Fill Management Protocol

585 Mamre Road, Orchard Hills NSW

Prepared for: ALTIS Property Partners

HNY-01-10273 / FMP1
v1. final
23rd March 2016

ADE CONSULTING GROUP
SOLUTIONS THROUGH INNOVATION

Prepared for:

ALTIS Property Partners

Fill Management Protocol

585 Mamre Road, Orchard Hills NSW

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1. INTRODUCTION 4
1.1. Objectives 4
1.2. Scope 4
1.3. Legislation 4
1.4. Previous Reports 5
2. IMPORTED MATERIAL REQUIREMENTS 6
2.1. Virgin Excavated Natural Material (VENM) 6
2.2. Excavated Natural Material (ENM) 7
2.3. Exempt Material 7
3. GEOTECHNICAL AND SALINITY REQUIREMENTS 8
3.1. Relevant Guidelines 8
3.2. Geotechnical Material Acceptance Criteria 8
3.3. Salinity Acceptance Criteria 8
4. PREAPPROVAL/ASSESSMENT 10
4.1. Assessment/Approval of Source Site 10
5.1. Gate Records and Check Sampling 11
6. NON-COMPLIANCE 12
7. FINAL VALIDATION OF IMPORTED FILL 13
8. LIMITATIONS 14
APPENDIX A – MATERIAL IMPORT CHECKLIST 15
APPENDIX B – THRESHOLD VALUES 16
Table B1 – Threshold Contaminant Values For Commercial / Industrial Landuse. Applys Screening Values to All Imported Materials (Including VENM and ENM) 17
Table B2 – Threshold Contaminant Values For ENM# 18
Table B3 – Reference Contaminant Values For Virgin Excavated Natural Material (VENM) Apply to Imported Natural Materials 19
Table B4 – Salinity Site Acceptance Criteria 20
Table B5 – Site assessment Criteria for Mildly Aggressive/B1 Type Soils 20
APPENDIX C – SAMPLING DENSITIES 21
TABLE C1 – Sampling and Analytical Requirements for ENM and VENM [4] 22
TABLE C2 – Sampling Requirements for CBR and Plasticity Index Tests 23
APPENDIX D – MATERIALS GIVEN RISE TO LOAD REJECTION 24
APPENDIX E – SITE RECEIVERSHIP CHECKLIST 26
APPENDIX F – EXCAVATED NATURAL MATERIAL ORDER 2014 27

1. INTRODUCTION

A.D. Envirotech Australia Pty Ltd (ADE) was engaged by ALTIS Property Partners (ALTIS) to develop a Fill Management Protocol (FMP) document for the control of imported fill into the site at 585 Mamre Road, Orchard Hills (the site).

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 approximately 400,000 m^3 of fill material from outside sources.

1.1. Objectives

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.

A further objective of this document is to prevent unsuitable materials being brought into the site.

1.2. Scope

It is understood that the Site proposes to import approximately 400,000 m^3 of material classified as virgin excavated natural material (VENM) or materials classified under either a general or specific resource recovery order (for example the Excavated Natural Material Order).

ADE considers that it is the responsibility of the client 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. Hansen Yuncken has the right to make the final decision on the suitability or otherwise of any material for importation onto the Site.

1.3. Legislation

The importation of materials to the Site is regulated by the Protection of the Environment Operations Act 1997. The following regulatory instruments applying to imported materials were considered in preparation of this FMP:

- DECCW Waste Classification Guidelines (DECCW 2014).
- Protection of the Environment Operations (Waste) Regulation 2014.
- National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 1999, amended 2013 (NEPC 2013).
- NSW EPA Contaminated Sites Guidelines for the NSW Site Auditor Scheme, 2nd Edition (DEC 2006).
- NSW EPA Sampling Design Guidelines – Contaminated Sites (EPA 1995).

