Fill Management Protocol

Prepared for:

Gregory Hills Corporate Park Pty Ltd

Proposed Commercial Subdivision
Lot 701, DP1154772, Gregory Hills Drive
Gledswood Hills NSW

6908 / FMP1
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FILL MANAGEMENT PROTOCOL

ADE Report No. 6908 / FMP1 / v1 final

Date of Report: 29.11.2013
Client: Gregory Hills Corporate Park Pty Ltd
Site Address: Proposed Commercial Subdivision, Lot 701 DP1154772, Gregory Hills Drive, Gledswood Hills NSW

1. INTRODUCTION

This document provides a protocol for the assessment of imported fill (the Protocol) to Lot 701 DP1154772, Gregory Hills Drive, Gledswood Hills (the Site). This document was commissioned by Mr Richard Harris of Gregory Hills Corporate Park Pty Ltd. The Protocol is applicable for assessing the suitability of soil/rock materials to be imported onto the Site as part of a commercial/industrial redevelopment.

It is understood that the proposed development will include a commercial/industrial subdivision with associated infrastructure (stormwater, sewer, power etc). The proposed redevelopment would also include the construction of supporting roadways. The development will require the importation of material from outside sources.

The purpose of the Protocol is to set out the requirements for imported materials with respect to contamination, geotechnical and salinity issues. Application of this Protocol to all soil/ rock materials to be imported onto the Site will provide a consistent approach to the management of materials with respect to their suitability for use as part of the development works.

It is understood that the Site proposes to accept approximately 330,000 m^3 of material classified as virgin excavated natural material (VENM) or materials classified under either a general or specific resource recovery exemption.

ADE considers that it is the responsibility of Gregory Hills Corporate Park or their nominated representative to ensure compliance with this Protocol. It is recommended that the filling material suppliers are issued with a copy of this Protocol. The suppliers will be requested to provide supporting information/ evidence to verify that the subject material complies with this Protocol, and that the required documentation (including appropriate supporting documentation) is supplied and is complete and correct. Gregory Hills Corporate Park has the right to make the final decision on the suitability or otherwise of any material for importation onto the Site.

1.1. Site Details

The Site is identified as Lot 701 in DP1154772, located on the corner of Camden Valley Way and Gregory Hills Drive in the suburb of Gledswood Hills. The site has an irregular shape and covers an area of some 29 ha. The Site location and boundaries are shown on Drawing 1, Appendix F.

Reference to the 1:100 000 Wollongong – Port Hacking Geological Series Sheet indicates that the site is underlain by Bringelly Shale of the Wianamatta Group of Triassic age which, in the vicinity of the site, includes an unnamed, fine to medium grained quartz-lithic sandstone member. The Bringelly Shale typically comprises shale, siltstone, claystone and laminite with coal bands, all of which weather to form clays of high plasticity.

McNally (2005) describes some general features of the hydrogeology of Western Sydney which are relevant to this Site. The shale terrain of much of Western Sydney is known for saline groundwater, resulting either from the release of connate salt in shales of marine origin or from the accumulation of windblown sea salt. Seasonal groundwater level changes of 1 – 2 m can occur in a shallow regolith aquifer or a deeper shale aquifer due to natural influences.

Former groundwater investigations undertaken by Douglas Partners (DP) in the Camden area and previous studies of areas underlain by the Wianamatta Group and Quaternary river alluvium indicate that:

- The shales have a very low intrinsic permeability, hence groundwater flow is likely to be dominated by fracture flow with resultant low yields (typically < 1 L/s) in bores; and

- The groundwater in the Wianamatta Group is typically brackish to saline with total dissolved solids (TDS) in the range 4000 – 5000 mg/L (but with cases of TDS up to 31750 mg/L being reported). The dominant ions are typically sodium and chloride and the water being generally unsuitable for livestock or irrigation.

Review of the Wollongong-Port Hacking 1:100,000 Soils Landscape Sheet indicates that the Site is located within an area that is mapped as the Blacktown Soil Landscape. The Blacktown group of soil landscape form on gently undulating rises on Wianamatta Group shales and Hawkesbury shale with local relief of up to 30 m. The types of soils encountered are typically yellow podzolic soils and soloths and brown podzolic soils. The typical limitations of this soil group include moderate reactivity and highly plastic sub soil, low soil fertility and poor soil drainage.

2. CONTAMINATION ISSUES

2.1. Relevant Legislation and Guidelines

Importation of materials onto the Site must fully abide by the provisions of relevant NSW environmental legislation, including, inter alia, the *Contaminated Land Management Act* (1997) and *Protection of the Environment Operations Act* (1997).

The following environmental guidelines are considered to be relevant:

- DECCW Waste Classification Guidelines (2008), December 2009 Revision;
- NSW EPA Contaminated Sites *Guidelines for the NSW Site Auditor Scheme* (2006) [The Auditors Guidelines];
- NEPC (1999). National Environmental Protection (Assessment of Site Contamination) Measure 1999, 2013 Revision. Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater;
- Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council (ANZECC/NHMRC): Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (1992), Environmental Soil Quality Guidelines Background A [ANZECC A];
- *Guidelines on Resource Recovery Exemption (Land Application of Waste Materials as Fill)* EPA Feb 2011;
- Protection of the Environment Operations (Waste) Regulation (2005) – General Exemption Under Part 6, Clause 51 and 51A - The excavated natural material exemption 2012;
- Any specific exemption issued under the Protection of the Environment Operations (Waste) Regulation (2005) by the NSW EPA;
- Camden Council "Imported Fill Condition"; and
- Camden Council Engineering Construction Specification (2009).

2.2. Imported Material Acceptance Criteria

Materials imported to the Site must satisfy the minimum requirements detailed below. All materials to be imported must be accompanied by appropriate reports from qualified environmental/geotechnical consultants verifying the status of the material with respect to contamination, salinity and relevant geotechnical parameters. The Forms included in Appendix A and B must be completed, and approved by Gregory Hills Corporate Park and the Environmental Consultant prior to acceptance of the material.

- All imported soil/rock material must be verified to be either **VIRGIN EXCAVATED NATURAL MATERIAL (VENM)** (imported natural materials), **EXCAVATED NATURAL MATERIAL (ENM)** (as defined under NSW EPA) Waste Classification Guidelines 2009 or materials classified under a specific exemption granted by the EPA. All source sites are subject to approval by Gregory Hills Corporate Park on a case by case basis.

- For specific purposes other certified materials such as quarry run materials and gravels will be acceptable provided that the materials are accompanied with supporting certification documentation to demonstrate their source and suitability.

- Recycled products (such as recycled concrete) are not considered suitable from a contamination risk standpoint as the quality of the materials can be difficult to guarantee.

- All VENM material must be accompanied by a VENM validation report from a suitably qualified environmental consultant. The validation assessment should include appropriate levels of sample analyses to be conducted at the sampling density as specified in Table C1, Appendix C. As The NSW Environment Protection Authority (EPA) has no specific VENM assessment criteria, VENM material should be reviewed on the basis of the source site history, "observation" and property of the material, and with reference to relevant guidelines/thresholds viz. the published Australian Background Soil Levels (NEPM Schedule B(1) and/ or ANZECC 1992 (see extract in Table B3, Appendix B) and, with respect to organic analytes, their analytical practical quantitation limits;

- All ENM material must be verified in accordance with the sampling methodology and density specified in the *Protection of the Environment Operations (Waste) Regulation* 2005 - General Exemption Under Part 6, Clause 51 and 51A for Excavated Natural Materials. The requirements are summarised in Table C1, Appendix C. In addition, the relevant "chemical and other attributes" in the ENM material must be verified to comply with the concentration threshold values specified in Table 2 of the General Exemption for Excavated Natural Material Exemption 2012. These concentrations are reproduced in Table B2, Appendix B, with the full ENM guidelines provided in Appendix F.

- In addition to the above requirements, all materials must be validated to be suitable, from a site contamination standpoint, for use on commercial/industrial sites. In this regard, the material must meet the assessment criteria specified in the National Environmental Protection (Assessment of Site Contamination) Measure 1999, 2013 Revision, Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, for **Commercial / Industrial Sites (HIL-D)**. For the top 0.5 m of site soils in landscape areas, the material used should comprise of ENM and VENM soils only. An extract of guideline values for common contaminants is provided in Table B1, Appendix B.

- With regard to the assessment testing, all laboratory analysis must be conducted by a laboratory that holds NATA accreditation for the test methods performed.

3. GEOTECHNICAL AND SALINITY ISSUES

3.1. Relevant Guidelines

The following geotechnical guidelines are considered relevant to the assessment of the geotechnical suitability of the imported materials:

- Australian Standards AS3798: Guidelines on Earthworks for Commercial & Residential Developments (1998) [AS3798];
- Department of Land and Water Conservation (DLWC) Site Investigations for Urban Salinity (2002);
- Camden Council "Imported Fill Condition"; and
- Camden Council Engineering Construction Specification (2009).

3.2. Geotechnical Material Acceptance Criteria

The geotechnical/engineering requirements for the imported material are as follows;

- The **maximum particle size** (mps) of the imported material must not exceed **150 mm**. The mps of greater than 150 mm is acceptable if the material can readily breakdown under normal compaction conditions (eg compaction of layers of ≤300 mm using an 8 – 10 tonne vibrating roller – this must be proven by trial prior to import);

- Imported material should have a **liquid limit** (obtained by Atterberg Limit test) of less than **50%**. Material with a Liquid Limit up to 50% will be acceptable if Shrink Swell Index test certificates show that shrink swell index is ≤2.0 (refer to Table B6, Appendix B). The number of tests conducted should be in accordance with Table C2, Appendix C.

- The imported material should have a CBR of at least 5% and should not contain any unsuitable material as listed in Section 4 of AS3798. The number of CBR tests conducted should be in accordance with Table C2, Appendix C; and

- The materials are not, or do not contain of any of the unsuitable materials as listed in Appendix D.

3.3. Salinity Acceptance Criteria

The Site is in an area of known moderate salinity (with some areas classified as very saline), therefore source sites should have a classification of moderate salinity or better. The salinity testing and selection criteria are as follows:

- The imported materials must be analysed for EC_e, pH, chlorides and sulphates in accordance with the sampling density specified in Table C3, Appendix C. The Protocol specifies variable sampling densities for materials sourced from area of known salinity and areas of no known salinity hazard;
- Imported materials should be moderately saline or better, based on ECe, the electrical conductivity of saturated pore water (Refer to Table B4, Appendix B for salinity scale);
- A stockpile will be considered non-saline to slightly saline if at least 90% of the tested samples are non-saline to slightly saline;
- Materials should be non-aggressive based on the scale given in Table B5; and
- Materials of higher salinity and aggressivity may be accepted if they can be demonstrated to be consistent with the local background conditions at the Site or an area within the Site (Refer to DP *Report on Salinity Investigation and Management Plan, Proposed Subdivision, Lot 701 in Deposited Plan 1154772, Gledswood Hills,* Project Number 76510.00 dated May 2012) or if appropriate salinity management procedures or appropriate engineering practices are in place to handle such materials. Such materials will only be accepted at the discretion of Gregory Hills Corporate Park and the environmental consultant.

4. Fill Management Protocol

Documentation required to verify the quality / status of any material for importation onto the Site includes:

1. Satisfactory completion of the "Material Suppliers Application Form" and "Material Questionnaire Form" by the material supply site (Tables A1 and A2, Appendix A);
2. Preparation and supply of all supporting documentation (eg VENM report, ENM reports, geotechnical/ salinity assessment reports conducted by a suitably qualified consultant and including NATA Laboratory Reports);
3. Completion of the "Fill Approval Checklist" (Table E1, Appendix E) by Gregory Hills Corporate Park or their representative assessing the adequacy of the documents provided in step 2;
4. Provide seven days' notice to council of the intention to commence the import of materials;

5. Collate trucking records (as per Section 5.2);
6. Records of the location of materials imported onto the Site including photographs, drawings and survey documentation (for volumes if the material is stockpiled);
7. Inspection records and description of the materials imported by site personnel (an example site record form is provided in Appendix E).

