB	<0.1	<0.1	-

TABLE B: Inter-Laboratory Duplicates Summary Table

ANALYTE	BH4 0.2-0.3 mg/kg ALS SYDNEY	SPLIT SS1 mg/kg ALS MELBOURNE	RELATIVE PERCENTAGE DIFFERENCE (RPD) %
HEAVY METALS			
Arsenic	<5	<5	-
Cadmium	<1	<1	-
Chromium	<2	<2	-
Copper	<5	<5	-
Mercury	<5	<5	-
Nickel	<0.1	<0.1	-
Lead	<2	<2	-
Zinc	6	6	0
TOTAL PETROLEUM HYDROCARBONS (TPH)			
C6 - C10	<10	<10	-
C10 - C16	<50	<50	-
C16 - C34	<100	<100	-
C34-C40	100	100	-
BTEX			
Naphthalene	<1	<1	-
Benzene	< 0.2	< 0.2	-
Toluene	< 0.5	< 0.5	-
Ethyl Benzene	<0.5	<0.5	-
Total Xylenes	0.6	0.6	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
B(a)P as TEQ	0.6	0.6	0
Total PAH	<0.5	<0.5	-
Benzo(a)pyrene	<0.5	<0.5	-
Naphthalene	<0.5	<0.5	-
ORGANOCHLORINE PESTICIDES (OCP)			
DDD + DDE + DDT	<0.05	<0.05	-
Aldrin + Dieldrin	<0.05	<0.05	-
Chlordane	<0.05	<0.05	-
Endosulfan	<0.05	<0.05	-
Endrin	<0.05	<0.05	-
Heptachlor	<0.05	<0.05	-
HCB	<0.05	<0.05	-
Methoxychlor	<0.2	<0.2	-

TABLE C: Rinsate Summary Tables

ANALYTE	Practical Quantitation Limits (PQL)	RINSATE R1 (µg/L) 11.03.2018
HEAVY METALS		
Arsenic	1	<1
Cadmium	0.1	<0.1
Chromium	1	<1
Copper	1	<1
Mercury	0.1	<0.1
Nickel	1	<1
Lead	1	<1
Zinc	5	<5
TOTAL PETROLEUM HYDROCARBONS (TPH)		
C6 - C10	20	<20
C10 - C16	50	<50
C16 - C34	100	<100
C34-C40	100	<100
BTEX		
Naphthalene	5	<5
Benzene	1	<1
Toluene	2	<2
Ethyl Benzene	2	<2
Total Xylenes	2	<2
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)		
B(a)P as TEQ	0.5	<0.5
Total PAH	0.5	<0.5
Benzo(a)pyrene	0.5	<0.5
Naphthalene	1	<1

TABLE D: Trip Blank and Trip Spike Summary Tables

ANALYTE	TRIP SPIKE % 11.03.2018
TRH	
C6-C10	77%
BTEX	
Naphthalene	-
Benzene	100%
Toluene	78%
Ethyl Benzene	89%
Total Xylenes	89%

ANALYTE	TRIP BLANK TB1 (mg/L) 11.03.2018	Practical Quantitation Limits (PQL)
TRH		
C6-C10	<10	10
BTEX		
Naphthalene	<1	1
Benzene	<0.2	0.2
Toluene	<0.2	0.5
Ethyl Benzene	<0.2	0.5
Total Xylenes	<0.5	0.5

