**Job Reference:** CGS3146

**File Reference:** CGS3146-002.0

**Date:** 25 July 2016

Mackas Sand and Soil
2684 Nelson Bay Road
Salt Ash NSW 2318

Attention: Mr Robert Mackenzie

**Cardno (NSW/ACT) Pty Ltd**
**trading as**
**Cardno Geotech Solutions**
ABN 95 001 145 035

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# VENM Assessment
# Proposed Residential Development
# 2346 Nelson Bay Road, Williamtown

## Introduction

Further to your recent request, Cardno Geotech Solutions (Cardno) has undertaken Virgin Excavated Natural Material (VENM) assessment of *in-situ* soils at the Mackas Sand and Soil Quarry at 2346 Nelson Bay Road.

The client is seeking classification of the excavated sand under the Virgin Excavated Natural Material (VENM) exemption as defined in the NSW EPA Waste Classifications, Part 1: Classifying Waste [1].

Reference to the Newcastle Geological series Sheet 9231 Ed1 1995 shows the material currently being extracted is within deposits of Quaternary Holocene Dune Sands.

## Inspection and Sampling

The excavation area and surrounding areas as shown in Photograph 1 was inspected and sampled by a Principal Geotechnical Engineer from CGS on 18 July 2016.

At the time of inspection, extraction earthworks were in progress with excavation from the rear of the dunal deposits

The subsurface profile observed from the within the nominated VENM area comprised silica sand largely yellow in colour.

**Photograph 1 –** Excavation area of quarry.

During the inspection, no foreign materials were observed, nor was there any visual or olfactory evidence of gross contamination observed within the proposal VENM material.

Sampling comprised the collection of two discrete environmental samples (ES001 – ES002) from the proposed VENM material using hand tools for subsequent laboratory assessment.

# Laboratory Assessment and Results

Two environmental samples (VENM1 & VENM2) were sent to ALS Pty Ltd (NATA Accredited Laboratory) for laboratory analysis for a suite of potential contaminants (VENM 1 for BTEXN, PAH, TRH, 8 metals, OPP, OCP and PCB and VENM 2 for Acid sulphate soil sPOCAS Suite). The results when compared against residential Health Investigation Levels (HILs A[1]) of the "National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013" [2] and the NSW Acid Sulphate Soils Assessment Guidelines [3] respectively and indicate no exceedance of the threshold limits.

# Discussions and Conclusions

The proposed VENM material is generally consistent with the regional geology expectations of the site.

The sPOCAS results show that the material although slightly acidic is below the action Criteria given in the NSW Acid Sulphate Soils Assessment Guidelines [3].

The contamination suite returned values below the limits of detection for all contaminants.

Based on the results of the inspection and limited laboratory assessment, it is considered that the sand encountered within the quarry area can be classified as VENM.

*The Protection of the Environment Operations Act 1997 defines VENM as natural material (such as clay, gravel, sand, soil or rock fines):*

- *that has been excavated or quarried from areas that are not contaminated with manufactured chemicals or process residues, as a result of industrial, commercial, mining or agricultural activities, and*

- *that does not contain any sulfidic ores or soils or any other waste.*

Where material is exported from site, records should be kept indicating the quantity and location of export. Should you have any queries please contact the undersigned.

Yours faithfully,

Phil Band
Principal Geotechnical Engineer

For Cardno Geotech Solutions

**Attachments:**

ALS Analytical Report

**References:**

[1] NSW EPA 'Waste Classification Guidelines, Part 1: Classifying Waste', November 2014

[2] NEPM, National Environment Protection (Assessment of Site Contamination) Measure, 2013

[3] NSW Acid Sulfate Soils Management Advisory Committee, 'Acid Sulphate Soils Assessment Guidelines', August 1998.