All documentation should be supplied to Gregory Hills Corporate Park or their representative for approval. All records will be kept by Gregory Hills Corporate Park for future reference.

5. APPROVAL/ASSESSMENT

Prior to acceptance of material from a source site, assessment of the source site should be undertaken to verify the general acceptability of material from that Site. In addition material tracking records and inspection of the materials imported to the site should be undertaken to verify that the materials being imported are consistent with those approved for importation.

5.1. Assessment/Approval of Source Site

Materials will be judged as suitable or otherwise by Gregory Hills Corporate Park or their representative based on the provided documentation, the apparent reliability or otherwise of the documentation and its conformance with this Protocol.

Gregory Hills Corporate Park site personnel responsible for accepting/ rejecting materials entering the site will have completed copies of the "Material Suppliers Application Form" and "Material Questionnaire Form" for materials currently being imported, and will compare each load with the material description provided by the source site.

Any materials deemed 'not to comply' or 'yet to comply' with this protocol should ***not*** be imported onto the site. If doubt arises with respect to any materials already imported onto the site, the materials shall remain stockpiled, fenced and signposted in a clearly defined area pending final assessment. If materials at the site are deemed unacceptable for use for the development works, a specific management plan for these materials should be developed by a suitably qualified consultant.

5.2. Gate Records and Check Sampling

A record of truck movements should be maintained for trucks carrying material imported to the Site providing the following information:

- The date and time of truck arrival;
- The source location of the material;
- The truck registration details;
- Material type;
- The approximate volume of material per load;
- Visual assessment of material at gate;
- Record of load acceptance/rejection;
- The approximate location of material placement (on a daily basis not per truck load); and
- The amount of material remaining to be imported based on the volume supplied in the original assessment report.

Gregory Hills Corporate Park will reject any materials entering the Site which are not deemed to be consistent with the supporting documentation, which has been previously supplied and accepted based on a visual assessment of the material at the gate. Similarly they will reject source sites which have imported to site more material than allowed for in the original assessment (a supplementary assessment may be made by the source site's consultant to allow for the additional assessment, but this must be submitted for review).

As an additional level of control it is recommended that check samples be collected at the gate. Sampling rates and analytical scope for check samples of ENM (or other material covered by a specific exemption) and VENM are provided in Table C4, Appendix C. If check samples indicate non-conformance with this protocol then further review/assessment of the source site may be required.

6. NON-COMPLIANCE

Any material imported to site that is found to be non-compliant (discovered during check testing or during general site activities) will be isolated and assessed by Gregory Hills Corporate Park or their representative. If the non-compliant material is found to be incompatible with the site it will be removed at the cost of the source site. This decision rests with Gregory Hills Corporate Park. A bond system is recommended to address such matters. The cost of remediation and validation will be borne by the source site.

7. FINAL VALIDATION OF IMPORTED FILL

At the completion of importation of the materials to the Site and prior to the commencement of constructions work a validation report should be prepared (by a suitably qualified environmental/geotechnical consultant) to ensure that all materials imported to the site meet the requirements of the Protocol. The validation report should include the following:

- A review of source site documentation;
- Copies of the completed forms from Appendix A and E;
- A review of gate keeping records (the consultant preparing the Final validation should undertake the gate keeping role);
- A review of site drawings/surveys identifying where imported materials were placed within the site;
- A review of and discussion of check sampling undertaken at the gate in accordance with Section 5.2;
- Records of non-conformances with this Protocol; and
- Assessment of the overall compliance with the Protocol.

If there are data gaps or incomplete records of gate keeping then additional check sampling of the imported materials may be required. The scope of such works would need to be determined at the time by a suitably qualified consultant.

A summary report shall be provided to Council on a monthly basis detailing both accepted and rejected sites. The final validation report will also be submitted to Camden Council to demonstrate adherence to the Protocol.

8. LIMITATIONS

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only and has been based on information provided by the client. The advice herein relates only to this project and all results, conclusions and recommendations made should be reviewed by a competent and experienced person with experience in environmental investigations, before being used for any other purpose. A.D. Envirotech Australia Pty Ltd (ADE) accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced or amended in any away without prior approval by the client or ADE and should not be relied upon by any other party, who should make their own independent enquiries.

This report does not provide an assessment of the environmental status of the site and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, ADE reserves the right to review the report in the context of the additional information.

ADE's professional opinions are based upon its professional judgment, experience, training and results from analytical data. In some cases further testing and analysis may be required, thus producing different results and/or opinions. ADE has limited investigation to the scope agreed upon with its client.

ADE has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the Environmental Industry within Australia. No other warranty, expressed or implied, is made or intended.

R. Nefodov

Ross Nefodov (Principal)
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APPENDIX A – FORMS FOR MATERIALS SUPPLIED TO SITE

Table A1 – Material Suppliers Application Form

Suppliers Details	
Supplier's Name:	_____ (organisation)
Supplier's Address:	_____
Suburb:	_____
Contact Person:	_____ (representative)
Position:	_____
Phone Number:	_____ Fax Number: _____
Mobile Number:	_____ Application Date: _____
Source Site Details	
Site Address:	_____
Suburb:	_____
Nearest Cross Street:	_____
Current Land Use:	_____
Previous Land Use:	_____
Surrounding Land Use:	North: _____ South: _____
	East: _____ West: _____
Material Details	
Regional Geology:	Wianamatta Shale / Narrabeen Group / Hawkesbury Sandstone / Quaternary Sediments (Please circle)
	comments:_____
General material	(Profile 1) _____(Natural/Fill)
Descriptors:	(Profile 2) _____(Natural/Fill)
	(Profile 3) _____(Natural/Fill)
Maximum Particle Size:	_____ (mm)
Estimated Volumes:	natural_____(m^3); filling_____(m^3)
	in-situ_____(m^3); Stockpiled_____(m^3)
Method of Excavation:	_____
Availability:	_____(date)
Delivery Frequency:	_____ (trucks or m^3/day)
Declaration	
Application Made By:	Name: _____ Signature: _____

Table A2 – Material Questionnaire Form Page 1 of 2

Suppliers Details			
Supplier's Name:	_____ (organisation)		
Contact Person:	_____ (representative)		
Phone Number:	_____ Date: _____		
Source Site Details			
Site Address:	_____		
Suburb:	_____		
Define Excavation Area/ location of stockpiles:	_____ _____ (attach plan and photographs)		
Environmental Details	(Please circle)		(Please circle)
Is site history information documented?	YES / NO	(are details attached?)	YES / NO
Do any contamination reports exist for this site?	YES / NO	(are all reports attached?)	YES / NO
Is a Waste Classification Report available?	YES / NO	(are all reports attached?)	YES / NO
What is the material classification?	VENM / ENM / Other		
What is the estimated volume of material:	_____		
No of samples tested:			
total:	_____		
Heavy Metals:	_____		
TRH/ BTEX::	_____		
PAH:	_____		
phenol:	_____		
PCB:	_____		
OCP:	_____		
asbestos:	_____		
TCLP heavy metals:	_____		
TCLP PAH:	_____		
Other:	_____		
Does waste classification assessment comply with:			
Table C1 (sample density)?	YES / NO		
Tables B1 and B2 (ENM or other exemption)?	YES / NO		
Tables B1 and B3 (VENM)?	YES / NO		

Table A2 – Material Questionnaire form Page 2 of 2

Geotechnical Details	(Please circle)		(Please circle)
Do any geotechnical reports exist for this site?	YES / NO	(are all reports attached?)	YES / NO
Have geotechnical tests been performed?	YES / NO	(are details attached?)	YES / NO
What is the moisture condition of the material?	_____		
Does the fill contain demolition / foreign inclusions?	YES / NO	If yes, provide details: _____	
	_____		
Does the material contain topsoil or vegetation matter?	YES / NO	(are details attached?)	YES / NO
Is the maximum particle size (mps) of the fill material less than 150 mm?	YES / NO	(are details attached?)	YES / NO
If mps is greater than 150 mm will the material breakdown under normal compaction conditions?	YES / NO	(are details attached?)	YES / NO
What is the portion of fines (<0.075mm)?	_____		
If <30% fines can the material be blended prior to delivery?	_____		
Comments:			
Is the material is clay:	YES / NO		
What is the liquid limit of the material?	_____		
what is the shrink swell index (if liquid limit>50%):	_____		
Does the liquid limit/ shrink swell comply with Table B6?	YES / NO		
Does the testing density confirm with Table C2	YES / NO		
Salinity Details	(Please circle)		(Please circle)
Has a salinity assessment been conducted?	YES / NO	(are all reports attached?)	YES / NO
Does the sampling density meet the requirements in Table C3?	YES / NO		
Are the materials non-saline to slightly saline?	YES / NO		
Comments regarding limited use of saline material:	_____		NA
Is the material non-aggressive as per Table B6?	YES / NO	(are all reports attached?)	YES / NO
Declaration			
Questionnaire completed by:	Name: _____	Signature: _____	

APPENDIX B – THRESHOLD VALUES

Table B1 – Threshold Contaminant Values For Commercial / Industrial Landuse. Applys Screening Values to All Imported Materials (Including VENM and ENM)

Contaminant	Site Assessment Criteria (SAC) (mg/kg)	Source
TPH		NEPC (1999), 2013 Amendment. SAC derived from 'Table 1B(7) – Management Limits for TPH fractions F1-F4 in soil'. Coarse soil texture adopted.
C_6-C_{10}	700	
C_{10}-C_{16}	1,000	
C_{16}-C_{34}	3,500	
C_{34}-C_{40}	10,000	
BTEX		*Protection of the Environment Operations (Waste) Regulation (2005) – General Exemption Under Part 6, Clause 51 and 51A - The excavated natural material exemption 2012 (Refer to Appendix F)
Benzene	1	
Toluene	0.5	
Ethylbenzene	65	
Xylene	25	
Metals		NEPC (1999), 2013 Amendment. SAC derived from 'Table 1A(1) – Health investigation levels for soil contaminants'. Commercial/industrial D criteria adopted.
Arsenic	3,000	
Cadmium	900	
Chromium (VI)	3,600	
Copper	240,000	
Lead	1,500	
Mercury (inorganic)	730	
Nickel	6,000	
Zinc	400,000	
Phenols #		
Phenol	240,000	
PAHs		
Total PAHs	4,000	
Carcinogenic PAHs (as BaP TEQ)	40	
OCPs		
Aldrin + dieldrin	45	
Chlordane	530	
Endosulfan	2,000	
DDT+DDE+DDD	3,600	
Heptachlor	50	
OPPs		
Chlorpyrifos	2,000	
Other Organics #		
PCBs	7	
Asbestos	No asbestos found in soil	No current NSW EPA endorsed guideline levels were available

– Required if there is the potential for the contaminant to occur on or adjacent to the source site, as determined by a suitably qualified Environmental Engineer/Scientist/Consultant employed by the governing body at the source site.

* – As no vapour intrusion modeling has been undertaken at GHCP, levels for BTEX in soils have been adopted as per the NSW EPA's Excavated Natural Material Exemption 2012.