APPENDIX P

SUMMARY OF RESULTS

Aargus

TABLE 1
SCHEDULE OF LABORATORY TESTING

Analyte / Analyte Group Sample	Depth (m)	TYPE	SAMPLING DATE	DUPLICATE	SPLIT	MET-8	TPH & BTEX	PAH	OC	PCB	ASBESTOS
BH1	0.4-0.5	F	11.03.2018			✔	✔	✔	✔	✔	✔
BH1	0.6-0.7	N	11.03.2018			✔					
BH2	0.4-0.5	F	11.03.2018			✔	✔	✔	✔	✔	✔
BH2	0.6-0.7	N	11.03.2018			✔					
BH3	0.2-0.3	F	11.03.2018			✔	✔	✔	✔	✔	✔
BH3	0.4-0.5	N	11.03.2018			✔					
BH4	0.2-0.3	F	11.03.2018	D1	SS1	✔	✔	✔	✔	✔	✔
BH4	0.4-0.5	N	11.03.2018			✔					
BH5	0.2-0.3	F	11.03.2018			✔	✔	✔	✔	✔	✔
BH5	0.4-0.5	N	11.03.2018			✔					
BH6	0.2-0.3	F	11.03.2018			✔	✔	✔	✔	✔	✔
BH6	0.4-0.5	N	11.03.2018			✔					

Notes
MET-8: arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc
OC : Organochlorine Pesticides
PCB : Polychlorinated Biphenyls
VOC: Volatile Organic Compounds
PAH: Polycyclic Aromatic Hydrocarbons
TPH: Total Petroleum Hydrcarbons
BTEX: Benzene, Toluene, Ethyl Benzene, Xylene
F,T,N: Fill, Topsoil, Natural

TABLE A

HEAVY METALS TEST RESULTS FOR HILs

Sample Location	Depth (m)	ARSENIC	CADMIUM	CHROMIUM	COPPER	LEAD g	MERCURY	NICKEL	ZINC
	Analyte	HEAVY METALS (mg/kg)							
BH1	0.4-0.5	<5	<1	4	9	8	<0.1	4	18
BH1	0.6-0.7	<5	<1	<2	7	6	<0.1	<2	8
BH2	0.4-0.5	<5	<1	<2	<5	<5	<0.1	<2	8
BH2	0.6-0.7	<5	<1	<2	8	<5	<0.1	<2	9
BH3	0.2-0.3	<5	<1	<2	<5	<5	<0.1	<2	6
BH3	0.4-0.5	<5	<1	<2	<5	7	<0.1	<2	9
BH4	0.2-0.3	<5	<1	<2	<5	<5	<0.1	<2	5
BH4	0.4-0.5	<5	<1	<2	<5	<5	<0.1	<2	6
BH5	0.2-0.3	<5	<1	<2	<5	6	<0.1	<2	11
BH5	0.4-0.5	<5	<1	<2	<5	<5	<0.1	<2	6
BH6	0.2-0.3	<5	<1	<2	<5	8	<0.1	<2	8
BH6	0.4-0.5	<5	<1	<2	<5	<5	<0.1	<2	6
DUPLICATE D1	-	<5	<1	<2	<5	<5	<0.1	<2	6
SPLIT SS1	-	<5	<1	<2	<5	<5	<0.1	<2	6
Practical Quantitation Limits (PQL)		5	1	2	5	5	0.1	2	5
NATIONAL ENVIRONMENT PROTECTION MEASURE (2013)									
Health Investigation Levels (HIL) - Table 1A (1)									
HIL A [a]		100	20	100	6000	300	40[e] / 10[f]	400	7400
HIL B [b]		500	150	500	30,000	1,200	120[e] / 30[f]	1200	60,000
HIL C [c]		300	90	300	17,000	600	80[e] / 13[f]	1200	30,000
HIL D [d]		3000	900	3600	240,000	1,500	730[e] / 180[f]	6000	400,000

Notes

a: Residential with garden/accessible soil (home grown poduce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

b: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high rise buildings and apartments.

c: Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate

d: Commercial/industrial, includes premises such as shops, offices, factories and industrial sites

e: Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present,

f: Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.