1.4. Previous Reports

In the development of this FMP, ADE has been provided the following documents by the client:

- Pells Sullivan Meynink (PSM) Report PSM2619-007L, '585 Mamre Road, Orchard Hills, Additional Geotechnical Investigation and Salinity and Aggressivity Assessment', dated the 27th November 2015 (PSM 2015a);
- PSM Report PSM2619-008S, '585 Mamre Road, Orchard Hills, Proposed Warehouse and Logistics Hub, Bulk Earthwork Specification, Filling, Cutting and Testing, dated November 2015 (PSM 2015b);
- PSM Report PSM2619-009L, 'Proposed Warehouse and Logistics Hub, 585 Mamre Road, Orchard Hills, Interim Geotechnical Design Advice, dated the 27th November 2015 (PSM 2015c);
- PSM Report PSM2619-010L, 'Proposed Warehouse and Logistics Hub, 585 Mamre Road, Orchard Hills, Salinity Management Plan, dated the 27th November 2015 (PSM 2015d);
- PSM Report PSM2619-009L, 'Proposed Warehouse and Logistics Hub, 585 Mamre Road, Orchard Hills, Secretary's Environmental Assessment Requirements (SEARS) – Point 2, dated the 27th November 2015 (PSM 2015e)

2. IMPORTED MATERIAL REQUIREMENTS

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 ALTIS and the Environmental Consultant prior to acceptance of the material. All source sites must be inspected by the Environmental Consultant to ensure the material proposed for import matches the appropriate reports.

All imported soil/rock material must be verified to be VIRGIN EXCAVATED NATURAL MATERIAL (VENM) (imported natural materials), EXCAVATED NATURAL MATERIAL (ENM) (as defined under NSW EPA) Excavated Natural Material Order 2014, or materials classified under a specific exemption granted by the EPA. All source sites are subject to approval by ALTIS on a case by case basis.

2.1. Virgin Excavated Natural Material (VENM)

The Protection of the Environment Operations Act 1997 defines VENM as:

> 'Natural material (such as clay, gravel, sand, soil or rock fines):
>
> - That has been excavated or quarried from areas that are not contaminated with manufactured chemicals or process residues, as a result of industrial, commercial, mining or agricultural activities, and
> - That does not contain any sulfidic ores or soils or any other waste.'

Material imported to the Fill Site as VENM must meet this definition. Further, an assessment of the VENM materials is to be undertaken, outlining the history of the source site, with sampling and a report from a suitably qualified environmental consultant outlining (at minimum) the following:

- Details of the source site – Address, area, history, etc.
- A review of acid sulphate soils maps and, if necessary, detailed investigation with sample analysis for acid sulphate soils or potential acid sulphate soils.
- Representative samples of the VENM material are to be collected as per the sampling densities outlines in Appendix C - Table C1.
- Samples are to be analysed for contaminants of potential concern, as per Appendix C - Table C1. Please note that the list provided is not exhaustive, and further analysis may be required depending on the site history.
- All organic analytes are to be below the laboratory detection limits, and results for metals are to be within the published background ranges (refer to Appendix B – Table B3).
- pH and EC results are to be within the criteria as set out in the Excavated Natural Material Order 2014 (refer to Appendix B – Table B2).
- All reports are to be accompanied by laboratory reports from a NATA accredited laboratory, including chain of custody documentation and laboratory QA/QC.

2.2. Excavated Natural Material (ENM)

All ENM material imported into the site is to be assessed against the NSW EPA Excavated Natural Material Order 2014, provided in Appendix F of this document. As per the Order, ENM is defined as:

> "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."

All ENM material must be verified in accordance with the sampling methodology and density specified in the ENM Order. Sampling 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 B2, Appendix B.

2.3. Exempt Material

Other material may be accepted if they are shown to meet the requirements of a Resource Recovery Exemption granted by the NSW EPA. Such cases will be reviewed on a case by case basis.

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.

2.4. Non-Conformances

In the event that materials do not meet the requirements detailed above, materials will not be approved for importation to the fill site at the discretion of the Environmental Consultant.

3. GEOTECHNICAL AND SALINITY REQUIREMENTS

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);

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

As per PSM 2015d, 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;
- 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 site assessment criteria);
- Materials should have an exposure classification of mild or better as per AS2519:2009, Piling Design and Installation, Table 6.4.2 based on chlorides and pH (Refer to Table B5, Appendix B for exposure classification site assessment criteria)
- Materials should have an exposure classification of B1 as per table AS3600-2009 'Concrete Structures', Table 4.8.2 based on the EC_e (Refer to Table B5, Appendix B for exposure classification site assessment criteria); 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 (PSM 2015a and PSM 2015d) 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 ALTIS and the environmental consultant.