Table B2 – Threshold Contaminant Values For ENM#

Column 1	Column 2	Column 3	Column 4
Chemicals and other attributes	**Maximum average concentration for characterisation** (mg/kg 'dry weight' unless otherwise specified)	**Absolute maximum concentration** (mg/kg 'dry weight' unless otherwise specified)	**Test method specified within Section**
1. Mercury	0.5	1	12.1
2. Cadmium	0.5	1	12.2
3. Lead	50	100	12.2
4. Arsenic	20	40	12.2
5. Chromium (total)	75	150	12.2
6. Copper	100	200	12.2
7. Nickel	30	60	12.2
8. Zinc	150	300	12.2
9. Electrical Conductivity	1.5 dS/m	3 dS/m	12.3
10. pH *	5 to 9	4.5 to 10	12.3
11. Total Polycyclic Aromatic Hydrocarbons (PAHs)	20	40	12.4
12. Benzo(a)pyrene	0.5	1	12.4
13. Benzene	NA	0.5	12.5
14. Toluene	NA	65	12.5
15. Ethyl-benzene	NA	25	12.5
16. Xylene	NA	15	12.5
17. Total Petroleum Hydrocarbons C_{10}-C_{36}	250	500	12.6
18. Rubber, plastic, bitumen, paper, cloth, paint and wood	0.05%	0.10%	12.7

* The ranges given for pH are for the minimum and maximum acceptable pH values in the excavated natural material.

 # Refer to Appendix F – Excavated Natural Material Exemption 2012 for full guidelines including sampling densities and testing method.

Table B3 – Reference Contaminant Values For Virgin Excavated Natural Material (VENM) Apply to Imported Natural Materials

Contaminant	NEPC[1]	ANZECC[2]
TPH C_6-C_{10} C_{10}-C_{16} C_{16}-C_{34} C_{34}-C_{40}	For all organic analytes, the analytical practical quantitation limits are used as the reference levels for VENM assessment.	
BTEX Benzene Toluene Ethylbenzene Xylene	 - - - -	 0.05-1 0.1-1 - -
Metals Arsenic (total) Cadmium Chromium (III) Copper Lead Mercury Nickel Zinc	 1-50 1 5-1000 2-100 2-200 0.03 5-500 10-300	 0.2-30 0.04-2 0.5-110 1-190 <2-200 0.001-0.1 2-400 2-180
Total Phenols #	For all organic analytes, the analytical practical quantitation limits are used as the reference levels for VENM assessment.	
PAH Total PAHs Benzo(a)Pyrene		
PCB #		
OCP/ OPP aldrin + dieldrin chlordane DDD, DDE, DDT Heptachlor Chlorprifos Methyl parathion		

Notes:

1. NEPC (1999). National Environmental Protection (Assessment of Site Contamination) Measure Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater, Background Ranges.
2. Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council (ANZECC/NHMRC): Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (1992), Environmental Soil Quality Guidelines Background A [ANZECC A].

Required if there is the potential for the contaminant to occur on or adjacent to the source site, as determined by a suitably qualified Environmental Engineer/Scientist/Consultant employed by the governing body at the source site.

Table B4 – Salinity Scale

Salinity	Electrical conductivity (ECe)
Non Saline	<2 dS/m
Slightly Saline	2 – 4 dS/m
Moderately Saline	4 – 8 dS/m
Highly Saline	8 – 16 dS/m

Table B5 – Criteria For Non-Aggressive Soils

Soil Type	Soil Use	chlorides	sulphates	pH
high permeability	above the water table	≤0.5%	≤0.5%	≥5.5
high permeability*	below the water table	NA	NA	NA
low permeability	above the water table	≤2%	≤0.5%	≥5.5
low permeability	below the water table	≤2%	≤0.5%	≥5.5

Source: AS 2159 2009

* high permeability soils which are in groundwater (soil condition A are by definition a minimum of mildly aggressive)

Table B6 – Liquid Limit Requirements for Clays

Liquid Limit (Atterberg Test)	Assessment
<50%	Acceptable
>50%	Reject

APPENDIX C – SAMPLING DENSITIES

TABLE C1 – Sampling and Analytical Requirements for ENM and VENM [4]

Filling/ Natural	Material Quantity [4] (m^3)	Minimum Sample number/ Frequency	Minimum analyte suite to include [1,2]	Additional analysis as required [2,3]
VENM	<5000	1 per 1000 m^3 (Minimum of 3 samples)	- Heavy metals - PAH - TPH - BTEX - Phenol (If suggested by site history) - PCB (If suggested by site history) - OCP/OPPs - Asbestos - Field Oxidation and/or SPOCAS (If within area with potential Acid Sulphate Soils)	- Any contaminant considered potentially present in the material based on site information
	5000-50,000	1 per 5000 m^3 (Minimum of 8 samples)		
	>50,000	1 per 5,000 m^3 (Minimum of 8 samples)		
	For alignments of > 5 km	At least 1 per km*		
Natural material (in- situ or freshly excavated)	Any volume	As per ENM Exemption 2012 - Refer to Appendix F	Mercury, cadmium, lead, arsenic, chromium (total), copper, nickel, zinc, electrical conductivity, pH, PAHs, TPH (C_{10}- C_{36}), Rubber plastic bitumen paper cloth paint and wood.	- Asbestos/OCP/OPP plus any contaminant considered potentially present in the material based on site information
Specific Exemption	Reviewed on a case by case basis			

Notes:

1. Note not all samples necessarily require testing for all analytes.
2. Heavy metals = arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. BTEX = benzene, toluene, ethyl benzene, total xylenes OCP = Organochlorine Pesticides (a scheduled chemical).PAH = Polycyclic Aromatic Hydrocarbons.PCB = Polychlorinated Biphenyls.TRH = Total Recoverable Hydrocarbons (including Total Petroleum Hydrocarbons).SPOCAS = Suspension Peroxide Oxidation Combined Acidity and Sulphate method.
3. Based on advice from a qualified consultant
4. Based on material volumes per site, i.e. if 5000 m3 or less from source site then frequency 1 applies, 5000-50000 from source site then frequency 2 applies etc, not on total volume being imported from all sites.

VENM = Virgin Excavated Natural Material

Composite samples mean a sample that combines 5 discrete sub-samples into a single sample for the purpose of analysis.

* Higher frequency of testing should be adopted in areas of higher contamination potential.

TABLE C2 – Sampling Requirements for CBR and Geotechnical Tests

Material	Quantity (m^3)	Minimum Sampling Frequency
Filling	<5000	1 Per 2500 m^3 1 per 250 m for alignments
	>5000	1 Per 5000 m^3 1 per 500 m for alignments
Natural	Any Volume	1 per 5000 m^2 (area) 1 per 500 m for alignments
Clays		Atterberg test - 1/1000 m^3
		Shrink swell index - 1/5000 m^3

TABLE C3 – Sampling and Analytical Requirements for Salinity

Assessment	Minimum Sample Frequency	Depth of Sample	Minimum analyte suite
Areas of no Known Salinity			
Stockpile	1 sample per 2500 m^3	-	ECe, pH, sulphates, chlorides, textural classification.
In situ	2 bores or test pits per ha or 2 bores per 1 km for alignments*	Samples at 0.2 m, 0.5 m and 1.0 m intervals or change in strata to depth of excavation or refusal.	ECe, pH, textural classification.
		Samples 0.5 m, 1.0 m and 2.0 m	Chlorides & sulphates.
Areas of Known Salinity			
Stockpile	1 sample per 1000 m^3	-	ECe, pH, sulphates, chlorides, textural classification.
In situ	2 bores or test pits per ha or 5 bores per 1 km for alignments*	Samples at 0.2 m, 0.5 m and 1.0 m intervals or change in strata to depth of excavation or refusal.	ECe, pH, textural classification.
		Samples 0.5 m, 1.0 m and 2.0 m	Chlorides & sulphates.

* Assumes alignment of 5 km or greater. Additional bores may be required for short alignments (Minimum of eight (8) boreholes for any alignment).

TABLE C4 – Sampling Requirements for Check Samples at Gate

Material	Minimum Sampling Frequency*	Analytical Requirement
Filling (Exemptions)	1 per 1000 m^3	**Contamination** - heavy metals, PAH, TRH, BTEX, phenol, PCB, OCP/OPPs, and asbestos **Salinity** – EC, pH, Chloride and sulphate **Geotechnical** – CBR (4 day soak)
Natural (VENM)	1 per 5000 m^3	**Contamination** - heavy metals, PAH, TRH, BTEX, phenol, PCB, OCP/OPPs, and asbestos **Salinity** – EC, pH, Chloride and sulphate **Geotechnical** – CBR (4 day soak)

* Sampling frequency may be increased based on visual assessment at gate.

APPENDIX D – MATERIALS GIVEN RISE TO LOAD REJECTION

Unsuitable Materials List

The following list contains materials that are unsuitable for use as fill. Any materials containing the following will be rejected. The list is not exhaustive.

- Acid sulphate soils;
- Asbestos (fibre and bonded);
- Biocides;
- Chemical storage containers;
- Contaminated material;
- Demolition rubble;
- Excessively wet soils (greater than 3% of optimal moisture content);
- Explosives;
- Fibro;
- Food waste;
- Fungicides;
- Herbicides;
- High plasticity clay;
- Household domestic waste;
- Large rock fragments;
- Liquid waste;
- Metals;
- Non-validated materials;
- Oil filters and rags;
- Paint;
- Pesticides;
- Plastics and PVC;
- Radioactive waste;
- Sanitary waste;
- Timber;
- Treated timber;
- Tyres;
- Vegetative waste; and
- All other potentially contaminating materials.

APPENDIX E – FORMS FOR RECEIVING SITE

TABLE E1 – APPROVAL CHECKLIST Page 1 of 2

Suppliers Details		
Supplier's Name:	_____ (organisation)	
Contact Person:	_____ (representative)	
Phone Number:	_____ Date: _____	
Source Site Details		
Site Address:	_____	
Suburb:	_____	
Environmental Assessment	*(Please circle)*	*(Please circle)*
Have the supplied contamination reports been reviewed?	*YES / NO*	*Satisfactory / Unsatisfactory*
Comments?	_____	
	_____	_____
	_____	_____
	_____	_____
Are the supplied Waste Classification report/s satisfactory?	*YES / NO*	*Satisfactory / Unsatisfactory*
What has the material been classified as (circle)?		
	VENM	*see below*
	Exempt Material (eg ENM)	*see below*
For VENM:	*Other*	*Satisfactory / Unsatisfactory*
has sufficient site history information been supplied?	*YES / NO*	*Satisfactory / Unsatisfactory*
does the assessment comply with Tables:		
• *C1 – Density of testing*	*YES / NO*	*Satisfactory / Unsatisfactory*
• *B1 – Site Acceptance Criteria (HIL Col 4)*	*YES / NO*	*Satisfactory / Unsatisfactory*
• *B3 – Australian Soils Natural Background*	*YES / NO*	*Satisfactory / Unsatisfactory*
For Exemptions:		
has sufficient site history information been supplied?	*YES / NO*	*Satisfactory / Unsatisfactory*
does the assessment comply with Tables:		
• *C1 – Density of testing*	*YES / NO*	*Satisfactory / Unsatisfactory*
• *B1 – Site Acceptance Criteria (HIL Col 4)*	*YES / NO*	*Satisfactory / Unsatisfactory*
• *B2 – Threshold Contaminant Concentrations*	*YES / NO*	*Satisfactory / Unsatisfactory*
ENVIRONMENTAL ASSESSMENT RESULT	*REJECTED*	*APPROVED*