g: Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

TABLE B
TOTAL RECOVERABLE HYDROCARBONS (TRH), BTEX AND NAPHTHALENE TEST RESULTS FOR HSLs IN SAND

Sample Location	Depth (m)	TRH (mg/kg) F1 [a]	TRH (mg/kg) F2 [b]	BTEX (mg/kg) BENZENE	BTEX (mg/kg) TOLUENE	BTEX (mg/kg) ETHYL BENZENE	BTEX (mg/kg) TOTAL XYLENES	NAPHTHALENE
BH1	0.4-0.5	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
BH2	0.4-0.5	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
BH3	0.2-0.3	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
BH4	0.2-0.3	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
BH5	0.2-0.3	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
BH6	0.2-0.3	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
DUPLICATE D1	-	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
SPLIT SS1	-	<10	<50	<0.2	<0.5	<0.5	<0.5	<1
Practical Quantitation Limits (PQL)		10	50	0.2	0.2	0.2	5	1
NATIONAL ENVIRONMENT PROTECTION MEASURE (2013)								
Health Screening Levels (HSL) - Table 1A (3)								
HSL A & HSL B: Low-high density residential								
Source depth - 0m to <1m		45	110	0.5	160	55	40	3
Source depth - 1m to <2m		70	240	0.5	220	NL	60	NL
Source depth - 2m to <4m		110	440	0.5	310	NL	95	NL
Source depth - 4m +		200	NL	0.5	540	NL	170	NL
HSL C: recreational / open space								
Source depth - 0m to <1m		NL	NL	NL	NL	NL	NL	NL
Source depth - 1m to <2m		NL	NL	NL	NL	NL	NL	NL
Source depth - 2m to <4m		NL	NL	NL	NL	NL	NL	NL
Source depth - 4m +		NL	NL	NL	NL	NL	NL	NL
HSL D: Commercial / Industrial								
Source depth - 0m to <1m		260	NL	3	NL	NL	230	NL
Source depth - 1m to <2m		370	NL	3	NL	NL	NL	NL
Source depth - 2m to <4m		630	NL	3	NL	NL	NL	NL
Source depth - 4m +		NL	NL	3	NL	NL	NL	NL

Notes
a: To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.
b: To obtain F2 subtract naphthalene from the >C_{10}-C_{16} fraction.
NL: Not Limiting

TABLE C

TOTAL RECOVERABLE HYDROCARBONS (TRH) TEST RESULTS

MANAGEMENT LIMITS FOR COARSE GRAINED SOIL TEXTURE

Analyte		TRH (mg/kg)			
Sample Location	Depth (m)	F1 (C_6-C_{10}) [a]	F2 (>C_{10}-C_{16}) [a]	F3 (C_{16}-C_{34})	F4 (C_{34}-C_{40})
BH1	0.4-0.5	<10	<50	<100	<100
BH2	0.4-0.5	<10	<50	<100	<100
BH3	0.2-0.3	<10	<50	<100	<100
BH4	0.2-0.3	<10	<50	<100	<100
BH5	0.2-0.3	<10	<50	<100	<100
BH6	0.2-0.3	<10	<50	<100	<100
DUPLICATE D1	-	<10	<50	<100	<100
SPLIT SS1	-	<10	<50	<100	<100
Practical Quantitation Limits (PQL)		10	50	100	100
NATIONAL ENVIRONMENT PROTECTION MEASURE (2013)					
Management Limits - Table 1B (7)					
Residential parkland and public open space		700	1000	2500	10,000
Commercial and industrial		700	1000	3500	10,000

Notes

a: Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

b: Management limits are applied after consideration of relevant ESLs and HSLs.

TABLE D

POLYCYCLIC AROMATIC HYDROCARBONS (PAH), ORGANOCHLORINE PESTICIDES (OCP) AND POLYCHLORINATED BIPHENYLS (PCB) TEST RESULTS FOR HIL