4. PREAPPROVAL/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.

4.1. Assessment/Approval of Source Site

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

Hansen Yuncken site personnel (as a reporesentative of ALTIS) responsible for accepting/rejecting materials entering the site will have completed copies of the "Material Import Checklist" 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.

A summary of the Documentation/actions required to verify the quality / status of any material before importation onto the Site is as follows:

1. 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);
2. Site inspection by an ADE Environmental Consultant to verify the material described within the reports is representative of material onsite;
3. Review of the supplied documents and completion of the "Material Import Checklist" (Appendix A) by ALTIS or their representative assessing the adequacy of the documents provided in step 2.

All documentation should be supplied to ALTIS or their representative for approval. All records will be kept by ALTIS for future reference.

5. FILL SITE REQUIREMENTS

5.1. 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.

ALTIS or its representatives 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). Completion of the "Site Receivership Checklist" (Appendix E) must be completed by ALTIS or its representative for each source site per week.

As an additional level of control it is required 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 ALTIS 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. 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 the consenting authority as required detailing both accepted and rejected sites. The final validation report will also be submitted to the consenting authority (Department of Planning and Environment) 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.

APPENDIX A – MATERIAL IMPORT CHECKLIST

Material Import Checklist

Material Import Checklist (MIC) No.:_____

Source Site:_____ Volume Tested: _____

Address:_____

VENM/ENM/ENM Exempt Report No.:_____ Geotech Report No.:_____

VENM ASSESSMENT

Does the material meet the definition of VENM as per the POEO Act 1997?_____

Are Details of the source site history and characteristics of the materis provided?_____

Material Description (eg Brown heavy CLAY with Gravel):_____

Are samples analysed for contamination adequately (including meeting the minimum sampling density)?

YES / NO

Are samples analysed for Salinity adequately (including meeting the minimum sampling density)?

YES / NO

ENM ASSESSMENT

Does the material meet the minimum requirements to be classified as ENM as per the ENM Exemption Order 2014? YES / NO

Are Details of the source site history and characteristics of the materis provided? YES / NO

Material Description (eg Brown heavy CLAY with Gravel):_____

Are samples analysed for Salinity adequately (including meeting the minimum sampling density)? YES / NO

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GEOTECHNICAL REQUIREMENTS

Has the material been assessed for CBR and Plasticity Index as per the correct frequencies? YES / NO

Is maximum particle size of material <150 mm?

Has the material undergone an inspection prior to import by the environmental Consultant

Additional Comments:

CONCLUSION

APPROVED / REJECTED

Audited By: Company: Date:

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 Site Acceptance Criteria

Site Assessment Criteria	(Electrical conductivity (ECe))
Non Saline to Moderately Saline	<2 dS/m – 8 dS/m

Please note: Soils considered to be highly saline (8-16 dS/m) may be considered acceptable as per the conditions in Section 3.3.

Table B5 – Site assessment Criteria for Mildly Aggressive/B1 Type Soils

Soil Type	Soil Use	Chlorides	Sulphates	pH
high permeability	above the water table	≤0.5%	≤0.5%	≥4.5
high permeability*	below the water table	NA	NA	NA
low permeability	above the water table	≤2%	≤0.5%	≥4.5
low permeability	below the water table	≤2%	≤0.5%	≥4.5

Source: AS 2159 2009

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

Table B5 – Geotechnical Site Assessment Criteria

Geotechnical Test	Site Assessment Criteria
CBR (4 day soak)	>5
Liquid Limit	<50

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	1000 – 10 000	1 per 1000 m^3 (Minimum of 3 samples)	Heavy metals (M8) PAH TPH BTEX Phenols (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
	10 000 – 20 000	10 samples minimum		
	>20,000	1 per 2,000 m^3 (Minimum of 10 samples)		
ENM	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 Plasticity Index Tests