TABLE E1 – APPROVAL CHECKLIST Page 2 of 2

Geotechnical Assessment	*(Please circle)*	*(Please circle)*
Are the supplied geotechnical report/s satisfactory?	*YES / NO*	*Satisfactory / Unsatisfactory*
Does the material contain any of the inclusions listed in Appendix D?	*YES / NO*	*Satisfactory / Unsatisfactory*
Are the supplied reports and test results satisfactory?	*YES / NO / NA*	
Does the liquidity limit/ shrink swell of clay materials comply with Table B4?	*YES / NO / NA*	*Satisfactory / Unsatisfactory*
Comments:	_____	_____
Does the material contain topsoil or vegetation matter?	*YES / NO*	*Satisfactory / Unsatisfactory*
Is the particle size acceptable?	*YES / NO*	*Satisfactory / Unsatisfactory*
Does the material require blending prior to use?	*YES / NO*	*Satisfactory / Unsatisfactory*
Comments:	_____	_____
Is ongoing excavation control required (eg both suitable and non suitable materials present on-site and separation required)?	*YES / NO*	*Satisfactory / Unsatisfactory*
GEOTECHNICAL ASSESSMENT RESULT	*REJECTED*	*APPROVED*
Salinity Assessment	*(Please circle)*	*(Please circle)*
Is the salinity assessment satisfactory?		*Satisfactory / Unsatisfactory*
Is the material suitable for unlimited use with regard to salinity (ie non-saline to slightly saline)?	*YES / NO*	*Satisfactory / Unsatisfactory*
Comments regarding limited use of saline material:	_____	_____
	_____	*limit use / Unsatisfactory / NA*
Is the material non-aggressive as per Table B6?	*YES / NO*	*Satisfactory / Unsatisfactory*
SALINITY ASSESSMENT RESULT	*REJECTED*	*APPROVED*
FINAL ASSESSMENT	***REJECTED***	***APPROVED***
Comments:	_____	
	_____	
Completed by:	_____	*(name)*
	_____	*(company)*
	_____	*(signature)*
	_____	*(date)*

TABLE E2 – MATERIALS ACCEPTANCE CHECKLIST

FILL ACCEPTANCE CHECKLIST	Completed By:_____ Date:_____
Material/ Suppliers Details Supplier's Name: Source Site Address:	_____ (organisation) _____ _____ _____
Materials described in application/ approval documentation:	_____ _____ _____
Description of materials arriving at site:	_____ _____ _____
Do material descriptions match?	Yes / No accept / reject
Location placed on-site: Sketch attached:	_____ Yes / No
Number of loads received:	

APPENDIX F – EXCAVATED NATURAL MATERIAL EXEMPTION 2012

Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A

The excavated natural material exemption 2012

Name

1. This exemption is to be known as 'The excavated natural material exemption 2012'.

Commencement

2. This exemption commences on 19 October 2012. 'The excavated natural material exemption 2008' which commenced 25 July 2008 is revoked from 19 October 2012.

Duration

3. This exemption is valid until revoked by the Environment Protection Authority (EPA) by notice published in the Government Gazette.

Legislation

4. Under the *Protection of the Environment Operations (Waste) Regulation 2005* (the Regulation):

4.1. Clause 51 (2) authorises the EPA to grant an exemption in relation to any matter or thing including an activity or class of activities, and

4.2. Clause 51A authorises the EPA to exempt a person from any of the following provisions in relation to an activity or class of activities relating to certain waste that is to be land applied or used as a fuel:

- the provisions of sections 47 to 49 and 88 of the *Protection of the Environment Operations Act 1997* (the Act),
- the provisions of Schedule 1 to the Act, either in total or as they apply to a particular activity, and
- the provisions of Part 3 and clauses 45 and 47 of the Regulation.

Exemption

5. In this Notice of Exemption:

5.1. The responsible person listed in Column 1 of Table 1 is exempt from the provision/s listed in Column 2 of that table but only:

- in relation to activities involving the relevant waste, and
- where the responsible person complies with the conditions referred to in Column 3 of the table, and
- in the case of a consumer, in relation to the premises where the waste is applied to land as permitted by clause 7.2.

However, this Notice of Exemption does not exempt the responsible person from the provisions specified in Column 2 where the relevant waste is received at premises that are, despite this exemption, required to be licensed for waste disposal (application to land) activities under the provisions of the Act.

5.2. Where a responsible person complies with the conditions of this Notice of Exemption, the activity referred to in Schedule 1 from which that person is exempt is taken to be a non-scheduled activity for the purposes of the Act.

Table 1

Column 1	Column 2	Column 3
Responsible person	**Provisions from which the responsible person is exempt**	**Conditions to be met by the responsible person**
Generator	section 48 of the Act in respect of clause 39 of Schedule 1 to the Act	all requirements specified in section 7 and 8
Consumer	section 48 of the Act in respect of clauses 39 and 42 of Schedule 1 to the Act section 88 of the Act clause 47 of the Regulation	all requirements specified in section 7 and 9

This Notice of Exemption is a general exemption for the purposes of clause 51(3) of the Regulation.

Definitions

6. In this Notice of Exemption:

Bgl means below ground level, referring to soil at depth beneath the ground surface.
Characterisation means sampling and testing that must be conducted on the material for the range of chemicals and other attributes listed in Column 1 of Table 2.
Composite sample means a sample that combines 5 sub-samples of equal size into a single sample for the purpose of analysis.
Consumer means a person who applies, causes, or permits the application to land of excavated natural material within the definitions of "application to land" in accordance with the Act. The consumer may be the landholder responsible for the land to which excavated natural material is applied.
Discrete sample means a sample collected and analysed individually that will not be composited.
Excavated natural material is naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

a) been excavated from the ground, and
b) contains at least 98% (by weight) natural material, and
c) does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated natural material does not include material located in a hotspot; that has been processed; or that contains asbestos, Acid Sulfate Soils (ASS), Potential Acid Sulfate soils (PASS) or sulfidic ores.
Generator means a person who generates excavated natural material for supply to a consumer.
Hotspot means a cylindrical volume which extends through the soil profile from the ground surface to the proposed depth of excavation, where the level of any contaminant listed in Column 1 of Table 2 is greater than the absolute maximum concentration in Column 3 of Table 2.
***In situ* material** means material that exists on or below the ground level. It does not include stockpiled material.
***In situ* sampling** means sampling undertaken on *in situ* material.
Relevant waste means excavated natural material that meets the requirements of Section 7.
Stockpiled material means material that has been excavated from the ground and temporarily stored on the ground prior to use.

Systematic sampling means sampling at points that are selected at even intervals and are statistically unbiased.
Validation means ensuring that test results comply with the conditions of this exemption prior to material being supplied to a consumer.

General conditions

7. This Notice of Exemption is subject to the following conditions:

7.1. The chemical concentration or other attribute of the excavated natural material listed in Column 1 of Table 2 must not exceed any of the following:
  7.1.1. For characterisation tests, the maximum average (based on the arithmetic mean) concentration or value listed in Column 2 of Table 2, and
  7.1.2. The absolute maximum concentration or value listed in Column 3 of Table 2.
7.2. The excavated natural material can only be applied to land as engineering fill or used in earthworks.

Generator responsibilities

8. The following conditions must be met by the generator for this exemption to apply:

8.1. The generator must prepare a written sampling plan which includes information on sample preparation and storage. The plan must be kept for a period of three years;
8.2. The generator must undertake sampling and analysis of the material for Acid Sulfate Soil (ASS) and Potential Acid Sulfate Soil (PASS), in accordance with the *NSW Acid Sulfate Soil Manual*, Acid Sulfate Soils Management Advisory Council, 1998 and the updated *Laboratory Methods Guidelines version 2.1 – June 2004* where:
  8.2.1. the pH measured in the material is below 5, and/or
  8.2.2. the review of the applicable Acid Sulfate Soil Risk Maps (published by the former Department of Land and Water Conservation and available at http://www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm) indicates the potential presence of Acid Sulfate Soils (ASS).
8.3. For stockpiled material, the generator must:
  8.3.1. undertake sampling in accordance with Australian Standard 1141.3.1-1996 *Methods for sampling and testing aggregates* – Sampling – Aggregates (or equivalent);
  8.3.2. undertake characterisation according to the requirements listed in Columns 1 and 2 of Table 3 for the range of chemicals and other attributes listed in Column 1 of Table 2; and
  8.3.3. store the excavated natural material appropriately until the characterisation test results are validated (i.e. obtained and assessed as compliant with this exemption).
8.4. For *in situ* material, the generator must:
  8.4.1. undertake characterisation for the range of chemicals and other attributes listed in Column 1 of Table 2 according to the requirements listed in Columns 1, 2, and 3 of Table 4. When the ground surface is not comprised of soil (e.g. concrete slab), samples must be taken at the depth at which the soil commences.
  8.4.2. undertake sampling at depth according to Column 1 of Table 5.
  8.4.3. collect additional soil samples (and analyse them for the range of chemicals and other attributes listed in Column 1 of Table 2), at any

depth exhibiting discolouration, staining, odour or other indicators of contamination inconsistent with soil samples collected at the depth intervals indicated in Table 5.

8.4.4. segregate and exclude hotspots identified in accordance with Table 4, from material excavated for reuse under this exemption.

8.5. For both stockpiled and *in situ* material the generator must:

8.5.1. keep a written record of all characterisation test results, volume of excavated material, and detected hotspot material for a period of three years; and

8.5.2. provide a written statement of compliance to the consumer with each transaction, certifying that the excavated natural material complies with the relevant conditions of this exemption.

Consumer responsibilities

9. The following conditions must be met by the consumer for this exemption to apply:

9.1. The consumer must ensure that the excavated natural material is fit for purpose and poses minimal risk of harm to human health or the environment.

9.2. The consumer must keep records of the quantity of the excavated natural material received as well as the suppliers' name and address, for a period of three years.

9.3. The consumer must land apply the relevant waste within a reasonable period of time.

Chemical and other material property requirements

10. This Notice of Exemption only applies to excavated natural material where the chemical and other attributes listed in Column 1 of Table 2 comply with the chemical concentrations and other values listed in Column 2 and Column 3 of Table 2, when analysed according to test methods specified in Column 4 of Table 2.

Table 2

Column 1	**Column 2**	**Column 3**	**Column 4**
Chemicals and other attributes	**Maximum average concentration for characterisation** (mg/kg 'dry weight' unless otherwise specified)	**Absolute maximum concentration** (mg/kg 'dry weight' unless otherwise specified)	**Test method specified within Section**
1. Mercury	0.5	1	12.1
2. Cadmium	0.5	1	12.2
3. Lead	50	100	12.2
4. Arsenic	20	40	12.2
5. Chromium (total)	75	150	12.2
6. Copper	100	200	12.2
7. Nickel	30	60	12.2
8. Zinc	150	300	12.2
9. Electrical Conductivity	1.5 dS/m	3 dS/m	12.3
10. pH *	5 to 9	4.5 to 10	12.3
11. Total Polycyclic Aromatic Hydrocarbons	20	40	12.4

Column 1	Column 2	Column 3	Column 4
Chemicals and other attributes	**Maximum average concentration for characterisation** (mg/kg 'dry weight' unless otherwise specified)	**Absolute maximum concentration** (mg/kg 'dry weight' unless otherwise specified)	**Test method specified within Section**
(PAHs)			
12. Benzo(a)pyrene	0.5	1	12.4
13. Benzene	NA	0.5	12.5
14. Toluene	NA	65	12.5
15. Ethyl-benzene	NA	25	12.5
16. Xylene	NA	15	12.5
17. Total Petroleum Hydrocarbons C_{10}-C_{36}	250	500	12.6
18. Rubber, plastic, bitumen, paper, cloth, paint and wood	0.05%	0.10%	12.7

* The ranges given for pH are for the minimum and maximum acceptable pH values in the excavated natural material.

Sampling requirements

11. This Notice of Exemption only applies to excavated natural material sampled according to the requirements in Tables 3, 4 and 5.