Analyte		PAH (mg/kg)				Organochlorine Pesticides (mg/kg)								
Sample Location	Depth (m)	Carcinogenic PAHs (as BaP TEQ) [e]	TOTAL PAHs [f]	BENZO(a)PYRENE	NAPHTHALENE	DDT + DDE + DDD	ALDRIN & DIELDRIN	CHLORDANE	ENDOSULFAN	ENDRIN	HEPTACHLOR	HCB	METHOXYCHLOR	PCB [i]
BH1	0.4-0.5	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
BH2	0.4-0.5	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
BH3	0.2-0.3	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
BH4	0.2-0.3	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
BH5	0.2-0.3	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
BH6	0.2-0.3	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
DUPLICATE D1	-	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.1
SPLIT SS1	-	0.6	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	-
Practical Quantitation Limits (PQL)		0.5	0.5	0.5	0.5	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.1
NATIONAL ENVIRONMENT PROTECTION MEASURE (2013)														
Health Investigation Levels (HIL) - Table 1A (1)														
HIL A [a]		3	300			240	6	50	270	10	6	10	300	1
HIL B [b]		4	400			600	10	90	400	20	10	15	500	1
HIL C [c]		3	300			400	10	70	340	20	10	10	400	1
HIL D [d]		40	4000			3600	45	530	2000	100	50	80	2500	7

Notes

a: Residential with garden/accessible soil (home grown poduce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

b: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high rise buildings and apartments.

c: Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate

d: Commercial/industrial, includes premises such as shops, offices, factories and industrial sites

e: Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

PAH species	TEF	PAH species	TEF
Benzo(a)anthracene	0.1	Benzo(g,h,i)perylene	0.01
Benzo(a)pyrene	1	Chrysene	0.01
Benzo(b+j)fluoranthene	0.1	Dibenz(a,h)anthracene	1
Benzo(k)fluoranthene	0.1	Indeno(1,2,3-c,d)pyrene	0.1

Where the B(a)P occurs in bitumen fragments it is relatively immobile and does not represent a significant health risk.

f: Total PAHs: HIL is based on the sum of the 16 PAHs most commonly reported for contaminated sites (WHO 1998). The application of the total PAH HIL should consider the presence of carcinogenic PAHs and naphthalene (the most volatile PAH). Carcinogenic PAHs reported in the total PAHs should meet the B(a)P TEQ HIL. Naphthalene reported in the total PAHs should meet the relevant HSL.

g: Insufficient data was available to calculate aged values for DDT and naphthalene, consequently the values for fresh contamination should be used.

h: Urban residential / public open space is broadly equivalent to the HIL-A, HIL-B and HIL-C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.

i: PCBs: HIL relates to non-dioxin-like PCBs only. Where a PCB source is known, or suspected, to be present at a site, a site-specific assessment of exposure to all PCBs (including dioxin-like PCBs) should be undertaken.

TABLE E
ASBESTOS TEST RESULTS

Sample Location	Date Sampled	Depth (m)	Field Observations* Visible ACM detected (>7mm)	Laboratory Results Asbestos Present / Absent	Type of Asbestos Present	Laboratory Results Asbestos %w/w
BH1	11.03.2018	0.4-0.5	No visible ACM observed	No Asbestos detected	NA	<0.001
BH2	11.03.2018	0.4-0.5	No visible ACM observed	No Asbestos detected	NA	<0.001
BH3	11.03.2018	0.2-0.3	No visible ACM observed	No Asbestos detected	NA	<0.001
BH4	11.03.2018	0.2-0.3	No visible ACM observed	No Asbestos detected	NA	<0.001
BH5	11.03.2018	0.2-0.3	No visible ACM observed	No Asbestos detected	NA	<0.001
BH6	11.03.2018	0.2-0.3	No visible ACM observed	No Asbestos detected	NA	<0.001
DUPLICATE D1	11.03.2018	-	No visible ACM observed	No Asbestos detected	NA	<0.001
SPLIT SS1	11.03.2018	-	No visible ACM observed	No Asbestos detected	NA	<0.001
WA Guidelines for the Assessment, Remediation and Management of Asbestos - Contaminated Sites in Western Australia - May 2009						
National Environment Protection (Assessment of Site Contamination) Measure 2013 Schedule B1						
%w/w asbestos for FA and AF						0.001%
%w/w asbestos for ACM - Residential use, childcare centres, preschools etc.						0.01%
%w/w asbestos for ACM - Residential, minimal soil access (fully sealed surfaces)						0.04%
%w/w asbestos for ACM - Parks, public open spaces, playing fields etc.						0.02%
%w/w asbestos for ACM - Commercial / Industrial						0.05%
All forms of Asbestos						No visible asbestos for surface soils