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES1615602** | Page | : 1 of 8 |
| Client | : **CARDNO GEOTECH SOLUTIONS** | Laboratory | : Environmental Division Sydney |
| Contact | : MR PHIL BAND | Contact | : |
| Address | : PO BOX 4224<br>BERESFORD NSW, AUSTRALIA 2322 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| Telephone | : +61 02 4949 4300 | Telephone | : +61-2-8784 8555 |
| Project | : MACKAS | Date Samples Received | : 18-Jul-2016 15:44 |
| Order number | : ---- | Date Analysis Commenced | : 19-Jul-2016 |
| C-O-C number | : ---- | Issue Date | : 25-Jul-2016 13:53 |
| Sampler | : PHIL BAND | | |
| Site | : ---- | | |
| Quote number | : ---- | | |
| No. of samples received | : 2 | | |
| No. of samples analysed | : 2 | | |

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

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* |
|---|---|---|
| Ben Felgendrejeris | | Brisbane Acid Sulphate Soils, Stafford, QLD |
| Celine Conceicao | Senior Spectroscopist | Sydney Inorganics, Smithfield, NSW |
| Edwandy Fadjar | Organic Coordinator | 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.

- ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA029 (SPOCAS): Excess ANC not required because pH OX less than 6.5.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime ($CaCO_3$) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m3 in-situ soil, multiply reported results x wet bulk density of soil in t/m3.
- 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 | VENM1 | VENM2 | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [18-Jul-2016] | [18-Jul-2016] | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | ES1615602-001 | ES1615602-002 | -------- | -------- | -------- |
| | | | | Result | Result | ---- | ---- | ---- |
| **EA029-A: pH Measurements** | | | | | | | | |
| **pH KCl (23A)** | ---- | 0.1 | pH Unit | ---- | **6.5** | ---- | ---- | ---- |
| **pH OX (23B)** | ---- | 0.1 | pH Unit | ---- | **5.2** | ---- | ---- | ---- |
| **EA029-B: Acidity Trail** | | | | | | | | |
| **Titratable Actual Acidity (23F)** | ---- | 2 | mole H+ / t | ---- | <2 | ---- | ---- | ---- |
| **Titratable Peroxide Acidity (23G)** | ---- | 2 | mole H+ / t | ---- | **12** | ---- | ---- | ---- |
| **Titratable Sulfidic Acidity (23H)** | ---- | 2 | mole H+ / t | ---- | **12** | ---- | ---- | ---- |
| **sulfidic - Titratable Actual Acidity (s-23F)** | ---- | 0.02 | % pyrite S | ---- | <0.020 | ---- | ---- | ---- |
| **sulfidic - Titratable Peroxide Acidity (s-23G)** | ---- | 0.02 | % pyrite S | ---- | <0.020 | ---- | ---- | ---- |
| **sulfidic - Titratable Sulfidic Acidity (s-23H)** | ---- | 0.02 | % pyrite S | ---- | <0.020 | ---- | ---- | ---- |
| **EA029-C: Sulfur Trail** | | | | | | | | |
| **KCl Extractable Sulfur (23Ce)** | ---- | 0.02 | % S | ---- | <0.020 | ---- | ---- | ---- |
| **Peroxide Sulfur (23De)** | ---- | 0.02 | % S | ---- | <0.020 | ---- | ---- | ---- |
| **Peroxide Oxidisable Sulfur (23E)** | ---- | 0.02 | % S | ---- | <0.020 | ---- | ---- | ---- |
| **acidity - Peroxide Oxidisable Sulfur (a-23E)** | ---- | 10 | mole H+ / t | ---- | <10 | ---- | ---- | ---- |
| **EA029-D: Calcium Values** | | | | | | | | |
| **KCl Extractable Calcium (23Vh)** | ---- | 0.02 | % Ca | ---- | <0.020 | ---- | ---- | ---- |
| **Peroxide Calcium (23Wh)** | ---- | 0.02 | % Ca | ---- | <0.020 | ---- | ---- | ---- |
| **Acid Reacted Calcium (23X)** | ---- | 0.02 | % Ca | ---- | <0.020 | ---- | ---- | ---- |
| **acidity - Acid Reacted Calcium (a-23X)** | ---- | 10 | mole H+ / t | ---- | <10 | ---- | ---- | ---- |
