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Report

Additional Contamination (Asbestos) Assessment and Remediation Action Plan (RAP) Proposed Car Park North Street, Penrith, NSW

Prepared for
Penrith City Council
PO Box 60
PENRITH NSW 2751

Ref: JC17302A-r2(rev)
January 2018

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11th January 2018

Our Ref: JC17302A-r2(rev)

Penrith City Council
PO Box 60
PENRITH NSW 2751

Attention: Mr Kumar Rethnasamy

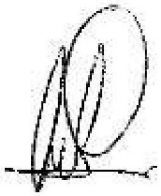
Dear Sir

Re Additional Contamination (Asbestos) Assessment and RAP
Proposed Car Park, North Street Penrith

Further to our contamination assessment report referenced JC17302A-r1 dated 24th August 2017, this report presents the results of an Additional Contamination Assessment and RAP for the proposed car park to be constructed at North Street Penrith

Should you have any queries, please contact the undersigned.

Yours faithfully
GeoEnviro Consultancy Pty Ltd



Solern Liew CPEng (NPER)
Director

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1 INTRODUCTION

This report presents the results of an Additional Contamination (Asbestos) Assessment and RAP for the proposed car park to be constructed on the southern side of North Street Penrith as shown on Drawing No 1. The investigation was commissioned by Mr Kumar Rethnasamy of Penrith Council following our fee proposal Ref PG17292B dated 9th October 2017.

We understand that the proposed car park will have an approximate 325m frontage to North Street and approximately 55m wide. Total site area is about 9825m^2.

The site was the subject of a Pavement Investigation and Fill Contamination Assessment (Ref JC17302A-r1 dated 31st August 2017) undertaken by GeoEnviro in August 2017 and based on the preliminary assessment, the topsoil/fill was found to be impacted by asbestos (ACM).

The objective of this additional testing was to assess the extent of asbestos contamination and to provide recommendations to remediate the site to ensure suitability of the site for the proposed landuse.

2 PREVIOUS INVESTIGATION AND ADDITIONAL INVESTIGATION

The site was the subject of a preliminary contamination assessment undertaken by GeoEnviro in 31st August 2017 (Reference 1). The previous investigation consisted of excavation of 17 test pits (TP 1 to TP 17) using a mini excavator on the 24th February 2017.

Five fibro fragments were taken from the test pits (TP 4, 7, 8, 12 and 15) and sent to Envirolab Services for asbestos analysis. In addition, two soil samples (TP 4 and TP 17) were taken to the laboratory for the following laboratory analysis;

- Heavy metals - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Mercury (Hg), Lead (Pb), Nickel (Ni) and Zinc (Zn).
- Organochlorine Pesticides (OCP).
- Polychlorinated biphenyl's (PCB)
- Total Recoverable Hydrocarbon (TRH)
- Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Asbestos
- TCLP – Heavy metals and PAH
- pH

The following is a summary of laboratory test (Refer to Appendix A for details);

- The concentrations of heavy metals in the soil samples were found to be within the Site Criteria for open space (ie HBIL 'C'). The concentrations of Lead of 320mg/kg and 330mg//kg in the soil samples were found to exceed the HBIL 'A' criteria for residential.
- The concentrations of OCP in the soil samples were found to be negligible or below laboratory detection limits and therefore within the Site Criteria.
- The concentrations of PCB in the soil samples were found to be negligible or below laboratory detection limits and therefore within the Site Criteria.
- The concentrations of TRH in the soil samples were found to be negligible or below laboratory detection limits and therefore within the Site Criteria.
- The concentrations of BTEX in the soil samples were found to be negligible or below laboratory detection limits and therefore within the Site Criteria.
- The concentrations of PAH in the soil sample from TP 4 were found to be negligible or below laboratory detection limits and therefore within the Site Criteria. Slightly elevated concentrations of PAH were encountered in the soil sample from TP 17 with Total PAH of 31mg/kg, however such a concentration is within the Site Criteria.
- Both soil samples did not encounter asbestos fibre (Fibre Asbestos –FA or Asbestos Fibre – AF). All asbestos fragments (Asbestos Cement Material – ACM) obtained from TP 4, 7, 8, 12 and 15) were found to contain Chrysotile, Amosimte and Crociolite.

In order to assess the extent of asbestos contamination, an additional 17 test pits (ie TP 18 to 33) were excavated across the site as shown on Drawing No 1. The additional investigation was carried out on the 17th October 2017.

3 SUBSURFACE CONDITIONS

Reference should be made to the attached Table 1 for a summary of subsurface profiles encountered in the previous and additional investigations. The following is a summary of the subsurface profiles encountered in the test pits;

Topsoil and Topsoil/fill

Topsoil and topsoil/fill was encountered in all test pits with thickness typically ranging from 150mm to 500mm. Relatively thick topsoil/fill of about 0.6m to 1.2m was encountered in TP 16, 17, 18, 19. The topsoil and topsoil/fill were found to consist predominantly of Clayey Silt and Gravelly Sandy Silt with varying quantities of building debris such as bricks, concrete, glass, tile and porcelain fragments. Some asbestos fragments were encountered in the topsoil/fill in TP 4, 7, 8, 12, 15, 17, 19, 20, 26, 28, 30, 31 and 32.

Fill

A thin layer of crushed sandstone fill about 200mm thick was encountered in TP 7 and 9 and a layer of clayey fill about 100mm thick was encountered beneath the topsoil/fill in TP 13. Some building debris including concrete, tiles and porcelain fragments were encountered in TP 13.

Natural Soil

Natural medium to high plasticity Silty Clay was encountered beneath the topsoil and fill at depths ranging from 0.3m to 1.2m below existing ground surface. Based on the hand penetrometer test results , the natural clay was assessed to be generally very stiff. The natural clay was generally found to be dry.

Bedrock

Bedrock was not encountered in any of the test pits which were taken to a maximum depth of 2.0m below existing ground surface.

Groundwater

All test pits were found to be dry during and shortly after investigation.

4 ASSESSMENT AND RECOMMENDATIONS

Based on the preliminary investigation, the site was found to be impacted by ACM (Asbestos) contaminated topsoil/fill. For the proposed car park development, our report highlighted the following geotechnical and contamination issues which need to be considered;

- The topsoil/fill material is not considered to be suitable as subgrade material for the proposed car park from the geotechnical perspective without improvement by mixing with some better quality compactable fill material
- The topsoil/fill material is impacted by ACM (Asbestos) and therefore removal of this material will incur costly landfill tip fees.
- Mixing and blending of the topsoil/fill with good quality fill to improve subgrade properties for the proposed car park will results in contaminating good quality fill with asbestos and therefore lead to higher clean up cost in future.
- Filling directly over the topsoil/fill with good quality subgrade material to improve subgrade characteristics and regrade the site for the car park will result in potential difficulty in separating the good fill from the underlying asbestos contaminated topsoil/fill should the site be redeveloped in future.