11.1. Stockpiled excavated natural material must be sampled as per the requirements in Table 3.

11.1.1. Composite sampling must be undertaken for analysis of attributes 1 to 10 and 18 in Column 1 of Table 2. Discrete sampling must be undertaken for analysis of attributes 11 to 17 in Column 1 of Table 2.

11.1.2. Sampling must be undertaken in a manner that ensures all parts of the stockpile are equally accessible for representative sampling.

11.1.3. For stockpiles greater than 4,000 tonnes the number of samples described in Table 3 must be repeated.

Table 3

Sampling of Stockpiled Material		
Column 1	**Column 2**	**Column 3**
Quantity (tonnes)	**Number of samples**	**Validation**
<500	3	Required
500 – 1,000	4	
1,000 – 2,000	5	
2,000 – 3,000	7	
3,000 – 4,000	10	

11.2. *In situ* material must be sampled by collecting discrete samples as per the requirements of Tables 4 and 5.

11.2.1. Sites larger than 50,000 m^2 should be subdivided into smaller areas and sampled as per Table 4.

Table 4

***In Situ* Sampling at surface**				
Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**
Size of *in situ* area (m^2)	**Number of systematic sampling points recommended**	**Distance between two sampling points** (m)	**Diameter of the hot spot that can be detected with 95% confidence** (m)	**Validation**
500	5	10.0	11.8	Required
1000	6	12.9	15.2	
2000	7	16.9	19.9	
3000	9	18.2	21.5	
4000	11	19.1	22.5	
5000	13	19.6	23.1	
6000	15	20.0	23.6	
7000	17	20.3	23.9	
8000	19	20.5	24.2	
9000	20	21.2	25.0	
10,000	21	21.8	25.7	
15,000	25	25.0	28.9	
20,000	30	25.8	30.5	
25,000	35	26.7	31.5	
30,000	40	27.5	32.4	
35,000	45	27.9	32.9	
40,000	50	28.3	33.4	
45,000	52	29.3	34.6	
50,000	55	30.2	35.6	

Table 4 has been taken from NSW EPA 1995, *Contaminated Sites Sampling Design Guidelines*, NSW Environment Protection Authority.

Table 5

***In Situ* Sampling at Depth**	
Column 1	**Column 2**
Sampling Requirements *	**Validation**
1 soil sample at 1.0 m bgl from each surface sampling point followed by 1 soil sample for every metre thereafter. From 1.0 m bgl, sample at the next metre interval until the proposed depth of excavation of the material is reached. If the proposed depth of excavation is between 0.5 to 0.9 m after the last metre interval, sample at the base of the proposed depth of excavation.	Required if the depth of excavation is equal to or greater than 1.0 m bgl

* Refer to Notes for examples

Test method

12. All testing must be undertaken by analytical laboratories accredited by the National Association of Testing Authorities (NATA), or equivalent. All chemicals and other attributes listed in Column 1 of Table 2 must be measured in accordance with the test methods specified below:

12.1. Test methods for measuring the mercury concentration.
- 12.1.1. Particle size reduction & sample splitting may be required.
- 12.1.2. Analysis using USEPA SW-846 Method 7471B Mercury in solid or semisolid waste (manual cold vapour technique), or an equivalent analytical method with a detection limit < 20% of the stated absolute maximum concentration in Column 3 of Table 2 (i.e. 0.20 mg/kg dry weight).
- 12.1.3. Report as mg/kg dry weight.

12.2. Test methods for measuring chemicals 2 to 8 in Column 1 of Table 2.
- 12.2.1. Particle size reduction & sample splitting may be required.
- 12.2.2. Sample preparation by digesting using USEPA SW-846 Method 3051A Microwave assisted acid digestion of sediments, sludges, soils, and oils (or an equivalent analytical method).
- 12.2.3. Analysis using USEPA SW-846 Method 6010C Inductively coupled plasma - atomic emission spectrometry, or an equivalent analytical method with a detection limit < 10% of the stated absolute maximum concentration in Column 3 of Table 2, (e.g. 10 mg/kg dry weight for lead).
- 12.2.4. Report as mg/kg dry weight.

12.3. Test methods for measuring electrical conductivity and pH.
- 12.3.1. Sample preparation by mixing 1 part excavated natural material with 5 parts distilled water.
- 12.3.2. Analysis using Method 103 (pH) and 104 (Electrical Conductivity). *In* Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).
- 12.3.3. Report electrical conductivity in deciSiemens per metre (dS/m).

12.4. Test method for measuring Polynuclear Aromatic Hydrocarbons (PAHs) and benzo(a)pyrene.
- 12.4.1. Analysis using USEPA SW-846 Method 8100 Polynuclear Aromatic Hydrocarbons (or an equivalent analytical method).
- 12.4.2. Calculate the sum of all 16 PAHs for total PAHs.
- 12.4.3. Report total PAHs as mg/kg dry weight.
- 12.4.4. Report benzo(a)pyrene as mg/kg.

12.5. Test method for measuring benzene, toluene, ethylbenzene and xylenes (BTEX).
- 12.5.1. Method 501 (Volatile Alkanes and Monocyclic Aromatic Hydrocarbons). In Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).
- 12.5.2. Report BTEX as mg/kg.

12.6. Test method for measuring Total Petroleum Hydrocarbons (TPH).

12.6.1. Method 506 (Petroleum Hydrocarbons). In Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).

12.6.2. Report as mg/kg dry weight.

12.7. Test method for measuring rubber, plastic, bitumen, paper, cloth, paint and wood.

12.7.1. NSW Roads & Traffic Authority Test Method T276 Foreign Materials Content of Recycled Crushed Concrete (or an equivalent method).

12.7.2. Report as percent.

Exemption Granted

Christopher McElwain
Manager Waste and Resource Strategy
Environment Protection Authority
by delegation

Notes

The EPA may amend or revoke this exemption at any time. It is the responsibility of the generator and the consumer to ensure that they comply with all relevant requirements of the most current exemption. The current version of an exemption will be available on the EPA website: www.epa.nsw.gov.au.

In gazetting this general exemption, the EPA is exempting the relevant waste from the specific requirements of the Act and Regulations as stated in this exemption. The EPA is not in any way endorsing the use of this substance or guaranteeing that the substance will confer benefit.

The use of exempted material remains subject to other relevant environmental regulations within the Act and Regulations. For example, a person who pollutes land (s142A) or water (s120), or does not meet the special requirements for asbestos waste (clause 42), regardless of having an exemption, is guilty of an offence and subject to prosecution.

For the purposes of arrangements between a generator and a consumer, a 'transaction' is taken to mean the contractual agreement between the two parties which specifies the exchange of waste material from one party to another. A 'statement of compliance' must be in writing and be provided with each transaction.

The conditions set out in this exemption are designed to minimise the risk of potential harm to the environment, human health or agriculture, however, neither this exemption nor these conditions guarantee that the environment, human health or agriculture will not be harmed.

The consumer should assess whether or not the exempted material is fit for the purpose for which the material is proposed to be used and whether this use will cause harm. The consumer may need to seek expert engineering or technical advice.

This exemption does not apply to any material received at premises that are required to be licensed for waste disposal (application to land) activities under the provisions of the Act. This exemption does not remove the need for a site at which processing occurs to be licensed, if required under Schedule 1 of the Act.

This exemption does not alter the requirements of any other relevant legislation that must be met in utilising this material, including for example, the need to prepare a Material Safety Data Sheet (MSDS).

Regardless of any exemption provided by the EPA, the person who causes or permits the application of the substance to land must ensure that the action is lawful and consistent with the development consent requirements of the land.
All records required to be kept under this exemption must be made available to authorised officers of the EPA upon request.

Failure to comply with the conditions of this Notice of Exemption may constitute an offence under clause 51 of the Regulation and the responsible person will be required to comply with the normal regulatory provisions.

Examples

In situ sampling at depth

Example 1.
If the proposed depth of ENM excavation is between 1 m bgl and 1.4 m bgl, then:

- 1 sample on surface (as per the requirements of Table 4).
- 1 sample at 1 m bgl.
- No further depth sampling after 1 m bgl, unless required under section 8.4.3.

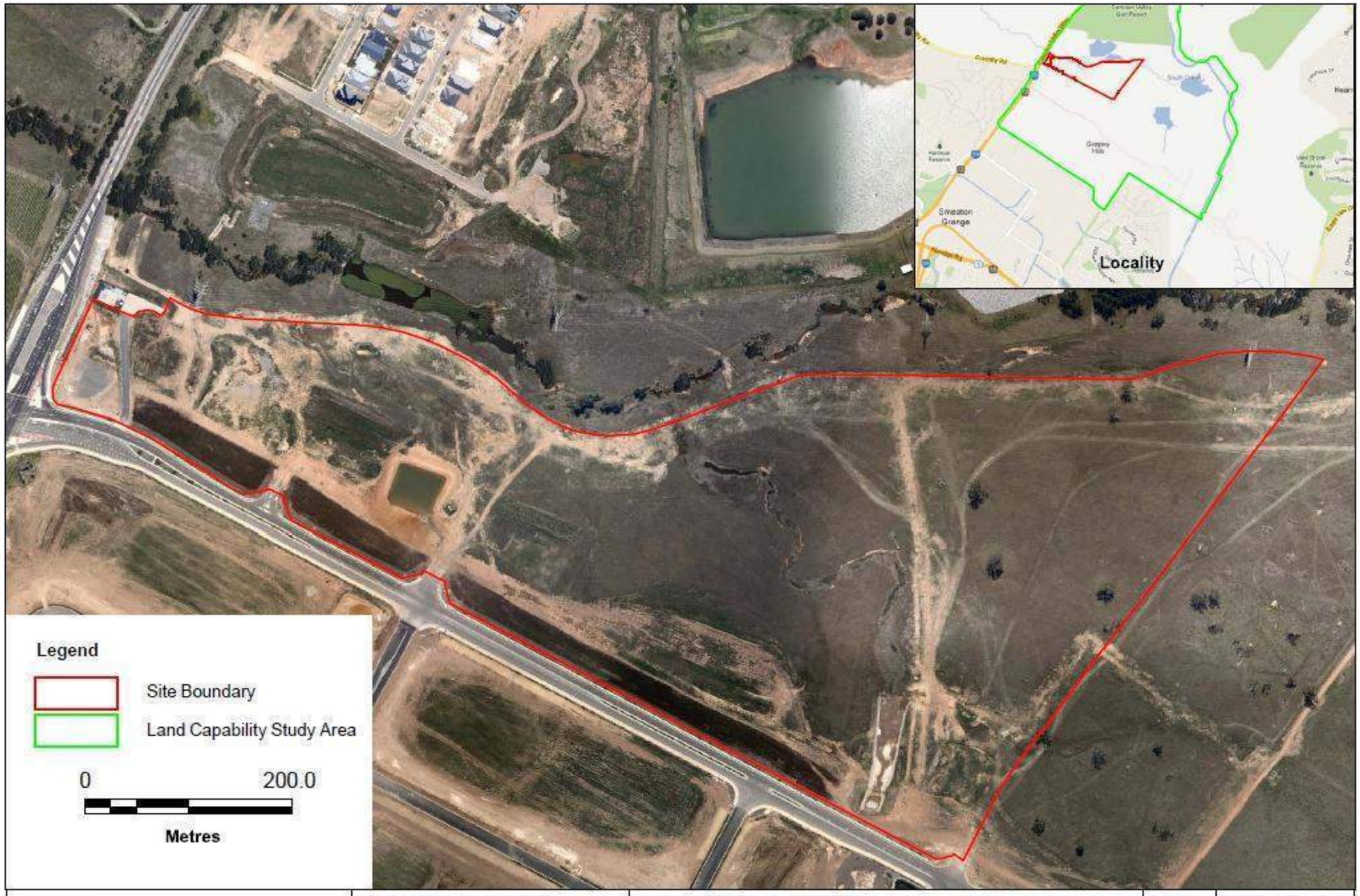
Example 2.
If the proposed depth of ENM excavation is at 1.75 m bgl, then:

- 1 sample on surface (as per the requirements of Table 4).
- 1 sample at 1 m bgl.
- 1 sample at 1.75 m bgl.
- No further depth sampling after 1.75 m bgl, unless required under section 8.4.3.

