Broadcrest Consulting Pty Ltd

44 Mayfair Road, Mulgoa
Assessment of Stockpiled Soil

June 2019

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Document controls

Approval and Authorisation

Title	44 Mayfair Road, Mulgoa Assessment of Stockpiled Soil
Authored on behalf of Broadcrest Consulting Pty Ltd by:	Cheyne Hudson Senior Environmental Scientist
Signed:	
Dated:	17.06.2019

Document Status

Date	Internal Reference	Document Status	Prepared by	Reviewed by
17.06.2019	REF-0333-ESA	Final	C. Hudson	K. Ferry

Contents

1 INTRODUCTION

1.1 Introduction

Broadcrest Pty. Ltd. was engaged by Mr. T. & Mrs. V. Delipetar to prepare this Assessment of stockpiled soil. The Assessment has been prepared as part of due diligence for the relocation and stockpiling of soil at 44 Mayfair Road, Mulgoa.

1.2 Objectives

The objectives of this Assessment are to:

1. Provide a description of soil stockpiled on the site, and
2. Validate the soil in accordance with the NSW Excavated Natural Material Order (2014).

The Protection of the Environment Operations (Waste) Regulation (NSW EPA, 2014) defines excavated natural material as '*Naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:*

1. *Been excavated from the ground*
2. *Contains at least 98% (by weight) natural material, and*
3. *Does not meet the definition of Virgin Excavated Natural Material in the Act'.*

1.3 Background

The Assessment has been prepared as part of due diligence for the relocation and stockpiling of approximately 80 tonnes of soil at 44 Mayfair Road, Mulgoa.

1.4 Description

At the time of inspection, the site was undeveloped and vegetated with native woodland. A low stockpile of approximately 80 tonnes of soil was present. The stockpile had been levelled, lightly compacted & bunded with silt fence (Figure 1). Soil consisted entirely of yellowish-brown silty-clay-loam with included shale fragments (Figure 2). There were no visible foreign materials or indicators of contamination. It is understood the soil was excavated & sourced from elsewhere on the site for the intended use in site earthworks and landscaping (Appendix B).

Figure 1: Stockpile of soil under assessment

Figure 2: Close-up photo of the soil under assessment

2 ASSESSMENT OF SOIL MATERIAL

2.1 Design Guidelines

Soil sampling and analysis for this Assessment has been undertaken in accordance with the *Protection of the Environment Operations (Waste) Regulation – Excavated Natural Material Order (NSW EPA, 2014).*

This guideline was considered most appropriate as it gives clearly defined methodologies, compliance values and outcomes for excavated natural material to be applied to land as engineering fill or used in earthworks. The Excavated Natural Material Order provides tight maximum average and absolute maximum concentration values for a suite of chemical and other attributes.

2.2 Analytes

The Excavated Natural Material Order only applies to excavated natural material where the chemical and other attributes listed in Column 1 of Table 1 comply with respective concentrations provided in Columns 2 and 3.

2.3 Sampling Design

In this case, stockpiled sampling from a volume < 500 tonnes applies, therefore, three (3) representative samples were required.

2.4 Field Quality Assurance and Quality Control

The following field quality assurance and quality control measures were implemented:

1. All soil samples were collected from the stockpile using clean independent spades
2. Disposable gloves were worn throughout the process and changed between the collection of each soil sample
3. All sample jars (as provided by ALS) were immediately placed in a chilled esky
4. All 12 kg sample bags (as provided by ALS) were immediately placed in the site vehicle
5. All samples were clearly labelled and sealed for couriering

6. The ALS Environmental chain-of-custody form (Appendix 1) was completed and emailed to the lab as well as a hard copy placed with the samples, and
7. Ice-blocks were interchanged prior to couriering.

2.5 Laboratory Quality Assurance and Quality Control

The following is an extract from the quote for service provided by ALS Environmental Division.

"ALS has a comprehensive QA/QC program. Our QA/QC procedures are designed to provide reliable and defensible analytical results. Our analytical services are based on internal QCS3 schedule, which includes Laboratory Control Samples (LCS), Method Blanks (MB), Matrix Spikes (MS), Laboratory Duplicates (Dups) and Surrogates (for target organics) where applicable, at frequencies at or above that detailed in NEPM Guidelines.

The basis of the QCS3 Schedule is the 'analytical lot' (process analytical batch) of samples. Generally, the laboratory processes samples of similar matrices in groups called 'Lots'. 'Lots' are made up of 20 samples that may consist of a number of discrete batches and may be independent of project and / or client. The selection of samples for QC purposes will be biased towards the larger batches within the process lot".