Based on the foregoing, we recommend the asbestos impacted topsoil/fill material to be managed on site by isolation and encapsulation within a designated area preferably in an area which will not be developed in future (eg future parkland, reserve/shoulder or landscaping areas). There is no apparent asbestos contamination in the underlying natural clayey soil.

The amount of asbestos impacted topsoil/fill and topsoil is difficult to quantify as there is no apparent trend in the location of ACM encountered in the test pits. From on the test pits, it may be assumed that the average thickness of topsoil/fill across the site is about 0.4m and based on a site area of about 9825m^2, the estimated total volume of topsoil/fill is about 4000m^3.

On the basis that about 40% of the test pits (ie 13 out of 35 test pits) were found to have asbestos, a rough estimate of about 1500 to 2000m^3 of topsoil/fill may be impacted by asbestos. We note that final volume of asbestos impacted soil could only be determined during remediation works when all topsoil/fill is excavated and the site is fully exposed.

5 REMEDIATION ACTION PLAN

The following sections describe the components essential for the remediation of the site. Appropriate modification of these components may be required depending upon actual site conditions encountered during the remediation process and other factors involving the logistics of the work to be carried out.

5.1 Remediation Goals

The remediation goal is to remediate the asbestos impacted topsoil and topsoil/fill in order to ensure suitability of the site for the proposed car park and future redevelopment.

5.2 Remediation Criteria

The NEPM 2013 guidelines should be adopted as the remediation criteria to clean up the site. The criteria as follows;

ACM Asbestos	0.01%
FA and AF	0.001%

5.3 Remediation Strategy and Process

The remediation strategy is as follows;'

- Nominate a suitable location for the encapsulation cell and this designated cell area should be located away from future building or development area. A detailed design of landscaping/open space areas should be considered to avoid erection of structures on the capped and/or contained area that may result in a risk of harm to public health or the environment.

  For a 2000m^3 cell, indicative cell dimensions of 20m wide by 70m long by 2.5m deep, allowing for 1.0m of capping layer should be adequate. The cell location and depth should be surveyed and documented for future reference. Some battering of the cell walls up to 45 degrees would be required for safety.

- Excavation of all topsoil/fill from the site to expose the underlying natural clean clay noting that the insitu topsoil/fill is generally considered not suitable for reuse without treatment or improvement. Prior to excavation, the grass and vegetation should be stripped from the surface and the exposed area should be noted for concentration of asbestos. Areas with asbestos concentration if identifiable should be delineated and excavated at increment depth of 150mm and the excavated surface be reassessed for presence of asbestos until the all topsoil/fill is removed. Care should be taken during excavation to isolate clean topsoil/fill from contaminated topsoil/fill as much as possible. The excavated topsoil/fill should be placed neatly in 15 to 20m^3 stockpiles and each stockpile should be identified and labelled for assessment
- The base should be inspected by environmental consultant to ensure adequate removal of asbestos impacted material and some validation testing by sampling and laboratory analysis may be carried out.
- The stockpiles should be sampled and assessed for presence of asbestos in accordance to the NEPM 2013 procedure (Reference 8). The NEPM provides a guideline on health screening levels for asbestos in soil which may be classified in three types of asbestos; Bonded asbestos-containing-material (ACM), Fibrous asbestos (FA) and Asbestos fines (AF).

  This procedure includes;

  - Bulk sampling of representative stockpile samples and sieving the samples through 7mm aperture sieve.
  - Measuring the weight of retained asbestos fragments classified as Asbestos Cement Material (ACM),
  - Analysing the sieved samples for Asbestos Fibre (AF) and Fibre Asbestos (FA) material by Envirolab Services
  - Comparing the results with the NEPM 2013 acceptable threshold levels

- Stockpiles with bonded fibreboard (ACM), Fibrous Asbestos or Asbestos Fibres (FA/AF) within the allowable limits may be reused on site in landscaping areas within the site or on Council's parklands. The topsoil/fill material may be reused on site as general fill beneath pavement subject to further assessment by a geotechnical engineer. Topsoil/fill improvement may include mixing of this material with good quality fill such as ripped sandstone based on an initial mix proportion of 1 topsoil/fill to 2 ripped sandstone. The final mix proportion should be determined by the geotechnical engineer.

- Stockpiles with bonded fibreboard (ACM), Fibrous Asbestos or Asbestos Fibres (FA/AF) above the allowable limits should be placed into the excavated encapsulation cell within the site. Some adjustments to the size of the cell will be required to accommodate the final fill volume as determined during excavation. A layer of geofabric (eg Bidim A34) in accordance to the "Guidelines for the Assessment, Remediation and Management of Australia" (Reference 13) should be placed on top of the cell in order to enable future identification and this should be surveyed and documented. A capping material consisting of clean and validated fill (Virgin Excavated Natural Material – VENM) should be placed on top of the cell to design level of the proposed car park.

- All fill material (ie cell material, capping material and general fill) should be placed in layers not exceeding 250mm thickness and compacted to a minimum 95% Standard Maximum Dry Density (SMDD) at within 2% Optimum Moisture Content (OMC).

- The surface should be turfed and vegetated to control erosion and scouring of barrier which may eventually lead to exposure of asbestos fragments.

5.4 Backfilling and Compaction

All excavation areas requiring backfilling may be backfilled with clean fill which must be validated. Adequate compaction levels should be achieved in the fill by rolling using a compactor and moisture control.

5.5 Monitoring and Control

All remediation works should be supervised by a qualified and experienced environmental consultant. Supervision and control include but not limited to the following;

Excavation

The extent of excavation may be determined prior to or during clean-up works by sampling and laboratory analysis.

Stockpiling

Stockpiling of contaminated soil if necessary should be carried out at locations away from construction activities, drainage easement or watercourse. The stockpile should be adequately covered with a waterproof membrane during wet periods to prevent contaminants from leaching through the soil and migrating to surrounding areas. Silt fence should be placed around the stockpile.

Rubbish Fill

The test pit investigation did not encounter mass burial of rubbish fill, however it may still exist in areas between test locations. Should buried rubbish including asbestos material be encountered during residential development, all buried rubbish should be excavated and disposed off site to a landfill in accordance with regulatory requirements.

Landfill Disposal

All fill material to be disposed off site should be characterised in accordance to NSW EPA's guidelines (Reference 11).