Note:
ACM = Asbestos Containing Materials >7mm x 7mm (visible by eye)
FA = Friable and Fibrous Asbestos Materials >7mm x 7mm and <7mm x 7mm
AF = Asbestos Fines <7mm x 7mm ACM including free fibres (visible by microscope only)
* Field Observations: All ACM observed are assumed to contain Asbestos until otherwise tested and recorded as such.

APPENDIX Q

IMPORTANT INFORMATION ABOUT YOUR REPORT

IMPORTANT INFORMATION ABOUT YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Aargus (Australia) Pty Ltd and its associated companies using guidelines prepared by ASFE (The Association) of Engineering Firms Practising in the Geo-sciences. They are offered to help you in the interpretation of your Environmental Site Assessment (ESA) reports.

REASONS FOR CONDUCTING AN ESA

ESA's are typically, though not exclusively, carried out in the following circumstances:

- as pre-acquisition assessments, on behalf of either purchaser or vender, when a property is to be sold;
- as pre-development assessments, when a property or area of land is to be redeveloped or have its use changed for example, from a factory to a residential subdivision;
- as pre-development assessments of greenfield sites, to establish "baseline" conditions and assess environmental, geological and hydrological constraints to the development of, for example, a landfill; and
- as audits of the environmental effects of an ongoing operation.

Each of these circumstances requires a specific approach to the assessment of soil and groundwater contamination. In all cases however, the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the proposed activity. Such risks may be both financial, for example, cleanup costs or limitations on site use, and physical, for example, health risks to site users or the public.

THE LIMITATIONS OF AN ESA

Although the information provided by an ESA could reduce exposure to such risks, no ESA, however, diligently carried out can eliminate them. Even a rigorous professional assessment may fail to detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled.

AN ESA REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

Your environmental report should not be used:

- when the nature of the proposed development is changed, for example, if a residential development is proposed instead of a commercial one;
- when the size or configuration of the proposed development is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership
- or for application to an adjacent site.

To help avoid costly problems, refer to your consultant to determine how any factors, which have changed subsequent to the date of the report, may affect its recommendations.

ESA "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of contamination, its likely impact on the proposed development and appropriate remediation measures. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to help minimise its impact. For this reason owners should retain the services of their consultants through the development stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Natural processes and the activity of man change subsurface conditions. As an ESA report is based on conditions, which existed at the time of subsurface exploration, decisions should not be based on an ESA report whose adequacy may have been affected by time. Speak with the consultant to learn if additional tests are advisable.

ESA SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Every study and ESA report is prepared in response to a specific brief to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Other persons should not use a report for any purpose, or by the client for a different purpose. No individual other than the client should apply a report even apparently for its intended purpose without first conferring with the consultant. No person should apply a report for any purpose other than that originally contemplated without first conferring with the consultant.

AN ESA REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when design professionals develop their plans based on misinterpretations of an ESA. To help avoid these problems, the environmental consultant should be retained to work with appropriate design professionals to explain relevant findings and to review the adequacy of their plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final borehole or test pit logs are developed by environmental scientists, engineers or geologists based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final logs customarily included in our reports. These logs should not under any circumstances be redrawn for inclusion in site remediation or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimise the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To reduce the likelihood of boring log misinterpretation, the complete report must be available to persons or organisations involved in the project, such as contractors, for their use. Those who o not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing all the available information to persons and organisations such as contractors helps prevent costly construction problems and the adversarial attitudes that may aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because an ESA is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in transmittals. These are not exculpatory clauses designed to foist liabilities onto some other party. Rather, they are definitive clauses that identify where your consultant's responsibilities begin and end. Their use helps all parties involved recognise their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your ESA report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.