The following summarizes the frequency that QC samples are processed:

1. 5% Method Blanks (MB) –1 analysed within each process lot of 20 samples.
2. 10% Laboratory Duplicates (Dups) –2 analysed within each process lot of 20 samples.
3. 5% Laboratory Control Samples (LCS) –1 analysed within each process lot of 20 samples.
4. 5% Matrix Spikes (MS) – 1 analysed within each process lot of 20 samples.
5. Surrogate Spikes on all 'target' organics analyses.

Table 1: Scan of Table 4 from the Excavated Natural Material Order (NSW EPA, 2014).

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%

Table 2: Scan of Table 1 from the Excavated Natural Material Order (NSW EPA, 2014)

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	

3 RESULTS

3.1 Analytes

A thorough review of the analytical results provided by ALS Environmental (Appendix A) was undertaken. The concentration values of all analytes were compared with their respective compliance values. Tables 3 and 4 below summarise the results.

Table 3: Summary of Results - *Maximum Average* Concentration for Characterisation (mg/kg)

Analyte	Maximum Average Concentration for Characterisation (mg/kg)	Average Concentration (mg/kg)	Comment
Arsenic	20	8.7	Pass
Cadmium	0.5	<0.4	Pass
Chromium (total)	75	16.3	Pass
Copper	100	21	Pass
Lead	50	22	Pass
Nickel	30	10.7	Pass
Zinc	150	60	Pass
Mercury	0.5	<0.1	Pass
EC	1,500 µS/cm	78	Pass
pH	5 – 9	5.7	Pass
Total PAH	20	<0.5	Pass
Benzo(a)pyrene	0.5	<0.5	Pass
Benzene	NA	<0.2	Pass
Toluene	NA	<0.5	Pass
Ethyl-benzene	NA	<0.5	Pass
Xylene	NA	<0.5	Pass
TPH	250	<50	Pass
Rubber, Plastic, Bitumen, Paper, Cloth, Paint, Wood	0.05%	<0.05%	Pass

Table 4: Summary of Results – *Absolute Maximum* Concentration for Characterisation

Analyte	Absolute maximum concentration (mg/kg)	S1	S2	S3
Arsenic	40	6	6	8
Cadmium	1	<0.4	<0.4	<0.4
Chromium	150	11	17	21
Copper	200	17	22	24
Lead	100	18	25	23
Nickel	60	6	14	12
Zinc	300	36	84	60
Mercury	1	<0.1	<0.1	<0.1
EC	3,000 µS/cm	83	79	71
pH	4.5 - 10	5.7	5.7	5.7
Total PAH	40	<0.5	<0.5	<0.5
Benzo(a)pyrene	1	<0.5	<0.5	<0.5
Benzene	0.5	<0.2	<0.2	<0.2
Toluene	65	<0.5	<0.5	<0.5
Ethyl-benzene	25	<0.5	<0.5	<0.5
Xylene	15	<0.5	<0.5	<0.5
TPH	500	<50	<50	<50
Rubber, Plastic, Bitumen, Paper, Cloth, Paint, Wood	0.1%	<0.05	<0.05	<0.05

In summary:

1. The soil consisted entirely of yellowish-brown silty-clay-loam with included shale fragments. There were no visible foreign materials or indicators of contamination.
2. All *Maximum Average* Concentrations complied with those specified.
3. All *Absolute Maximum* Concentrations complied with those specified.

The material may be classified as Excavated Natural Material (ENM) under the *Excavated Natural Material Order* (NSW EPA, 2014). As such, subject to Council approval, the material may be utilised in the intended landscape works (Appendix B).

4 QUALITY ASSURANCE

4.1 Field

1. All soil samples arrived at ALS Environmental Division within specified holding times
2. All soil samples arrived at ALS Environmental Division within specified temperature requirements
3. No potential OHS incidents were recorded on site
4. No quality assurance incidents (such as cross contamination or similar) were recorded on site.

4.2 Laboratory

ALS Environmental Division provided a *Quality Control Report* and *Interpretive Quality Control Report* (Appendix A). Those Quality Control Reports contain the following information:

1. A *Laboratory Duplicate (DUP) Report* - referring to a randomly selected intra-laboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. No duplicate outliers were recorded.
2. A *Method Blank (MB) Report* - referring to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. No method blank outliers were recorded.
3. *Laboratory Control Spike (LCS) Report* - referring to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. No laboratory control outliers were recorded.
4. A *Matrix Spike (MS) Report* – referring to an intra-laboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. No matrix spike outliers were recorded.
5. An *Analysis Holding Time Compliance Report* – No analysis holding time outliers were recorded.