Material	Quantity (m^3)	Minimum Sampling Frequency
VENM/ENM/ENM Exempt	<5000	1 Per 2500 m^3 1 per 250 m for alignments
	>5000	1 Per 5000 m^3 1 per 500 m for alignments

TABLE C3 – Sampling and Analytical Requirements for Salinity

Filling/ Natural	Material Quantity [4] (m^3)	Minimum Sample number/ Frequency	Minimum analyte suite to include[1,2]
VENM / ENM / ENM Exempt	1000 - 10000	1 per 1000 m^3 (Minimum of 3 samples)	pH EC Textures Sulphates Chlorides
	10 000 – 20 000	10 samples	
	>20,000	1 per 2,000 m^3 (Minimum of 10 samples)	

* 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
ENM / ENM Exemption	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), Plasticity Index
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), Plasticity Index

* 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 – SITE RECEIVERSHIP CHECKLIST

Site Receivership Checklist

Corresponding Material Import Checklist (MIC) Number:

Source Site:_____ Volume Tested: _____

Address:_____

VENM/ENM/ENM Exempt Report No.:_____ Geotechnical Report No.:_____

Does the material appear consistent with that described in the corresponding MIC: YES / NO

Does the material contain any foreign materials? YES / NO

Does the material visually meet the geotechnical requirements? YES / NO

If yes to all of the above, the material is approved for import. If No was answered to any of the above, the material should be stockpiled and delineated until the Environmental Consultant is notified and an inspection undertaken.

Material Approved By: Company: Date

APPENDIX F – EXCAVATED NATURAL MATERIAL ORDER 2014

Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014

The excavated natural material order 2014

Introduction

This order, issued by the Environment Protection Authority (EPA) under clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation), imposes the requirements that must be met by suppliers of excavated natural material to which 'the excavated natural material exemption 2014' applies. The requirements in this order apply in relation to the supply of excavated natural material for application to land as engineering fill or for use in earthworks.

1. Waste to which this order applies

1.1. This order applies to excavated natural material. In this order, excavated natural material means 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.

2. Persons to whom this order applies

2.1. The requirements in this order apply, as relevant, to any person who supplies excavated natural material, that has been generated, processed or recovered by the person.

2.2. This order does not apply to the supply of excavated natural material to a consumer for land application at a premises for which the consumer holds a licence under the POEO Act that authorises the carrying out of the scheduled activities on the premises under clause 39 'waste disposal (application to land)' or clause 40 'waste disposal (thermal treatment)' of Schedule 1 of the POEO Act.

3. Duration

3.1. This order commences on 24 November 2014 and is valid until revoked by the EPA by notice published in the Government Gazette.

4. Generator requirements

The EPA imposes the following requirements on any generator who supplies excavated natural material.

Sampling requirements

4.1. On or before supplying excavated natural material, the generator must:

4.1.1. Prepare a written sampling plan which includes a description of sample preparation and storage procedures for the excavated natural material.

4.1.2. Undertake sampling and testing of the excavated natural material as required under clauses 4.2, 4.3, and 4.4 below. The sampling must be carried out in accordance with the written sampling plan.

4.2. The generator must undertake sampling and analysis of the material for ASS and 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:

4.2.1. the pH measured in the material is below 5, and/or

4.2.2. 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 ASS.

4.3. For stockpiled material, the generator must:

4.3.1. undertake sampling in accordance with Australian Standard 1141.3.1-2012 Methods for sampling and testing aggregates – Sampling – Aggregates (or equivalent);

4.3.2. undertake characterisation sampling by collecting the number of samples listed in Column 2 of Table 1 with respect to the quantity of the waste listed in Column 1 of Table 1 and testing each sample for the chemicals and other attributes listed in Column 1 of Table 4. For the purposes of characterisation sampling the generator must collect:

4.3.2.1. composite samples for attributes 1 to 10 and 18 in Column 1 of Table 4.

4.3.2.2. discrete samples for attributes 11 to 17 in Column 1 of Table 4.

4.3.2.3. The generator must carry out sampling in a way that ensures that the samples taken are representative of the material from the entire stockpile. All parts of the stockpile must be equally accessible for sampling.