5.6 Validation

Excavation Area

All excavation areas from the asbestos remediation process should be adequately validated in order to ensure the area is adequately cleaned of contaminated soil. Validation of the excavated areas should include;

- Validation sampling to be collected at regular intervals of one every 30m apart for laboratory analysis.
- Visual inspection of the excavation walls, bases and surrounding areas to ensure there are no visible signs of ACM.
- Should asbestos contamination be encountered during validation of the excavated areas, further remediation works should be carried out.
- The validation laboratory test results should be compared with the appropriate acceptance criteria established by the National Environment Protection Council Service Corporation (NEPM 2013 – Reference 8), Guidelines for the Assessment, Remediation and Management of Asbestos- Contaminated Sites in Western Australia (Reference 13) and other relevant EPA endorsed guidelines.

Imported Fill Material

Imported fill material for use as capping material should consist of natural clayey material classified as Virgin Excavated Natural Material (VENM) and this material should be validated by sampling and laboratory analysis.

One validation sample per 500m^3 of earth fill or a minimum of 3 samples should generally be adequate depending on the homogeneity of the fill material. More samples per unit volume of earthfill may be required if the fill material is found to be variable.

5.7 Unexpected Asbestos Finds

In the event where bonded asbestos fragments are encountered on the site other those areas identified, an unexpected asbestos finds protocol as detailed in Appendix B should be initiated.

6. CONCLUSION

Subject to site remediation as outlined in the Remediation Action Plan (RAP) below and implementation of an Environmental Management Plan (EMP), the site will be suitable for the proposed future development.

7. LIMITATIONS

The findings contained in this report are the results of discreet/specific sampling methodologies used in accordance with normal practices and standards. There is no investigation which is thorough enough to preclude the presence of material which presently, or in future, may be considered hazardous to the site. The site has been the subject of dumping of rubbish fill in the past and the scope of this report do not cover for future dumping and burial of such material on the subject site.

As regulatory evaluation criteria are constantly updated, concentrations of contaminants presently considered low, may in the future fall short of regulatory standards that require further investigation/redemption.

The statements presented in these documents are intended to advise you of what should be your realistic expectations of this report, and to present you with recommendations on how to minimise the risks associated with the groundworks for this project. The document is not intended to reduce the level of responsibility accepted by GeoEnviro Consultancy Pty Ltd, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Attached in Appendix C are documents entitled "Important Information about Your Environmental Site Assessment" and Explanatory Notes in conjunction with which this report must be read, as it details important limitations regarding the investigation undertaken and this report.

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REFERENCES

1. *Pavement Investigation and Fill Contamination Assessment – Proposed Car Park North Street Penrith - GeoEnviro Consultancy Pty Ltd Referenced JC17302A-r1 dated 31st August 2017.*
2. *1:100,000 Geological Map of Penrith – Geological Series Sheet 9029-9129 (Edition 1) 1985*
3. *1:100,000 Soil Landscape Map of Penrith – Soil Conservation Service of NSW; Sheet 9029-9129*
4. *Australian & New Zealand Guidelines for the Assessment and Management of Contaminated Sites, Australian and New Zealand Conservation Council and National Health and Medical Research Council, 1992.*
5. *Assessment of Orchard and Market Garden Contamination - Contaminated Sites Discussion Paper, NSW EPA 1995.*
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9. *Guidelines for Assessment Service Station Sites – NSW EPA 1994*
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11. *NSW EPA 2014 guidelines "Part 1 – Classifying Waste*
12. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 – ANZECC.*
13. *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia – Department of Heath -May 2009*

Legend

- TP 1 — Test Pits (24/07/2017)
- TP 18 — Test Pits (17/10/2017)

GeoEnviro Consultancy

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Drawn By: SG	Date: 31/10/2017	Penrith City Council	
Checked By: SL	Date: 31/10/2017	North Street, Penrith	
Revision By:	Date:	Test Pit Location Plan	
Scale: Not to Scale	A3	Project No: JC17302A-r2	Drawing No: 1

Legend

TP 1 — Test Pits with asbestos Impacted topsoil/fill

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Drawn By: SG	Date: 31/10/2017	Penrith City Council	
Checked By: SL	Date: 31/10/2017	North Street, Penrith	
Revision By:	Date:	Plan Indicating Test Pits with Asbestos	
Scale: Not to Scale	A3	Project No: JC17302A-r2	Drawing No: 2

GeoEnviro Consultancy Pty Ltd
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Table 1 : Summary of Test Pit Profile

Client: Penrith City Council | Job Number: JC17302A-r2

Project: Proposed Temporary Car Park | Logged By: SG

Location: North Street, Penrith | Date: 31/10/2017

Test Pit Number	Depth (m) From	Depth (m) To	Material Description
1	0.00	0.40	Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, minor plastic and 1x cobble, dry
	0.40	0.70	(CH) Silty Clay: high plasticity, red brown, dry to moist
2	0.00	0.40	Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, 1x brick fragment and trace of sand, dry
	0.40	1.10	(CH) Silty Clay: high plasticity, red brown, dry to moist, PP=360kPa, very stiff
	1.10	1.60	(CI) Silty Clay: medium plasticity, red and grey with fine grained gravel, dry to moist
3	0.00	0.50	Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, and concrete, porcelain and glass fragments, dry to moist
	0.50	0.80	(CH) Silty Clay: high plasticity, red brown, moist, PP=310kPa, very stiff
4	0.00	0.30	Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, 1x brick and asbestos fragment, dry
	0.30	0.50	(CH) Silty Clay: high plasticity, red brown, dry to moist
5	0.00	0.50	Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, dry to moist
	0.50	0.70	(CI) Silty Clay: medium plasticity, grey brown, moist, PP=300, very stiff
6	0.00	0.40	Topsoil/Fill: Clayey Silt: low liquid limit, brown with brick and glass fragments, dry to moist
	0.40	0.60	(CH) Silty Clay: high plasticity, red brown, dry to moist
7	0.00	0.20	Fill: Crushed Sandstone
	0.20	0.45	Topsoil/Fill: Clayey Silt: low liquid limit, brown with gravel and 1 asbestos piece, dry
	0.45	0.70	(CH) Silty Clay: high plasticity, red brown, dry to moist
8	0.00	0.40	Topsoil/Fill: Clayey Silt: low liquid limit, brown with gravel, metal pipe, and 2x asbestos fragments, dry
	0.40	0.60	(CH) Silty Clay: high plasticity, red brown, dry to moist
9	0.00	0.20	Fill: Crushed Sandstone
	0.20	0.35	Topsoil/Fill: Clayey Silt: low liquid limit, brown with glass fragments, dry
	0.35	0.60	(CH) Silty Clay: high plasticity, red brown, dry to moist
10	0.00	0.50	Topsoil: Clayey Silt: low liquid limit, brown with river gravel, dry to moist
	0.50	0.70	(CH) Silty Clay: high plasticity, brown, dry to moist
11	0.00	0.30	Topsoil/Fill: Clayey Silt: low liquid limit, brown with abundant bricks, dry
	0.30	0.70	(CH) Silty Clay: high plasticity, brown red, dry, PP=410-450kPa, hard
12	0.00	0.35	Topsoil/Fill: Gravelly Clayey Silt: low liquid limit, brown with 3x asbestos fragments, dry
	0.35	0.60	(CH) Silty Clay: high plasticity, brown, dry to moist
			Notes:
			MC = Moisture Content.
			PL = Plastic Limit.
			PP = Pocket Penetrometer.