5 DISCLAIMER

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, and conclusions made should be reviewed by a competent and experienced person with experience in environmental investigations, before being used for any other purpose. Broadcrest Consulting Pty Ltd accepts no liability for use or interpretation by any person or body outside the consent authority. This report should not be reproduced or amended in any away without prior approval by the client or Broadcrest Consulting Pty Ltd and should not be relied upon by any other party, who should make their own independent enquiries.

The extent of sampling of soils and subsequent analysis has been necessarily limited and has been targeted towards areas where contamination is most likely based on the knowledge of the Site history and visual observation. This approach maximises the probability of identifying contaminants, however, it may not identify contamination which occurs in unexpected locations or from unexpected sources.

Further, soils rock and aquifer conditions are often variable, resulting in non-homogenous contaminant distributions across a Site. Contaminant concentrations have been identified at chosen sample locations, however, conditions between samples locations can only be inferred based on the estimated geological and hydrogeological conditions and the nature and extent of identified contamination.

Boundaries between zones of variable contamination are often indistinct and have been interpreted based on available information and the application of professional judgement. The accuracy with which the subsurface conditions have been characterised depends on the frequency and methods of sampling and the uniformity of subsurface conditions and is therefore limited by the scope of works undertaken.

This report does not provide a complete 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, Broadcrest Consulting Pty Ltd reserves the right to review the report in the context of the additional information.

Broadcrest Consulting Pty Ltd accepts no liability for the unlawful disposal of waste materials from any site. Broadcrest Consulting Pty Ltd does not accept any responsibility for the material tracking, loading, management, transport or disposal of waste from the site.

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

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

APPENDIX A: ALSE SOIL ANALYSIS RESULTS AND QC

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1917293**	Page	: 1 of 6
Client	: **BROADCREST PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Cheyne Hudson	Contact	: Customer Services ES
Address	: 9 Dalwood Pl MOUNT ANNAN 2567	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: MAYFAIR	Date Samples Received	: 05-Jun-2019 15:00
Order number	: 0333	Date Analysis Commenced	: 07-Jun-2019
C-O-C number	: ----	Issue Date	: 13-Jun-2019 20:25
Sampler	: Cheyne Hudson		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Peter Keyte	Newcastle Manager	Newcastle - Inorganics, Mayfield West, NSW
Peter Wu		Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	S1	S2	S3	----	----
			Client sampling date / time	05-Jun-2019 00:00	05-Jun-2019 00:00	05-Jun-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1917293-001	ES1917293-002	ES1917293-003	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.7**	**5.7**	**5.7**	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**83**	**79**	**71**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**9.3**	**8.2**	**10.0**	----	----
EA155: Foreign Material - Type III								
Rubber	----	0.05	%	<0.05	<0.05	<0.05	----	----
Plastic	----	0.05	%	<0.05	<0.05	<0.05	----	----
Bitumen	----	0.05	%	<0.05	<0.05	<0.05	----	----
Paint	----	0.05	%	<0.05	<0.05	<0.05	----	----
Paper	----	0.05	%	<0.05	<0.05	<0.05	----	----
Cloth	----	0.05	%	<0.05	<0.05	<0.05	----	----
Wood	----	0.05	%	<0.05	<0.05	<0.05	----	----
EG005(ED093)T-MW: Total Metals by nitric acid microwave digestion / ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**6**	**10**	**10**	----	----
Cadmium	7440-43-9	0.4	mg/kg	<0.4	<0.4	<0.4	----	----
Chromium	7440-47-3	2	mg/kg	**11**	**17**	**21**	----	----
Copper	7440-50-8	5	mg/kg	**17**	**22**	**24**	----	----
Lead	7439-92-1	5	mg/kg	**18**	**25**	**23**	----	----
Nickel	7440-02-0	2	mg/kg	**6**	**14**	**12**	----	----
Zinc	7440-66-6	5	mg/kg	**36**	**84**	**60**	----	----
EG035T-MW: Total Recoverable Mercury by nitric acid microwave digestion / FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S1	S2	S3	----	----
				Client sampling date / time	05-Jun-2019 00:00	05-Jun-2019 00:00	05-Jun-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1917293-001	ES1917293-002	ES1917293-003	--------	--------
					Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	**0.2**	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	**0.2**	<0.2	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**86.5**	**84.4**	**86.7**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**91.9**	**90.7**	**90.9**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**86.1**	**82.4**	**84.7**	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**105**	**99.3**	**94.1**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S1	S2	S3	----	----
				Client sampling date / time	05-Jun-2019 00:00	05-Jun-2019 00:00	05-Jun-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1917293-001	ES1917293-002	ES1917293-003	--------	--------
					Result	Result	Result	----	----
EP075(SIM)T: PAH Surrogates - Continued									
Anthracene-d10	1719-06-8	0.5	%		**97.1**	**99.7**	**96.7**	**----**	**----**
4-Terphenyl-d14	1718-51-0	0.5	%		**101**	**107**	**104**	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**114**	**109**	**104**	**----**	**----**
Toluene-D8	2037-26-5	0.2	%		**118**	**108**	**110**	**----**	**----**
4-Bromofluorobenzene	460-00-4	0.2	%		**113**	**92.1**	**105**	**----**	**----**