Example 3.
If the proposed depth of ENM excavation is at 2.25 m bgl, then:

- 1 sample on surface (as per the requirements of Table 4).
- 1 sample at 1 m bgl.
- 1 sample at 2 m bgl.
- No further depth sampling after 2 m bgl, unless required under section 8.4.3.

APPENDIX G – DRAWING 1



Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Gregory Hills Corporate Park		TITLE: Site Boundary, Site Locality Phase 2 Contamination Assessment Lot 701, Deposited Plan 1154772, Gregory Hills Drive, Gledswood Hills	PROJECT No: 76510.01
OFFICE: Campbelltown	DRAWN BY: BAH		DRAWING No: 1
SCALE: As shown	DATE: 09.01.2012	MGA	REVISION: A

Our Ref: GDRS0176.17
Contact: Deven Date

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08/09/14

Ryan Grdusiak (Lend Lease)
Northern Road Upgrade
Cnr Sherringham Road & The Northern Road
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NSW 2747

Dear Ryan

RE: ENM CLASSIFICATION OF EXCAVATED ROAD BASE MATERIAL FOR LEND LEASE, THE NORTHERN ROAD UPGRADE, JORDAN SPRINGS, NSW

1. Introduction

As requested by Mr. Ryan Grdusiak representing Lend Lease on the Northern Road upgrade, a classification of existing material within the excavated road base between chainage 390 and 1260 at the locations, shown in the attached test hole plans. The purpose of the assessment was to determine if the excavated road base could be classified as Excavated Natural Material (ENM) as per specification clause 21.12 'Excess Fill Material', for disposal off site at the nominated location.

2. Fieldwork Assessment & Sampling (ENM)

On the 22nd August 2014, a Geotechnical Engineer from Cardno Bowler visited the captioned site and carried out an assessment of the material within the excavated road base. The assessment consisted of a visual inspection of the soil for foreign inclusions (eg building materials or plastics) and sample collection.

From visual inspection and tactile assessment of the samples collected within the test hole locations, the material was observed to be brown, sandy/silty clays with foreign inclusions. It was deemed the material could be classified as ENM pending the laboratory analysis results of the test hole samples.

From laboratory analysis the following was found:

3. Results and Discussion

3.1 Salinity

After converting the EC values to ECe values for medium clays, results indicate that soil electrical conductivity ranged from 0.1 to 0.7 ECe (ds/cm). Corresponding salinity (for medium clays) ranged from non-saline (sample SPS1) through to moderately saline:

> Non-saline - samples S/18315-CH572-S2, S/18316-CH644, S/18318-CH794, S/18322-CH1085, S/18323-CH1172, S/18324-CH1243;

> Slightly-saline – samples S/18311-CH391, S/18312-CH431, S/18313-CH502, S/18317-CH723, S/18319-CH868, S/18320-CH936, S/18321-CH1010; and

> Moderately-saline – sample S/18314-CH572-S1.

3.1.1 Sodicity

Exchangeable Sodium Percentage (ESP) varied across the three samples analysed between 6.6 (S/18321-CH1010) and 19.9 % (S/18311-CH391), that is, sodic to highly sodic.

3.1.2 Waste Classification

The waste classification has been undertaken on the basis of results presented within laboratory report ES1418852, for soil samples described by the sample numbers:

> S/18311-CH391;

> S/18312-CH431;

> S/18313-CH502;

> S/18314-CH572-S1;

> S/18315-CH572-S2;

> S/18316-CH644;

> S/18317-CH723;

> S/18318-CH794;

> S/18319-CH868;

> S/18320-CH936;

> S/18321-CH1010;

> S/18322-CH1085;

> S/18323-CH1172; and

> S/18324-CH1243.

Currently the material is classified as **Hazardous Waste** in accordance with the NSW DECCW (EPA) Waste Classification Guidelines. Further leachate testing on the benzo(a)pyrene may potentially result in re-classification as Restricted Solid Waste. The material cannot be classified as ENM or VENM due to the elevated benzo(a)pyrene results. Moreover, fill materials, by definition cannot be classified as ENM or VENM.

Yours faithfully

Deven Date
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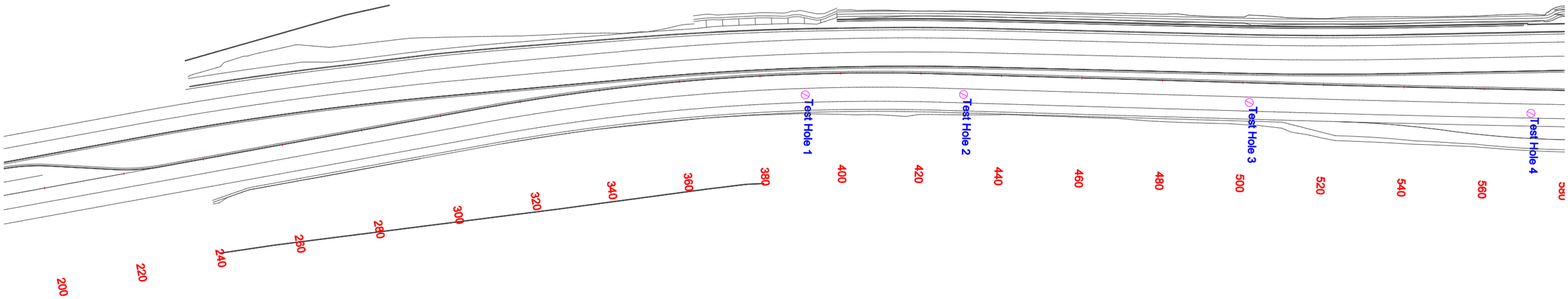

REV	ZONE	AMENDMENTS	APP'D	DATE

GENERAL NOTES / REFERENCES

Lend Lease
Engineering
Northern Rd Upgrade
Cnr Jordan Springs Blvd & Northern Rd
Jordan Springs, NSW, 2747 Ph 02 9499 0999

SURVEYED / DRAWN BY: SURVEY RE
COORDINATE SYSTEM: MGA Zone 56
HEIGHT DATUM: A.H.D
SCALE: 1:1000

PLOT DATE: Mon Aug 25 13:48:54 2014 LOCATION: NRU

Cardno Test Hole
SB Pavement Locations 22/08/2014

Lend Lease Engineering Title Block Edited by Dan Ripley 17/03/2014

Project: NRU

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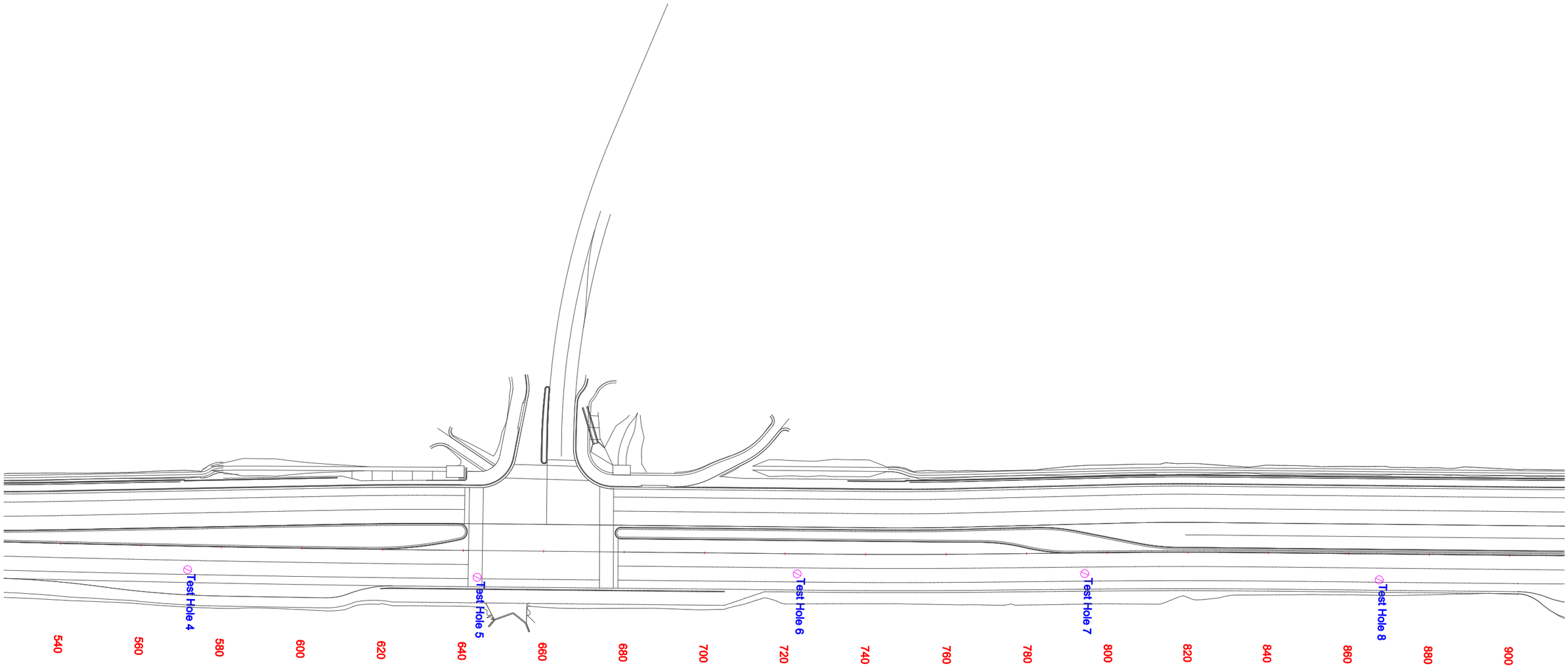

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SB Pavement Locations 22/08/2014

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Project: NRU

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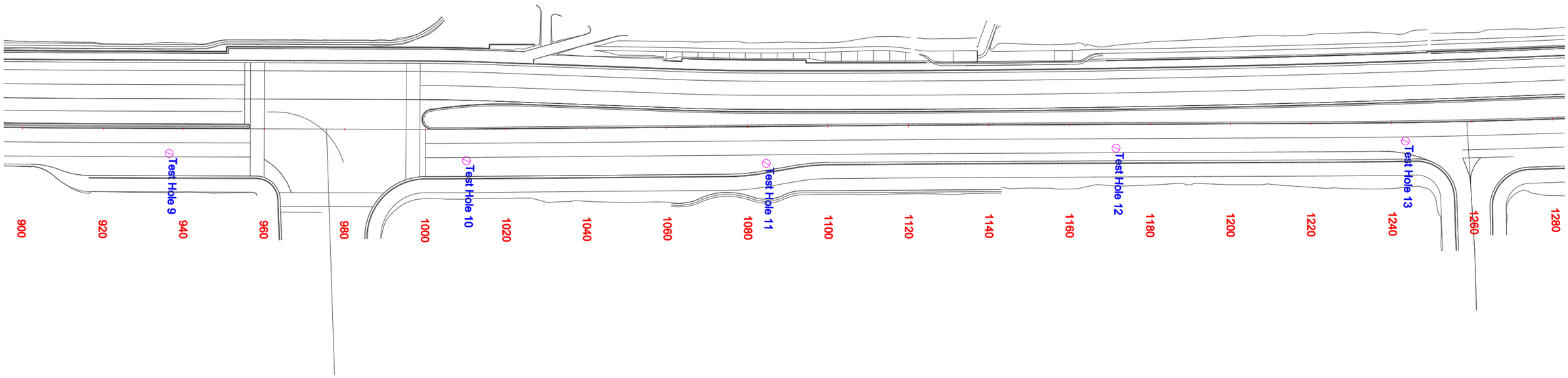

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Northern Rd Upgrade
Cnr Jordan Springs Blvd & Northern Rd
Jordan Springs, NSW, 2747 Ph 02 9499 0999

SURVEYED / DRAWN BY: SURVEY RE
COORDINATE SYSTEM: MGA Zone 56
HEIGHT DATUM: A.H.D
SCALE: 1:1000

PLOT DATE: Mon Aug 25 13:50:10 2014 LOCATION: NRU

Cardno Test Hole
SB Pavement Locations 22/08/2014

Land Lease Engineering Title Block Edited by Dan Ripley 17/03/2014

Project: NRU

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

WASTE CLASSIFICATION SUMMARY
SELECTED ANALYTES OF POTENTIAL CONCERN
THE NORTHERN ROAD UPGRADE

Results of waste classification:

On the basis of the analytical results received, and subject to the sampling following protocols specified in relevant regulatory guidance, soil subject to this classification may be classified as **Hazardous Waste** in the absence of further testing.