4.3.2.4. for stockpiles greater than 4,000 tonnes the number of samples described in Table 1 must be repeated.

4.3.3. store the excavated natural material appropriately until the characterisation test results are validated as compliant with the maximum average concentration or other value listed in Column 2 of Table 4 and the absolute maximum concentration or other value listed in Column 3 of Table 4.

Table 1

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	

4.4. For in situ material, the generator must:

4.4.1. undertake sampling by collecting discrete samples. Compositing of samples is not permitted for in-situ materials.

4.4.2. undertake characterisation sampling for the range of chemicals and other attributes listed in Column 1 of Table 4 according to the requirements listed in Columns 1, 2 and 3 of Table 2. 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.

4.4.3. undertake sampling at depth according to Column 1 of Table 3.

4.4.4. collect additional soil samples (and analyse them for the range of chemicals and other attributes listed in Column 1 of Table 4), at any depth exhibiting discolouration, staining, odour or other indicators of contamination inconsistent with soil samples collected at the depth intervals indicated in Table 3.

4.4.5. segregate and exclude hotspots identified in accordance with Table 2, from material excavated for reuse.

4.4.6. subdivide sites larger than 50,000 m² into smaller areas and sample each area as per Table 2.

4.4.7. store the excavated natural material appropriately until the characterisation test results are validated as compliant with the maximum average concentration or other value listed in Column 2 of Table 4 and the absolute maximum concentration or other value listed in Column 3 of Table 4.

Table 2

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

Table 3

***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

Chemical and other material requirements

4.5. The generator must not supply excavated natural material waste to any person if, in relation to any of the chemical and other attributes of the excavated natural material:

4.5.1. The chemical concentration or other attribute of any sample collected and tested as part of the characterisation of the excavated natural material exceeds the absolute maximum concentration or other value listed in Column 3 of Table 4:

4.5.2. The average concentration or other value of that attribute from the characterisation of the excavated natural material (based on the arithmetic mean) exceeds the maximum average concentration or other value listed in Column 2 of Table 4.

4.6. The absolute maximum concentration or other value of that attribute in any excavated natural material supplied under this order must not exceed the absolute maximum concentration or other value listed in Column 3 of Table 4.

Table 4

Column 1	Column 2	Column 3
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)
1. Mercury	0.5	1
2. Cadmium	0.5	1
3. Lead	50	100
4. Arsenic	20	40
5. Chromium (total)	75	150
6. Copper	100	200
7. Nickel	30	60
8. Zinc	150	300
9. Electrical Conductivity	1.5 dS/m	3 dS/m
10. pH *	5 to 9	4.5 to 10
11. Total Polycyclic Aromatic Hydrocarbons (PAHs)	20	40
12. Benzo(a)pyrene	0.5	1
13. Benzene	NA	0.5
14. Toluene	NA	65
15. Ethyl-benzene	NA	25
16. Xylene	NA	15
17. Total Petroleum Hydrocarbons C_{10}-C_{36}	250	500
18. Rubber, plastic, bitumen, paper, cloth, paint and wood	0.05%	0.10%

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

Test methods

4.7. The generator must ensure that any testing of samples required by this order is undertaken by analytical laboratories accredited by the National Association of Testing Authorities (NATA), or equivalent.

4.8. The generator must ensure that the chemicals and other attributes (listed in Column 1 of Table 4) in the excavated natural material it supplies are tested in accordance with the test methods specified below or other equivalent analytical methods. Where an equivalent analytical method is used the detection limit must be equal to or less than that nominated for the given method below.

4.8.1. Test methods for measuring the mercury concentration.

4.8.1.1. 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).

4.8.1.2. Report as mg/kg dry weight.

4.8.2. Test methods for measuring chemicals 2 to 8.

4.8.2.1. 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).

4.8.2.2. 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).

4.8.2.3. Report as mg/kg dry weight.

4.8.3. Test methods for measuring electrical conductivity and pH.

4.8.3.1. Sample preparation by mixing 1 part excavated natural material with 5 parts distilled water.

4.8.3.2. 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).