| **sulfidic - Acid Reacted Calcium (s-23X)** | ---- | 0.02 | % S | ---- | <0.020 | ---- | ---- | ---- |
| **EA029-E: Magnesium Values** | | | | | | | | |
| **KCl Extractable Magnesium (23Sm)** | ---- | 0.02 | % Mg | ---- | <0.020 | ---- | ---- | ---- |
| **Peroxide Magnesium (23Tm)** | ---- | 0.02 | % Mg | ---- | <0.020 | ---- | ---- | ---- |
| **Acid Reacted Magnesium (23U)** | ---- | 0.02 | % Mg | ---- | <0.020 | ---- | ---- | ---- |
| **Acidity - Acid Reacted Magnesium (a-23U)** | ---- | 10 | mole H+ / t | ---- | <10 | ---- | ---- | ---- |
| **sulfidic - Acid Reacted Magnesium (s-23U)** | ---- | 0.02 | % S | ---- | <0.020 | ---- | ---- | ---- |
| **EA029-H: Acid Base Accounting** | | | | | | | | |
| **ANC Fineness Factor** | ---- | 0.5 | - | ---- | **1.5** | ---- | ---- | ---- |
| **Net Acidity (sulfur units)** | ---- | 0.02 | % S | ---- | <0.02 | ---- | ---- | ---- |
| **Net Acidity (acidity units)** | ---- | 10 | mole H+ / t | ---- | <10 | ---- | ---- | ---- |
| **Liming Rate** | ---- | 1 | kg CaCO3/t | ---- | <1 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | Client sample ID | VENM1 | VENM2 | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [18-Jul-2016] | [18-Jul-2016] | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | ES1615602-001 | ES1615602-002 | -------- | -------- | -------- |
| | | | | Result | Result | ---- | ---- | ---- |
| **EA029-H: Acid Base Accounting - Continued** | | | | | | | | |
| Net Acidity excluding ANC (sulfur units) | ---- | 0.02 | % S | ---- | <0.02 | ---- | ---- | ---- |
| Net Acidity excluding ANC (acidity units) | ---- | 10 | mole H+ / t | ---- | <10 | ---- | ---- | ---- |
| Liming Rate excluding ANC | ---- | 1 | kg CaCO3/t | ---- | <1 | ---- | ---- | ---- |
| **EA055: Moisture Content** | | | | | | | | |
| Moisture Content (dried @ 103°C) | ---- | 1 | % | 1.7 | ---- | ---- | ---- | ---- |
| **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 | <5 | ---- | ---- | ---- | ---- |
| **EG035T: Total Recoverable Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.1 | mg/kg | <0.1 | ---- | ---- | ---- | ---- |
| **EP066: Polychlorinated Biphenyls (PCB)** | | | | | | | | |
| Total Polychlorinated biphenyls | ---- | 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 | ---- | ---- | ---- | ---- |
| ^ 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 | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | | Client sample ID | VENM1 | VENM2 | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time | [18-Jul-2016] | [18-Jul-2016] | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | ES1615602-001 | ES1615602-002 | -------- | -------- | -------- |
| | | | | | Result | Result | ---- | ---- | ---- |
| **EP068A: Organochlorine Pesticides (OC) - Continued** | | | | | | | | | |
| ^ 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 | ---- | ---- | ---- | ---- |
| **EP068B: Organophosphorus Pesticides (OP)** | | | | | | | | | |
| Dichlorvos | 62-73-7 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Demeton-S-methyl | 919-86-8 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Monocrotophos | 6923-22-4 | 0.2 | mg/kg | | <0.2 | ---- | ---- | ---- | ---- |
| Dimethoate | 60-51-5 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Diazinon | 333-41-5 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Chlorpyrifos-methyl | 5598-13-0 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Parathion-methyl | 298-00-0 | 0.2 | mg/kg | | <0.2 | ---- | ---- | ---- | ---- |