Sample ID	Lab Report #	Date Sample Obtained	Foreign Inclusions	pH	BTEX (mg/kg)				PAHs (mg/kg)		TPH	Metals (mg/kg)							
			%	(pH units)	Benzene	Toluene	Ethylbenzene	Total Xylenes	Benzo (a) pyrene	Total PAH	C10-36	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury
S/18311-CH391	ES1418852006	22/08/2014	<0.05	5.9	<0.2	<0.5	<0.5	<0.5	3.9	49.1	<50	<5	<0.4	5	<5	6	<2	<5	<0.1
S/18312-CH431	ES1418852006	22/08/2014	<0.05	6.1	<0.2	<0.5	<0.5	<0.5	2.3	25.5	<50	<5	<0.4	5	<5	<5	<2	<5	<0.1
S/18313-CH502	ES1418852006	22/08/2014	<0.05	5.8	<0.2	<0.5	<0.5	<0.5	4.5	50.7	160	<5	<0.4	16	<5	8	<2	<5	<0.1
S/18314-CH572-S1	ES1418852006	22/08/2014	<0.05	4.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<5	<0.4	14	14	19	<2	10	<0.1
S/18315-CH572-S2	ES1418852006	22/08/2014	<0.05	5.4	<0.2	<0.5	<0.5	<0.5	<0.5	1.2	<50	<5	<0.4	12	<5	6	<2	<5	<0.1
S/18316-CH644	ES1418852006	22/08/2014	<0.05	5.9	<0.2	<0.5	<0.5	<0.5	7.9	125	370	<5	<0.4	11	<5	9	<2	<5	<0.1
S/18317-CH723	ES1418852006	22/08/2014	<0.05	5.5	<0.2	<0.5	<0.5	<0.5	1	10.8	<50	7	<0.4	46	5	21	2	<5	<0.1
S/18318-CH794	ES1418852006	22/08/2014	<0.05	5.8	<0.2	<0.5	<0.5	<0.5	1.6	21.2	<50	<5	<0.4	4	<5	7	<2	<5	<0.1
S/18319-CH868	ES1418852006	22/08/2014	<0.05	5.7	<0.2	<0.5	<0.5	<0.5	20.1	291	820	<5	<0.4	7	<5	7	<2	<5	<0.1
S/18320-CH936	ES1418852006	22/08/2014	<0.05	5	<0.2	<0.5	<0.5	<0.5	1.6	23.9	<50	<5	<0.4	3	<5	8	<2	<5	<0.1
S/18321-CH1010	ES1418852006	22/08/2014	<0.05	5.8	<0.2	<0.5	<0.5	<0.5	0.7	10.7	<50	<5	<0.4	3	<5	14	<2	<5	<0.1
S/18322-CH1085	ES1418852006	22/08/2014	<0.05	5.9	<0.2	<0.5	<0.5	<0.5	6.1	68.9	360	<5	<0.4	6	<5	5	<2	<5	<0.1
S/18323-CH1172	ES1418852006	22/08/2014	<0.05	6	<0.2	<0.5	<0.5	<0.5	12.1	209	440	<5	<0.4	9	<5	8	<2	<5	<0.1
S/18324-CH1243	ES1418852006	22/08/2014	<0.05	6.1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<50	<5	<0.4	3	<5	<5	<2	<5	<0.1
Maximum Concentration	-	-	<0.05	6.1	<0.2	<0.5	<0.5	<0.5	20.1	291	820	7	<0.4	46	14	21	2	10	<0.1
Average Concentration	-	-	N/A	5.7	N/A	N/A	N/A	N/A	5.6	73.9	430	7	N/A	10.3	9.5	9.8	2	10	N/A

Virgin Excavated Natural Materials	0	-	0	0	0	0	0	0	0	< naturally occurring background concentrations								
Excavated Natural Materials (ENM): Maximum average concentration for characterisation / Absolute maximum concentration	0.05 / 0.1	5-9 / 4.5-10	N/A / 0.5	N/A / 65	N/A / 25	N/A / 15	0.5 / 1.0	20 / 40	250 / 500	20 / 40	0.5 / 1.0	75 / 150	100 / 200	50 / 100	30 / 60	150 / 300	0.5 / 1.0
Special Waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Contaminant Threshold values for waste not requiring a Leachate Test for 'General Solid Waste / CT 1' waste classification (mg/kg)	-	-	<10	<288	<600	<1,000	<0.8	200	10,000	<100	<20	<100	-	<100	<40	-	<4
Contaminant Threshold values for waste not requiring a Leachate Test for 'Restricted Solid Waste / CT 2' waste classification (mg/kg)	-	-	<40	<1,152	<2,400	<4,000	<3.2	800	40,000	<400	<80	<400	-	<400	<160	-	<16
Contaminant Threshold values for waste not requiring a Leachate Test for 'Hazardous Waste' waste classification (mg/kg)			>40	>1,152	>2,400	>4,000	>3.2	-	-	>400	>80	>400	-	>400	>160	-	>16

Notes:

Chromium results presented are those for total chromium. The ENM exemption limits are expressed as Total Chromium; the NSW Waste Classification Guidelines limits are for Chromium VI.

Regulatory Assessment Guidelines

Waste Classification Guidelines, Part 1: 'Classifying Waste'. NSW DECCW

EXCAVATED SOIL SALINITY, SODICITY AND AGGRESIVITY SUMMARY
THE NORTHERN ROAD UPGRADE

Sample ID	S/18311-CH391	S/18312-CH431	S/18313-CH502	S/18314-CH572-S1	S/18315-CH572-S2	S/18316-CH644	S/18317-CH723	S/18318-CH794	S/18319-CH868	S/18320-CH936	S/18321-CH1010	S/18322-CH1085	S/18323-CH1172	S/18324-CH1243
Analyte														
Soil pH	5.9	6.1	5.8	4.7	5.4	5.9	5.5	5.8	5.7	5	5.8	5.9	6	6.1
Electrical Conductivity (EC) in µS/cm	363	435	441	735	249	232	466	218	382	537	430	109	217	129
Electrical Conductivity of a Saturated Extract (ECE) in µS/cm	363	435	441	735	249	232	466	218	382	537	430	109	217	129
Electrical Conductivity of a Saturated Extract (ECE) in dS/cm	0.363	0.435	0.441	0.735	0.249	0.232	0.466	0.218	0.382	0.537	0.43	0.109	0.217	0.129
Electrical Conductivity of a Saturated Extract (ECE*) in dS/cm	2.5	3.0	3.1	5.1	1.7	1.6	3.3	1.5	2.7	3.8	3.0	0.8	1.5	0.9
Exchangeable Cations														
Exchangeable Calcium	0.1	0.7	1	0.6	0.4	0.4	0.3	0.2	0.4	0.5	0.3	0.5	0.2	1.1
Exchangeable Magnesium	1.9	1.7	1.8	5.2	0.8	2.3	2.2	1	3.2	3.8	2.2	1.9	1.3	1.9
Exchangeable Potassium	<0.1	<0.1	<0.1	0.2	<0.1	0.1	0.2	<0.1	0.1	0.2	0.1	<0.1	<0.1	0.1
Exchangeable Sodium	0.6	0.4	0.4	1.5	0.1	0.3	0.2	0.2	0.3	0.5	0.2	0.3	0.2	0.3
Exchangeable Aluminium	0.2	0.2	0.2	0.2	0.2	0.2	0.2	<0.1	0.3	0.3	0.2	0.3	0.2	0.3
Cation Exchange Capacity	2.6	2.9	3.3	7.4	1.4	3.1	2.9	1.4	4.1	4.9	2.7	2.7	1.8	3.5
Exchangeable Sodium Percent	19.9	13.7	12.6	19.4	7.3	9	6.9	16.8	7.8	9	6.6	8.9	11.6	9.2
Calcium/Magnesium Ratio	<0.1	0.4	0.6	0.1	0.5	0.2	0.1	0.2	0.1	0.1	0.1	0.3	0.2	0.6
Sulfate as SO4 2-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resistivity (ohm cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1418852**	Page	: 1 of 12
Client	: **CARDNO BOWLER - VINEYARD**	Laboratory	: Environmental Division Sydney
Contact	: DEVEN DATE	Contact	: Client Services
Address	: 7/68 INDUSTRY ROAD VINEYARD NSW 2765	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: deven.date@cardno.com.au	E-mail	: sydney@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: THE NORTHERN ROAD UPGRADE	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 1202		
C-O-C number	: ----	Date Samples Received	: 25-AUG-2014
Sampler	: TP/PF	Issue Date	: 04-SEP-2014
Site	: ----		
		No. of samples received	: 14
Quote number	: EN/024/14	No. of samples analysed	: 14

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Dian Dao		Sydney Inorganics
Hamish Murray	Supervisor - Soils	Newcastle - Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics

General Comments

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

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

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

Where the LOR of a reported result differs from standard LOR, this may be due to high 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