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Project: Proposed Temporary Car Park | Logged By: SG

Location: North Street, Penrith | Date: 31/10/2017

Test Pit Number	Depth (m) From	Depth (m) To	Material Description
13	0.00	0.25	Topsoil/Fill: Sandy Silt: low liquid limit, brown with concrete fragments and gravel, dry
	0.25	0.35	Fill: Gravelly Silty Clay: medium plasticity, brown with concrete, tile and porcelain fragments, dry
	0.35	0.60	(CH) Silty Clay: high plasticity, brown, dry, PP=450kPa, hard
14	0.00	0.40	Topsoil/Fill: Clayey Silt: low liquid limit, brown with tile and brick fragments, glass, timber, PVC and concrete pieces, dry
	0.40	0.70	(CH) Silty Clay: high plasticity, brown, dry
15	0.00	0.45	Topsoil/Fill: Gravelly Clayey Silt: low liquid limit, brown with fine to coarse grained gravel, brick fragments and 1x asbestos piece, dry
	0.45	0.90	(CI-CH) Silty Clay: medium to high plasticity, brown, dry to moist, PP=310-330kPa, very stiff
	0.90	1.60	(CI) Silty Clay: medium plasticity, brown with fine grained gravel, dry
16	0.00	0.40	Topsoil/Fill: Gravelly Sandy Silt: low liquid limit, brown with fine to coarse grained gravel and brick fragments, dry
	0.40	0.70	Topsoil: Clayey Silt, low liquid limit, dark brown, moist
	0.70	1.10	(CI-CH) Silty Clay: medium to high plasticity, brown, dry to moist, PP=300kPa, very stiff
17	0.00	0.60	Topsoil/Fill: Gravelly Clayey Silt: low liquid limit, brown with brick fragments, glass, tile, asphalt, river gravel and asbestos
	0.60	0.90	(CI-CH) Silty Clay: medium to high plasticity, brown, dry
18	0.00	0.80	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, PVC pipe, sandstone gravel, brick fragment, glass, concrete fragment, dry
	0.80	1.10	Topsoil: Clayey Silt: Low liquid limit, brown, dry
	1.10	1.30	(CI-CH) Silty Clay: Medium to high plasticity, brown, dry
19	0.00	0.90	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with brick fragments, rusty metal, plastic bottle, orange conduit, Asbestos fragment at 0.5m, sandstone gravel, porceline and glass fragments, dry
	0.90	1.20	Topsoil: Clayey Silt: Low liquid limit, brown, dry
	1.20	2.00	(CI-CH) Silty Clay: Medium to high plasticity, brown, dry
20	0.00	0.35	Tospoil/Fill: Clayey Silt: Low liquid limit, brown, with porceline, asbestos at 0.1m, brick fragments, river gravel, dry
	0.35	0.70	(CH) Silty Clay: High plasticity, red brown, dry
21	0.00	0.35	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with brick, glass and wood fragments, dry
	0.35	0.50	(CH) Silty Clay: High plasticity, red brown, dry
22	0.00	0.50	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with shale cobbles, roots, minor fabric and porceline fragments, dry
	0.50	0.70	(CH) Silty Clay: High plasticity, red brown, dry
23	0.00	0.40	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with brick fragments, masonite board, Silty Clay inclusions, dry
	0.40	0.60	(CH) Silty Clay: High plasticity, red brown, dry
24	0.00	0.30	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with river gravel and porceline, dry
	0.30	0.50	(CH) Silty Clay: High plasticity, red brown, dry
			Notes:
			MC = Moisture Content.
			PL = Plastic Limit.
			PP = Pocket Penetrometer.

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Table 1 : Summary of Test Pit Profile

Client: Penrith City Council — Job Number: JC17302A-r2

Project: Proposed Temporary Car Park — Logged By: SG

Location: North Street, Penrith — Date: 31/10/2017

Test Pit Number	Depth (m) From	Depth (m) To	Material Description
25	0.00	0.35	Topsoil/Fill: Silty Clay/Clayey Silt: Low plasticity, brown, gravel, dry
	0.35	0.60	(CH) Silty Clay: High plasticity, red brown, dry to moist
26	0.00	0.50	Topsoil/Fill: Silty Clay/Clayey Silt: Low liquid limit, brown, with asbestos at 0.3m, brick and porceline fragments, ash, gravel, dry
	0.50	0.80	(CH) Silty Clay: High plasticity, red brown, dry
27	0.00	0.60	Topsoil/Fill: Clayey Silt/Silty Clay: Low plasticity, brown, with brick fragments, car axle, river pebble, shale gravel, glass, dry
	0.60	0.90	(CI-CH) Silty Clay: Medium to high plasticity, brown, dry
28	0.00	0.55	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete gravel, asbestos at 0.3m, plastic, wire, porceline, glass, and brick fragments, dry
	0.55	0.70	(CH) Silty Clay: High plasticity, red brown, dry
29	0.00	0.30	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete gravel, glass and concrete gravel, dry
	0.30	0.60	(CH) Silty Clay: High plasticity, red brown, dry
30	0.00	0.30	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete gravel, asbestos fragment at 0.1m, dry
	0.30	0.60	(CH) Silty Clay: High plasticity, red brown, dry
31	0.00	0.40	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete and brick fragments, wire, glass and asbestos at 0.2m
	0.40	0.60	(CH) Silty Clay: High plasticity, red brown, dry
32	0.00	0.20	Topsoil/Fill: Silty Clay/Clayey Silt: Low plasticity, red brown, with gravel, dry
	0.20	0.50	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with ash, brick fragments, asbestos at 0.3m, dry
	0.50	0.80	Topsoil: Clayey Silt: Low liquid limit, brown, dry
	0.80	1.80	(CH) Silty Clay: High plasticity, red brown, dry
33	0.00	0.50	Topsoil/Fill: Clayey Silt/Silty Clay: Low plasticity. Brown, with brick, tile, glass fragments, river gravel, dry
	0.50	0.70	(CH) Silty Clay: High plasticity, red brown, dry
34	0.00	0.40	Topsoil/Fill: Clayey Silt/Silty Clay: Low liquid limit, brown, with brick, concrete, sandstone and terracotta fragments, dry
	0.40	0.60	(CH) Silty Clay: High plasticity, red brown, dry
35	0.00	0.30	Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with river gravel, dry
	0.30	0.50	(CH) Silty Clay: High plasticity, red brown, dry

Notes:
MC = Moisture Content.
PL = Plastic Limit.
PP = Pocket Penetrometer.