| Malathion | 121-75-5 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Fenthion | 55-38-9 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Chlorpyrifos | 2921-88-2 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Parathion | 56-38-2 | 0.2 | mg/kg | | <0.2 | ---- | ---- | ---- | ---- |
| Pirimphos-ethyl | 23505-41-1 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Chlorfenvinphos | 470-90-6 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Bromophos-ethyl | 4824-78-6 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Fenamiphos | 22224-92-6 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Prothiofos | 34643-46-4 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Ethion | 563-12-2 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Carbophenothion | 786-19-6 | 0.05 | mg/kg | | <0.05 | ---- | ---- | ---- | ---- |
| Azinphos Methyl | 86-50-0 | 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 | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | | Client sample ID | VENM1 | VENM2 | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time | [18-Jul-2016] | [18-Jul-2016] | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | ES1615602-001 | ES1615602-002 | -------- | -------- | -------- |
| | | | | | Result | Result | ---- | ---- | ---- |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued** | | | | | | | | | |
| **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 | ---- | ---- | ---- | ---- |
| ^ **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 | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: SOIL (Matrix: SOIL) | | | | Client sample ID | VENM1 | VENM2 | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time | [18-Jul-2016] | [18-Jul-2016] | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | ES1615602-001 | ES1615602-002 | -------- | -------- | -------- |
| | | | | | Result | Result | ---- | ---- | ---- |
| **EP080: BTEXN - Continued** | | | | | | | | | |
| **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** | 1330-20-7 | 0.5 | mg/kg | | <0.5 | ---- | ---- | ---- | ---- |
| **Naphthalene** | 91-20-3 | 1 | mg/kg | | <1 | ---- | ---- | ---- | ---- |
| **EP066S: PCB Surrogate** | | | | | | | | | |
| **Decachlorobiphenyl** | 2051-24-3 | 0.1 | % | | **98.5** | ---- | ---- | ---- | ---- |
| **EP068S: Organochlorine Pesticide Surrogate** | | | | | | | | | |
| **Dibromo-DDE** | 21655-73-2 | 0.05 | % | | **96.1** | ---- | ---- | ---- | ---- |
| **EP068T: Organophosphorus Pesticide Surrogate** | | | | | | | | | |
| **DEF** | 78-48-8 | 0.05 | % | | **70.2** | ---- | ---- | ---- | ---- |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | | |
| **Phenol-d6** | 13127-88-3 | 0.5 | % | | **87.1** | ---- | ---- | ---- | ---- |
| **2-Chlorophenol-D4** | 93951-73-6 | 0.5 | % | | **82.5** | ---- | ---- | ---- | ---- |
| **2.4.6-Tribromophenol** | 118-79-6 | 0.5 | % | | **56.5** | ---- | ---- | ---- | ---- |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | | |
| **2-Fluorobiphenyl** | 321-60-8 | 0.5 | % | | **80.8** | ---- | ---- | ---- | ---- |
| **Anthracene-d10** | 1719-06-8 | 0.5 | % | | **103** | ---- | ---- | ---- | ---- |
| **4-Terphenyl-d14** | 1718-51-0 | 0.5 | % | | **92.2** | ---- | ---- | ---- | ---- |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | | |
| **1.2-Dichloroethane-D4** | 17060-07-0 | 0.2 | % | | **85.9** | ---- | ---- | ---- | ---- |
| **Toluene-D8** | 2037-26-5 | 0.2 | % | | **90.2** | ---- | ---- | ---- | ---- |
| **4-Bromofluorobenzene** | 460-00-4 | 0.2 | % | | **84.5** | ---- | ---- | ---- | ---- |

## Surrogate Control Limits

Sub-Matrix: **SOIL**

| Compound | CAS Number | Recovery Limits (%) Low | 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 |