- **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.**
- **ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl (Method 15G1) is a more suitable method for the determination of exchange acidity (H+ + Al3+).**
- **EP075(SIM): Poor duplicate precision due to sample heterogeneity. Confirmed by re-extraction and re-analysis.**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S/18311-CH391	S/18312-CH431	S/18313-CH502	S/18314-CH572-S1	S/18315-CH572-S2
			Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418852-001	ES1418852-002	ES1418852-003	ES1418852-004	ES1418852-005
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.9	6.1	5.8	4.7	5.4
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	363	435	441	735	249
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	9.2	6.5	7.3	17.5	5.0
EA155: Foreign Material - Type III								
Rubber	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Plastic	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Bitumen	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Paint	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Paper	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Cloth	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Wood	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	0.1	0.7	1.0	0.6	0.4
Exchangeable Magnesium	----	0.1	meq/100g	1.9	1.7	1.8	5.2	0.8
Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	<0.1	0.2	<0.1
Exchangeable Sodium	----	0.1	meq/100g	0.6	0.4	0.4	1.5	0.1
Exchangeable Aluminium	----	0.1	meq/100g	0.2	0.2	0.2	0.2	0.2
Cation Exchange Capacity	----	0.1	meq/100g	2.6	2.9	3.3	7.4	1.4
Exchangeable Sodium Percent	----	0.1	%	19.9	13.7	12.6	19.4	7.3
Calcium/Magnesium Ratio	----	0.1	-	<0.1	0.4	0.6	0.1	0.5
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	0.4	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	7440-47-3	2	mg/kg	5	5	16	14	12
Copper	7440-50-8	5	mg/kg	<5	<5	<5	14	<5
Lead	7439-92-1	5	mg/kg	6	<5	8	19	6
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	10	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	S/18311-CH391	S/18312-CH431	S/18313-CH502	S/18314-CH572-S1	S/18315-CH572-S2
				Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00
					ES1418852-001	ES1418852-002	ES1418852-003	ES1418852-004	ES1418852-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		**0.5**	<0.5	**0.9**	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		**1.4**	**1.2**	**1.9**	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		**0.6**	**0.6**	**1.0**	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		**11.3**	**4.2**	**10.2**	<0.5	**0.6**
Pyrene	129-00-0	0.5	mg/kg		**12.1**	**5.2**	**10.0**	<0.5	**0.6**
Benz(a)anthracene	56-55-3	0.5	mg/kg		**3.8**	**1.9**	**3.5**	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		**4.1**	**1.9**	**3.5**	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		**5.1**	**3.2**	**6.0**	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		**2.1**	**1.4**	**2.1**	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		**3.9**	**2.3**	**4.5**	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		**2.1**	**1.6**	**3.0**	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		**2.1**	**2.0**	**4.1**	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		**49.1**	**25.5**	**50.7**	<0.5	**1.2**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		**5.3**	**3.1**	**6.0**	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	**160**	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	**160**	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		**110**	**100**	**220**	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**110**	**100**	**220**	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	S/18311-CH391	S/18312-CH431	S/18313-CH502	S/18314-CH572-S1	S/18315-CH572-S2
				Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00
					ES1418852-001	ES1418852-002	ES1418852-003	ES1418852-004	ES1418852-005
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Total Xylenes**	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**88.1**	**95.8**	**79.1**	**83.5**	**89.7**
2-Chlorophenol-D4	93951-73-6	0.1	%		**92.1**	**89.3**	**83.2**	**85.1**	**81.6**
2.4.6-Tribromophenol	118-79-6	0.1	%		**58.0**	**80.0**	**81.3**	**97.6**	**80.6**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**78.7**	**103**	**105**	**105**	**90.5**
Anthracene-d10	1719-06-8	0.1	%		**88.5**	**102**	**93.9**	**102**	**108**
4-Terphenyl-d14	1718-51-0	0.1	%		**91.8**	**93.7**	**87.9**	**101**	**106**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**102**	**110**	**108**	**102**	**108**
Toluene-D8	2037-26-5	0.1	%		**102**	**104**	**106**	**97.1**	**110**
4-Bromofluorobenzene	460-00-4	0.1	%		**99.3**	**99.0**	**99.4**	**93.9**	**103**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S/18316-CH644	S/18317-CH723	S/18318-CH794	S/18319-CH868	S/18320-CH936
			Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418852-006	ES1418852-007	ES1418852-008	ES1418852-009	ES1418852-010
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.9	5.5	5.8	5.7	5.0
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	232	466	218	382	537
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	7.1	5.7	5.0	7.6	10.0
EA155: Foreign Material - Type III								
Rubber	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Plastic	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Bitumen	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Paint	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Paper	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Cloth	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
Wood	----	0.05	%	<0.05	<0.05	<0.05	<0.05	<0.05
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	0.4	0.3	0.2	0.4	0.5
Exchangeable Magnesium	----	0.1	meq/100g	2.3	2.2	1.0	3.2	3.8
Exchangeable Potassium	----	0.1	meq/100g	0.1	0.2	<0.1	0.1	0.2
Exchangeable Sodium	----	0.1	meq/100g	0.3	0.2	0.2	0.3	0.5
Exchangeable Aluminium	----	0.1	meq/100g	0.2	0.2	<0.1	0.3	0.3
Cation Exchange Capacity	----	0.1	meq/100g	3.1	2.9	1.4	4.1	4.9
Exchangeable Sodium Percent	----	0.1	%	9.0	6.9	16.8	7.8	9.0
Calcium/Magnesium Ratio	----	0.1	-	0.2	0.1	0.2	0.1	0.1
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	7	<5	<5	<5
Cadmium	7440-43-9	0.4	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	7440-47-3	2	mg/kg	11	46	4	7	3
Copper	7440-50-8	5	mg/kg	<5	5	<5	<5	<5
Lead	7439-92-1	5	mg/kg	9	21	7	7	8
Nickel	7440-02-0	2	mg/kg	<2	2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S/18316-CH644	S/18317-CH723	S/18318-CH794	S/18319-CH868	S/18320-CH936
			Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00
Compound	CAS Number	LOR	Unit	ES1418852-006	ES1418852-007	ES1418852-008	ES1418852-009	ES1418852-010
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	**1.3**	<0.5	<0.5	**3.0**	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**7.1**	**0.9**	**0.6**	**35.2**	**0.8**
Anthracene	120-12-7	0.5	mg/kg	**2.4**	<0.5	<0.5	**7.6**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**33.0**	**2.6**	**5.0**	**57.1**	**6.8**
Pyrene	129-00-0	0.5	mg/kg	**30.5**	**2.7**	**5.1**	**67.0**	**6.2**
Benz(a)anthracene	56-55-3	0.5	mg/kg	**8.8**	**0.8**	**1.6**	**18.6**	**1.7**
Chrysene	218-01-9	0.5	mg/kg	**8.5**	**0.9**	**1.7**	**18.3**	**1.7**
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	**9.7**	**1.2**	**2.4**	**29.0**	**2.2**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	**3.8**	<0.5	**0.9**	**10.8**	**0.8**
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**7.9**	**1.0**	**1.6**	**20.1**	**1.6**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**4.6**	<0.5	**1.0**	**9.8**	**0.9**
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	**0.8**	<0.5	<0.5	**1.6**	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**6.2**	**0.7**	**1.3**	**12.6**	**1.2**
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	**125**	**10.8**	**21.2**	**291**	**23.9**
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	**11.5**	**1.2**	**2.2**	**28.8**	**2.2**
EP080/071: Total Petroleum Hydrocarbons								
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**240**	<100	<100	**550**	<100
C29 - C36 Fraction	----	100	mg/kg	**130**	<100	<100	**270**	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**370**	<50	<50	**820**	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
>C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	**320**	<100	<100	**710**	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	**150**	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	**320**	<50	<50	**860**	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S/18316-CH644	S/18317-CH723	S/18318-CH794	S/18319-CH868	S/18320-CH936
				Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00
Compound	CAS Number	LOR	Unit		ES1418852-006	ES1418852-007	ES1418852-008	ES1418852-009	ES1418852-010
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		89.8	83.9	91.0	85.9	92.8
2-Chlorophenol-D4	93951-73-6	0.1	%		88.1	87.7	87.2	80.8	85.6
2.4.6-Tribromophenol	118-79-6	0.1	%		106	84.1	77.4	90.3	64.8
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		88.4	92.2	88.4	73.2	86.1
Anthracene-d10	1719-06-8	0.1	%		99.5	98.0	97.6	91.0	98.3
4-Terphenyl-d14	1718-51-0	0.1	%		89.9	105	87.0	85.2	90.8
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		121	105	108	110	73.5
Toluene-D8	2037-26-5	0.1	%		130	99.8	108	104	106
4-Bromofluorobenzene	460-00-4	0.1	%		123	95.0	101	95.0	98.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S/18321-CH1010	S/18322-CH1085	S/18323-CH1172	S/18324-CH1243	----
			Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	----
Compound	CAS Number	LOR	Unit	ES1418852-011	ES1418852-012	ES1418852-013	ES1418852-014	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.8	5.9	6.0	6.1	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	430	109	217	129	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1.0	%	6.1	7.6	5.3	8.8	----
EA155: Foreign Material - Type III								
Rubber	----	0.05	%	<0.05	<0.05	<0.05	<0.05	----
Plastic	----	0.05	%	<0.05	<0.05	<0.05	<0.05	----
Bitumen	----	0.05	%	<0.05	<0.05	<0.05	<0.05	----
Paint	----	0.05	%	<0.05	<0.05	<0.05	<0.05	----
Paper	----	0.05	%	<0.05	<0.05	<0.05	<0.05	----
Cloth	----	0.05	%	<0.05	<0.05	<0.05	<0.05	----
Wood	----	0.05	%	<0.05	<0.05	<0.05	<0.05	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	0.3	0.5	0.2	1.1	----
Exchangeable Magnesium	----	0.1	meq/100g	2.2	1.9	1.3	1.9	----
Exchangeable Potassium	----	0.1	meq/100g	0.1	<0.1	<0.1	0.1	----
Exchangeable Sodium	----	0.1	meq/100g	0.2	0.3	0.2	0.3	----
Exchangeable Aluminium	----	0.1	meq/100g	0.2	0.3	0.2	0.3	----
Cation Exchange Capacity	----	0.1	meq/100g	2.7	2.7	1.8	3.5	----
Exchangeable Sodium Percent	----	0.1	%	6.6	8.9	11.6	9.2	----
Calcium/Magnesium Ratio	----	0.1	-	0.1	0.3	0.2	0.6	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	----
Cadmium	7440-43-9	0.4	mg/kg	<0.4	<0.4	<0.4	<0.4	----
Chromium	7440-47-3	2	mg/kg	3	6	9	3	----
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	----
Lead	7439-92-1	5	mg/kg	14	5	8	<5	----
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	----
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	<5	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S/18321-CH1010	S/18322-CH1085	S/18323-CH1172	S/18324-CH1243	----
				Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1418852-011	ES1418852-012	ES1418852-013	ES1418852-014	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	1.2	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	1.2	2.2	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	1.2	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	2.6	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		1.3	3.9	34.0	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	1.7	6.9	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		2.7	12.5	46.4	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		2.6	12.8	43.7	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		0.8	4.1	12.0	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		0.9	4.3	11.1	<0.5	----
Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg		1.1	8.9	15.3	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	3.1	5.4	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		0.7	6.1	12.1	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	4.2	6.2	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	0.8	1.1	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		0.6	5.3	7.9	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		10.7	68.9	209	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		0.9	9.0	17.3	<0.5	----
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	230	310	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	130	130	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	360	440	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
>C10 - C16 Fraction	>C10_C16	50	mg/kg		<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	320	380	<100	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	320	380	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S/18321-CH1010	S/18322-CH1085	S/18323-CH1172	S/18324-CH1243	----
				Client sampling date / time	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	22-AUG-2014 15:00	----
Compound	CAS Number	LOR	Unit		ES1418852-011	ES1418852-012	ES1418852-013	ES1418852-014	----
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ **Total Xylenes**	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		**84.8**	**87.9**	**84.4**	**82.0**	----
2-Chlorophenol-D4	93951-73-6	0.1	%		**80.1**	**87.0**	**84.8**	**82.4**	----
2.4.6-Tribromophenol	118-79-6	0.1	%		**64.4**	**68.0**	**71.0**	**61.6**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**81.2**	**83.5**	**84.2**	**83.6**	----
Anthracene-d10	1719-06-8	0.1	%		**91.6**	**92.9**	**94.2**	**95.3**	----
4-Terphenyl-d14	1718-51-0	0.1	%		**85.4**	**83.6**	**85.7**	**80.7**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**109**	**76.8**	**117**	**123**	----
Toluene-D8	2037-26-5	0.1	%		**103**	**112**	**107**	**110**	----
4-Bromofluorobenzene	460-00-4	0.1	%		**96.8**	**104**	**100**	**107**	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
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	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0