APPENDIX A

Summary of Soil Profile and Laboratory Test Results/Certificates

Legend

Test Pit

GeoEnviro Consultancy
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Drawn By: AT	Date: 24/8/17	Penrith City Council
Checked By: SL	Date: 24/8/17	North Street Penrith
Revision By:	Date:	Test Pit Location Plan
Scale: Not to Scale	A3	Project No: JC17302A / Drawing No: 1

c:\\lab\report\R012

Form No. R012/Ver02/06/07

Sample	Depths (m)	Sample Date	Sample Type	Analysis															
				pH	Heavy Metals								OCP	PCB	TRH	BTEX	PAH	Asbestos	TCLP
					As	Cd	Cr	Cu	Pb	Hg	Ni	Zn							(Heavy Metals + PAH)
TP4	0.0-0.1	24/07/2017	Soil/ACM	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
TP7	Fragments	24/07/2017	ACM															o	
TP8	Fragments	24/07/2017	ACM															o	
TP12	Fragments	24/07/2017	Soil/ACM															o	
TP15	Fragments	24/07/2017	ACM															o	
TP17	0.2-0.3	24/07/2017	Soil	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

Note: O denotes tested

GeoEnviro Consultancy

TABLE 2

Analytical Program

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

Prepared By:SL Date: 27/11/2017
Checked By:__SG___Date:27/11/2017

Sample	Depths (m)	pH	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
TP 4	0.00-0.10	6.6	7	0.6	15	37	320	0.1	9	580
TP17	0.2-0.3	5.4	15	<0.4	15	100	330	1	8	120
HBILs 'A' Criteria			100	20	100 (VI)	600	300	40	400	7400
HBILs 'C' Criteria			300	90	300 (VI)	17000	600	80	1200	30000

Notes

1) All results are expressed as mg/kg and pH (units).

2) Figures in bold italics exceed the EIL Criteria

3) Figures in bold italics exceed the HBIL 'A' Criteria

4) Ambient Background Concentrations

5) Added Contaminant Limits

* EIL = ABC+ACL

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TABLE 3

Summary of Analytical Results - Heavy Metals

Penrith City Council

Proposed Temporary Car Park

North Street Penrith

Prepared By: SL Date: 27/11/2017
Checked By:__SG___Date:27/11/2017

Sample	Depths (m)	HCB	alpha-BHC	gamma-BHC	beta-BHC	Heptachlor	delta-BHC	Aldrin	Heptachlor Epoxide	gamma-Chlordane	alpha-chlordane	Endosulfan I	pp-DDE	Dieldrin	Endrin	pp-DDD	Endosulfan II	pp-DDT	Endrin Aldehyde	Endosulfan Sulphate	Methoxychlor	Total OCP
TP 4	0.00-0.10	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ND
TP17	0.2-0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ND
HBILs 'A' Criteria		10				6		6		50		270	240	6	10	240		240			300	
HBILs 'C' Criteria		10				10		10		70		340	400	10	20	400		400			400	

Notes

1) All results are expressed as mg/kg and pH (units).

2) Figures in bold italics exceed the HBILs 'A' Criteria

3) Figures in bold italics and underlined exceed the HBILs 'C' Criteria

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TABLE 4
Summary of Analytical Results - OCP

Penrith City Council

Proposed Temporary Car Park

North Street Penrith

Prepared by: SL Date: 27/11/2017
Checked By:__SG___Date:27/11/2017

Sample	Depths (m)	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	Total PCB
TP 4	0.00-0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ND
TP17	0.2-0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ND
HBILs 'A' Criteria									1
HBILs 'C' Criteria									1

GeoEnviro Consultancy

TABLE 5
Summary of Analytical Results - PCB

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

Notes

1) All results are expressed as mg/kg and pH (units).
2) Figures in bold italics exceed the HBILs 'A' Criteria
3) Figures in bold italics and underlined exceed the HBILs 'C' Criteria

Sample	Depths (m)	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	C_{10}-C_{36}	F1 [4] C_6-C_{10}	F2 [5] $>C_{10}$-C_{16}	F3 C_{16}-C_{34}	F4 C_{34}-C_{40}	Volatile Organic Compounds (VOC)					
											Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene
TP 4	0.00-0.10	<25	<50	<100	<100	<250	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<1
TP17	0.2-0.3	<25	<50	<100	<100	<250	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1	<1
NSW DEC (1994)		65				1000					1	1.4	3.1	14		
HSLs 'A and B' Criteria (CLAY)	0m to <1m						50	280			0.7	480	480	110		5
	1m to <2m						90				1			310		
	2m to < 4m						150				2					
	4m+						290				3					
ESL Criteria							180	120	1300	5600	65	105	125	45		

Notes

1) All results are expressed as mg/kg unless otherwise specified

2) Figures in bold exceed the NSW DEC criteria

3) ND Not detected

4) F1 is C_6-C_{10} minus the sum of the BTEX concentrations

5) F2 is $>C_{10}$-C_{16} Minus Napthalene

6) Figures in bold italics exceed the ESL Criteria

7) Figures in bold italics that have been underlined exceed the HSLs 'A and B' Criteria

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TABLE 6

Summary of Analytical Results - TRH and VOC

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

Sample	Depths (m)	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene	Benzo(a)pyrene TEQ	Total PAHs
TP 4	0.00-0.10	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	0.2	<0.1	0.1	<0.2	0.1	0.1	<0.1	0.1	<0.5	1
TP17	0.2-0.3	<0.1	0.2	<0.1	0.1	2.4	0.5	6.5	5.8	2.2	2.1	3.8	2.4	2	0.5	1.9	3.8	31
HBILs 'A' Criteria		3															3*	300
HBILs 'C' Criteria																	3*	300
ESL Criteria													0.7					

Notes

1) All results are expressed as mg/kg

2) Figures in bold italics exceed the HBILs 'A' Criteria

3) Figures in bold italics and underlined exceed the HBILs 'C' Criteria

4) Figures in bold italics that have been underlined and shaded exceed the ESL Criteria