4.8.3.3. Report electrical conductivity in deciSiemens per metre (dS/m).

4.8.4. Test method for measuring Polynuclear Aromatic Hydrocarbons (PAHs) and benzo(a)pyrene.

4.8.4.1. Analysis using USEPA SW-846 Method 8100 Polynuclear Aromatic Hydrocarbons (or an equivalent analytical method).

4.8.4.2. Calculate the sum of all 16 PAHs for total PAHs.

4.8.4.3. Report total PAHs as mg/kg dry weight.

4.8.4.4. Report benzo(a)pyrene as mg/kg.

4.8.5. Test method for measuring benzene, toluene, ethylbenzene and xylenes (BTEX).

4.8.5.1. 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).

4.8.5.2. Report BTEX as mg/kg.

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

4.8.6.1. 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).

4.8.6.2. Report as mg/kg dry weight.

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

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

4.8.7.2. Report as percent.

Notification

4.9. On or before each transaction, the generator must provide the following to each person to whom the generator supplies the excavated natural material:

- a written statement of compliance certifying that all the requirements set out in this order have been met;
- a copy of the excavated natural material exemption, or a link to the EPA website where the excavated natural material exemption can be found; and
- a copy of the excavated natural material order, or a link to the EPA website where the excavated natural material order can be found.

Record keeping and reporting

4.10. The generator must keep a written record of the following for a period of six years:

- the sampling plan required to be prepared under clause 4.1.1;
- all characterisation sampling results in relation to the excavated natural material supplied;
- the volume of detected hotspot material and the location;
- the quantity of the excavated natural material supplied; and
- the name and address of each person to whom the generator supplied the excavated natural material.

4.11. The generator must provide, on request, the characterisation and sampling results for that excavated natural material supplied to the consumer of the excavated natural material.

5. Definitions

In this order:

application or apply to land means applying to land by:

- spraying, spreading or depositing on the land; or
- ploughing, injecting or mixing into the land; or
- filling, raising, reclaiming or contouring the land.

Bgl means below ground level, referring to soil at depth beneath the ground surface.

composite sample means a sample that combines five discrete sub-samples of equal size into a single sample for the purpose of analysis.

consumer means a person who applies, or intends to apply excavated natural material to land.

discrete sample means a sample collected and analysed individually that will not be composited.

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.

N/A means not applicable.

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.

transaction means:

- in the case of a one-off supply, the supply of a batch, truckload or stockpile of excavated natural material that is not repeated.
- in the case where the supplier has an arrangement with the recipient for more than one supply of excavated natural material, the first supply of excavated natural material as required under the arrangement.

Manager Waste Strategy and Innovation

Environment Protection Authority

(by delegation)

Notes

The EPA may amend or revoke this order at any time. It is the responsibility of each of the generator and processor to ensure it complies with all relevant requirements of the most current order. The current version of this order will be available on ' www.epa.nsw.gov.au

In gazetting or otherwise issuing this order, the EPA is not in any way endorsing the supply or use of this substance or guaranteeing that the substance will confer benefit.

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

Any person or entity which supplies excavated natural material should assess whether the material is fit for the purpose the material is proposed to be used for, and whether this use may cause harm. The supplier may need to seek expert engineering or technical advice.

Regardless of any exemption or order 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 any other legislative requirements including, if applicable, any development consent(s) for managing operations on the site(s).

The supply of excavated natural material remains subject to other relevant environmental regulations in the POEO Act and Waste Regulation. For example, a person who pollutes land (s. 142A) or water (s. 120), or causes air pollution through the emission of odours (s. 126), or does not meet the special requirements for asbestos waste (Part 7 of the Waste Regulation), regardless of this order, is guilty of an offence and subject to prosecution.

This order does not alter the requirements of any other relevant legislation that must be met in supplying this material, including for example, the need to prepare a Safety Data Sheet. Failure to comply with the conditions of this order constitutes an offence under clause 93 of the Waste Regulation.

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 2).
- 1 sample at 1 m bgl.
- No further depth sampling after 1 m bgl, unless required under section 4.4.4.

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 2).
- 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 4.4.4.

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 2).
- 1 sample at 1 m bgl.
- 1 sample at 2 m bgl.
- No further depth sampling after 2 m bgl, unless required under section 4.4.4.