* 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
Benzo(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b+j)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Benzo(g,h,i)perylene	0.01
Chrysene	0.01
Dibenzo(a,h)anthracene	1
Indeno(1,2,3-c,d)pyrene	0.1

GeoEnviro Consultancy

TABLE 7
Summary of Analytical Results - PAH

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

Sample	Depths (m)	Asbestos
TP4	0.0-0.1	ACM - Chrysotile and Amosite/No Friable
TP7	Fragments	ACM - Chrysotile, Amosite and Crocidolite
TP8	Fragments	ACM - Chrysotile and Amosite
TP12	Fragments	ACM - Chrysotile, Amosite and Crocidolite
TP15	Fragments	ACM - Chrysotile, Amosite and Crocidolite
TP17	0.2-0.3	ACM - Chrysotile and Amosite/No Friable
HBILs 'A' Criteria		0.01% / 0.001% [1]
HBILs 'C' Criteria		0.02% / 0.001% [1]

Note: ND = Not detected

Measured in %w/w

1) Bonded Asbestos Contaminaint Material / Fiberous Asbestos and Asbestos Fines

2) Figures in bold italics exceed the HBILs 'A' Criteria

3) Figures in bold italics and underlined exceed the HBILs 'A' Criteria

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TABLE 8

Summary of Analytical Results - Asbestos

Penrith City Council

Proposed Temporary Car Park

North Street Penrith

Sample	Depths (m)	Arsenic	Cadmium	Chromium	Lead	Mercury	Nickel	PAH
TP 4	0.00-0.10	<0.05	<0.01	<0.01	0.07	<0.0005	<0.02	0.001
TP17	0.2-0.3	<0.05	<0.01	<0.01	0.1	<0.0005	<0.02	ND

Notes

1) All results are expressed as mg/L

GeoEnviro Consultancy

TABLE 9

Summary of Analytical Results - (TCLP) Heavy Metals and PAH

Penrith City Council

Proposed Temporary Car Park

North Street Penrith

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

CERTIFICATE OF ANALYSIS 172091

Client Details

Client	Geoenviro Consultancy Pty Ltd
Attention	Solern Liew
Address	PO Box 1543, Macquarie Centre, North Ryde, NSW, 2113

Sample Details

Your Reference	**JC17302A, Penrith**
Number of Samples	2 soils 5 materials
Date samples received	25/07/2017
Date completed instructions received	25/07/2017

Analysis Details

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

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

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

Report Details

Date results requested by	03/08/2017
Date of Issue	03/08/2017

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

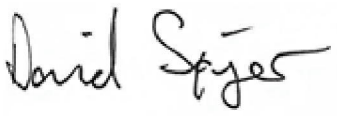
Report Comments

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 172091-1 & 7 were sub-sampled from jars provided by the client.

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lulu Scott

Results Approved By
Dragana Tomas, Senior Chemist
Long Pham, Team Leader, Metals
Lulu Scott, Asbestos Supervisor
Steven Luong, Chemist

Authorised By



David Springer, General Manager

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date extracted	-	27/07/2017	27/07/2017
Date analysed	-	27/07/2017	27/07/2017
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	101	107

svTRH (C10-C40) in Soil			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date extracted	-	27/07/2017	27/07/2017
Date analysed	-	28/07/2017	28/07/2017
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	90	92

PAHs in Soil			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date extracted	-	27/07/2017	27/07/2017
Date analysed	-	28/07/2017	28/07/2017
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.2
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.1
Phenanthrene	mg/kg	0.1	2.4
Anthracene	mg/kg	<0.1	0.5
Fluoranthene	mg/kg	0.2	6.5
Pyrene	mg/kg	0.2	5.8
Benzo(a)anthracene	mg/kg	<0.1	2.2
Chrysene	mg/kg	0.1	2.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	3.8
Benzo(a)pyrene	mg/kg	0.1	2.4
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	2.0
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.5
Benzo(g,h,i)perylene	mg/kg	0.1	1.9
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	3.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	3.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	3.8
Total +ve PAH's	mg/kg	1.0	31
Surrogate p-Terphenyl-d14	%	91	100

Organochlorine Pesticides in soil			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date extracted	-	27/07/2017	27/07/2017
Date analysed	-	27/07/2017	27/07/2017
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	0.2	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	0.2	<0.1
gamma-Chlordane	mg/kg	0.3	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	94	94

PCBs in Soil			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date extracted	-	27/07/2017	27/07/2017
Date analysed	-	27/07/2017	27/07/2017
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	94	94

Acid Extractable metals in soil			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date prepared	-	27/07/2017	27/07/2017
Date analysed	-	27/07/2017	27/07/2017
Arsenic	mg/kg	7	15
Cadmium	mg/kg	0.6	<0.4
Chromium	mg/kg	15	15
Copper	mg/kg	37	100
Lead	mg/kg	320	330
Mercury	mg/kg	0.1	1.0
Nickel	mg/kg	9	8
Zinc	mg/kg	580	120

Moisture			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date prepared	-	27/07/2017	27/07/2017
Date analysed	-	28/07/2017	28/07/2017
Moisture	%	7.8	11

Metals in TCLP USEPA1311			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date extracted	-	27/07/2017	27/07/2017
Date analysed	-	27/07/2017	27/07/2017
pH of soil for fluid# determ.	pH units	9.4	8.4
pH of soil TCLP (after HCl)	pH units	1.5	1.5
Extraction fluid used	-	1	1
pH of final Leachate	pH units	5.0	4.9
Arsenic in TCLP	mg/L	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01
Lead in TCLP	mg/L	0.07	0.1
Mercury in TCLP	mg/L	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02

PAHs in TCLP (USEPA 1311)			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date extracted	-	28/07/2017	28/07/2017
Date analysed	-	28/07/2017	28/07/2017
Naphthalene in TCLP	mg/L	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001
Phenanthrene in TCLP	mg/L	0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001
Total +ve PAH's	mg/L	0.001	NIL (+)VE
Surrogate p-Terphenyl-d14	%	74	82

Asbestos ID - soils			
Our Reference		172091-1	172091-7
Your Reference	UNITS	TP4	YP 17
Depth		0.0-0.1	0.2-0.3
Date Sampled		24/07/2017	24/07/2017
Type of sample		Soil	Soil
Date analysed	-	3/08/2017	3/08/2017
Sample mass tested	g	Approx. 40g	Approx. 45g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected

Asbestos ID - materials						
Our Reference		172091-2	172091-3	172091-4	172091-5	172091-6
Your Reference	UNITS	TP4 ACM	TP7 ACM	TP8 ACM	TP12 Fibro and ACM	TP15 ACM
Depth		-	0.2-0.21	-	-	-
Date Sampled		24/07/2017	24/07/2017	24/07/2017	24/07/2017	24/07/2017
Type of sample		material	material	material	material	material
Date analysed	-	1/08/2017	1/08/2017	1/08/2017	1/08/2017	1/08/2017
Mass / Dimension of Sample	-	48x35x5mm	33x20x5mm	60x50x5mm	90x80x5mm	80x55x5mm
Sample Description	-	Grey compressed fibre cement material	Grey fibrous sheet material	Grey compressed fibre cement material	Grey compressed fibre cement material	Grey compressed fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected Amosite asbestos detected	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected	Chrysotile asbestos detected Amosite asbestos detected	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Org-012	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Date analysed	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	94	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	94	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	104	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	94	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	92	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	90	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	110	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Date analysed	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	105	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	106	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	91	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	105	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	106	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	91	[NT]
Surrogate o-Terphenyl	%		Org-003	90	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Date analysed	-			28/07/2017	[NT]	[NT]	[NT]	[NT]	28/07/2017	[NT]
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	[NT]	[NT]	83	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	99	[NT]	[NT]	[NT]	[NT]	118	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Date analysed	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	89	[NT]
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	78	[NT]
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-005	92	[NT]	[NT]	[NT]	[NT]	120	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date extracted	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Date analysed	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCLMX	%		Org-006	92	[NT]	[NT]	[NT]	[NT]	93	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date prepared	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Date analysed	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	114	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	109	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: Metals in TCLP USEPA1311						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Date analysed	-			27/07/2017	[NT]	[NT]	[NT]	[NT]	27/07/2017	[NT]
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	[NT]	[NT]	[NT]	[NT]	116	[NT]
Cadmium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	[NT]	[NT]	[NT]	[NT]	120	[NT]
Chromium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	[NT]	[NT]	[NT]	[NT]	114	[NT]
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	[NT]	[NT]	99	[NT]
Mercury in TCLP	mg/L	0.0005	Metals-021 CV-AAS	<0.0005	[NT]	[NT]	[NT]	[NT]	96	[NT]
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02	[NT]	[NT]	[NT]	[NT]	113	[NT]

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			28/07/2017	[NT]	[NT]	[NT]	[NT]	28/07/2017	[NT]
Date analysed	-			28/07/2017	[NT]	[NT]	[NT]	[NT]	28/07/2017	[NT]
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	76	[NT]
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	74	[NT]
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	71	[NT]
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	70	[NT]
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	71	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	73	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	74	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	92	[NT]	[NT]	[NT]	[NT]	78	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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SAMPLE RECEIPT ADVICE

Client Details	
Client	Geoenviro Consultancy Pty Ltd
Attention	Solern Liew

Sample Login Details	
Your Reference	JC17302A, Penrith
Envirolab Reference	**172091**
Date Sample Received	25/07/2017
Date Instructions Received	25/07/2017
Date Results Expected to be Reported	**03/08/2017**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	2 soils 5 materials
Turnaround Time Requested	Standard
Temperature on receipt (°C)	15.5
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

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

Sample and Testing Details on following page

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

Sample Id	*vTRH(C6-C10)/BTEXN in Soil*	*svTRH (C10-C40) in Soil*	*PAHs in Soil*	*Organochlorine Pesticides in soil*	*PCBs in Soil*	*Acid Extractable metals in soil*	*Metals in TCLP USEPA1311*	*PAHs in TCLP (USEPA 1311)*	*Asbestos ID - soils*	*Asbestos ID - materials*
TP4-0.0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
TP4 ACM										✓
TP7ACM-0.2-0.21										✓
TP8ACM										✓
TP12 Fibro and ACM										✓
TP15 ACM										✓
YP 17-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓	✓	

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Laboratory Test Request/Chain of Custody Record

Job Details
Job Number: JC17302A
Client:
Project: Proposed Pavement Design
Location: North Street, Penrith

Sample Date: 24/07/2017
Sampled By: SG
Project Manager: SL
Store Location:

External Laboratory Details:
Laboratory name: Envirolab Services Pty Ltd
Address: 12 Ashley Street
Chatswood
Contact: Tania Notaris

Sampling Details			Sample Type		Test Required (\) / Test Performed(X)																							
Location	Depth (m)		Soil	Water	Metals (As Cd Cr Cu Pb Zn Ni Hg)	OCP / PCB	Combination 12a	Combination 5a	Combination 5	Asbestos		pH	EC	CEC/ESP	Cl / SO4	Resistivity												Keep Sample
	From	To																										
1 TP 4	0.00	0.10	DG				/																					
2 TP 4 ACM	-	-	DG							/																		
3 TP 7 ACM	0.20	0.21	DG							/																		
4 TP 8 ACM	-	-	DG							/																		
5 TP 12 Fibro and ACM	-	-	DG							/																		
6 TP 15 ACM	-	-	DG							/																		
7 YP 17	0.20	0.30	DG				/																					

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

Job No: 172091
Date Received: 25.7.17
Time Received: 16.10
Received by: JE
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by				Received By			
Laboratory	Name	Signature	Date	Laboratory	Name	Signature	Date
GeoEnviro Consultancy	Steven Goss	SMGoss	25/07/2017	ELS	JE		25.7.17

Legend

DB Disturbed Sample (Bulk, Plastic bag)
DS Disturbed Sample (Small, Plastic bag)
DG Disturbed Sample (Glass Jar)
STP Standard Penetration Test Sample
U50 Undisturbed Sample, 50mm Tube
U75 Undisturbed Sample, 75mm Tube
WG Water Sample, Amber Glass Jar
WP Water Sample, Plastic Bottle
Y Keep Sample
N Discard Sample

APPENDIX B

Unexpected Asbestos Finds Protocol

Unexpected Asbestos Finds

If asbestos is detected in area not identified as containing asbestos prior to, or during, bulk excavation works the following 'Unexpected Finds Protocol' will apply:

- Upon discovery of suspected asbestos containing material, the site manager is to be notified and the affected area closed off by the use of barrier tape and warning signs. Warning signs shall be specific to Asbestos Hazards and shall comply with the Australian Standard 1319-1994 – Safety Signs for the Occupational Environment;
- Work shall comply with WorkCover requirements including *Working with Asbestos, 2008*;
- An OHS consultant or a hygienist is to be notified to inspect the area and confirm the presence of asbestos and determine whether the asbestos is classified as friable or bonded asbestos and determine the extent of remediation works to be undertaken. A report detailing this information will be compiled by the OHS consultant and provided to the Site Manager (SM) (or his representative);
- The impacted soil will be classified and disposed of, as a minimum, as Special Waste (Asbestos) at an appropriately licensed facility. In dry and windy conditions the stockpile will be kept lightly wetted and may be covered with plastic sheet whilst awaiting disposal;
- All work associated with asbestos in soil will be undertaken by a contractor holding a class AS-1 Licence (friable) or AS2 Licence for bonded asbestos, as appropriate. WorkCover must be notified 7 days in advance of any asbestos works;
- Monitoring for airborne asbestos fibres is to be carried out during the soil excavation in asbestos contaminated materials;
- Documentary evidence (weighbridge dockets) of correct disposal is to be provided to the Principal (or their representative);
- At the completion of the excavation, a clearance inspection is to be carried out, soil samples taken and analysed for asbestos fibres followed by written certification provided by an OHS Consultant that the area is safe to be accessed and worked (with respect to asbestos impact). If required, the filling material remaining in the inspected area can be covered/ sealed by an appropriate physical barrier layer of non-asbestos containing material prior to sign–off;
- Details are to be recorded in the site record system;
- Following clearance by an OHS Consultant or hygenist, the area may be reopened for further excavation or construction work.

APPENDIX C

Important Information about your Environmental Site Assessment

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown, NSW 2148, Australia
PO Box 1543, Macquarie Centre. North Ryde, NSW 2113

ABN: 62 084 294 762
Tel: (02) 9679 8733
Fax: (02) 9679 8744
Email: geoenviro@exemail.com.au

IMPORTANT INFORMATION REGARDING YOUR ENVIRONMENTAL SITE ASSESSMENT

This Environmental Assessment Report was performed in general conformance with our understanding of the guidelines by the Australian and New Zealand Conservation Council (ANZECC), the Office of Environment and Heritage (OEH) and the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (amended 2013).

These accompanying notes have been prepared by GeoEnviro Consultancy Pty Ltd, using guidelines prepared by ASFE; The Association of Engineering Firms Practising in the Geosciences. The notes are offered as an aid in the interpretation of your environmental site assessment report.

REASONS FOR AN ENVIRONMENTAL SITE ASSESSMENT

Environmental site assessments are typically, though not exclusively, performed in the following circumstances:

- As a pre- acquisition assessment on behalf of either a purchaser or a vendor, when a property is to be sold
- As a pre-development assessment, when a property or area of land is to be redeveloped, or the land use has change, eg from a factory to a residential subdivision
- As a pre-development assessment of greenfield sites, to establish baseline conditions and assess environmental, geological and hydrological constraints to the development of, eg, a landfill
- As an audit of the environmental effects of previous and present site usage

Each circumstance requires a specific approach to the assessment of soil and groundwater contamination. In all cases the objective is to identify and if possible, quantify the risks which unrecognised contamination poses to the ongoing or proposed activity. Such risk may be both financial (clean-up costs or limitations in site use) and physical (health risks to site users or the public).

ENVIRONMENTAL SITE ASSESSMENT LIMITATIONS

Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination within a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which did not show signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur, only the most likely contaminants are screened.

AN ENVIRONMANTAL SITE ASSESSMENT REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

Your environmental assessment report should not be used;

- When the nature of the proposed development is changed, eg, if a residential development is proposed, rather than a commercial development
- When the size or configuration of the proposed development is altered, eg, if a basement is added
- When the location or orientation of the proposed structure is modified
- When there is a change of land ownership, or
- For application to an adjacent site

In order to avoid costly problems, you should ask your consultant to assess any changes in the project since the assessment and the implications, if any, to recommendations made in the assessment.

ENVIRONMENTAL SITE ASSESSMENT FINDINGS ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual sub-surface conditions only at those points where samples are taken, when they are taken. Data obtained from the sampling and subsequent laboratory analyses are interpreted by geologists, engineers or scientist and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on any proposed development and appropriate remediation measures. Actual conditions may differ from those inferred, because no professional, no matter how qualified and no sub-surface 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 an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, however, steps can be taken to help minimise the impact. For this reason, site owner should retain the services of their consultants throughout the development stage of the project in order to identify variances, conduct additional tests which may be necessary and to recommend solutions to problems encountered on site.

Soil and groundwater contamination is a field in which legislation and interpretation of legislation by government departments is changing rapidly. Whilst every attempt is made by GeoEnviro Consultancy Pty Ltd to be familiar with current policy, our interpretation of the investigation findings should not be taken to be that of the relevant authority. When approval from a statutory authority is required for a project, that approval should be directly sought.

STABILITY OF SUB-SURFACE CONDITIONS

Sub-surface conditions can change by natural processes and site activities. As an environmental site assessment is based on conditions existing at the time of the investigation, project decisions should not be based on environmental site assessment data which may have been affected by time. The consultant should be requested to advise if additional tests are required.

ENVIRONMENTAL SITE ASSESSMENTS ARE PERFORMED FOR SPECIFIC PURPOSES AND CLIENTS

Environmental site assessments are prepared in response to a specific scope of work required to meet the specific needs or specific individuals. An assessment prepared for a consulting civil engineer may not be adequate to a construction contractor or another civil engineer.

An assessment should not be used by other persons for any purpose, or by the client for a different purposes. No individual, other than the client, should apply an assessment, even for its intended purposes, without first conferring with the consultant. No person should apply an assessment for any purposes other than that originally contemplated, without first conferring with the consultant.

MISINTERPRETATION OF ENVIRONMENTAL SITE ASSESSMENTS

Costly problems can occur when design professionals develop plans based on misinterpretation of an environmental site assessment. In order to minimise problems, the environmental consultant should be retained to work with appropriate design professionals, to explain relevant findings and to review the adequacy of plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FORM THE REPORT

Borehole and test pit logs are prepared by environmental scientists, engineers or geologist, based upon interpretation of field conditions and laboratory evaluation of field samples. Field logs normally provided in our reports and these should not be redrawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however, contractors can still misinterpret the logs during bid preparation if separated from the test of the assessment. Should this occur, delays and disputes , or unanticipated costs may result.

To reduce the likelihood of boreholes and test pit logs misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of sub-surface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations, such as contractors.

READ RESPONSIBILITY CLAUSES CLOSELY

An environmental site assessment is based extensively on judgement and opinion, therefore, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claim being lodged against consultants. In order to aid in prevention of this problem, model clauses have been developed for use in written transmittals. These are definitive clauses, designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment and you are encouraged to read them closely. Your consultant will be happy to give full and frank answers to any questions you may have.