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	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1917293**	Page	: 1 of 6
Client	: **BROADCREST PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Cheyne Hudson	Telephone	: +61-2-8784 8555
Project	: MAYFAIR	Date Samples Received	: 05-Jun-2019
Site	: ----	Issue Date	: 13-Jun-2019
Sampler	: Cheyne Hudson	No. of samples received	: 3
Order number	: 0333	No. of samples analysed	: 3

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
S1, S2, S3	**05-Jun-2019**	**07-Jun-2019**	12-Jun-2019	✓	**07-Jun-2019**	07-Jun-2019	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
S1, S2, S3	**05-Jun-2019**	**07-Jun-2019**	12-Jun-2019	✓	**07-Jun-2019**	05-Jul-2019	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
S1, S2, S3	**05-Jun-2019**	**----**	----	----	**07-Jun-2019**	19-Jun-2019	✓
EA155: Foreign Material - Type III							
Snap Lock Bag (EA155)							
S1, S2, S3	**05-Jun-2019**	**----**	----	----	**13-Jun-2019**	02-Dec-2019	✓
EG005(ED093)T-MW: Total Metals by nitric acid microwave digestion / ICP-AES							
Soil Glass Jar - Unpreserved (EG005T-MW)							
S1, S2, S3	**05-Jun-2019**	**12-Jun-2019**	02-Dec-2019	✓	**12-Jun-2019**	02-Dec-2019	✓
EG035T-MW: Total Recoverable Mercury by nitric acid microwave digestion / FIMS							
Soil Glass Jar - Unpreserved (EG035T-MW)							
S1, S2, S3	**05-Jun-2019**	**12-Jun-2019**	02-Dec-2019	✓	**13-Jun-2019**	02-Dec-2019	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
S1, S2, S3	**05-Jun-2019**	**08-Jun-2019**	19-Jun-2019	✓	**11-Jun-2019**	18-Jul-2019	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071)							
S1, S2, S3	**05-Jun-2019**	**08-Jun-2019**	19-Jun-2019	✓	**08-Jun-2019**	18-Jul-2019	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071)							
S1, S2, S3	**05-Jun-2019**	**08-Jun-2019**	19-Jun-2019	✓	**08-Jun-2019**	18-Jul-2019	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
S1, S2, S3	**05-Jun-2019**	**07-Jun-2019**	19-Jun-2019	✓	**07-Jun-2019**	19-Jun-2019	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Microwave Digestion)	EG035T-MW	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICPAES (Microwave Digestion)	EG005T-MW	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Microwave Digestion)	EG035T-MW	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICPAES (Microwave Digestion)	EG005T-MW	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Microwave Digestion)	EG035T-MW	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICPAES (Microwave Digestion)	EG005T-MW	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Microwave Digestion)	EG035T-MW	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICPAES (Microwave Digestion)	EG005T-MW	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3)
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Foreign Material Content	EA155	SOIL	In house: Referenced to RTA T276. Foreign Material Content
Total Metals by ICPAES (Microwave Digestion)	EG005T-MW	SOIL	In house: Referenced to USEPA SW846 - 3051 (Microware Digestion); APHA 3120; USEPA SW846 - 6010. Metals in solids are determined following a microware digestion. The ICPAES technique ionizes selected elements. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass / charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS (Microwave Digestion)	EG035T-MW	SOIL	In house: Referenced to USEPA SW846 - 3051 (Microware Digestion); AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following a microware digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

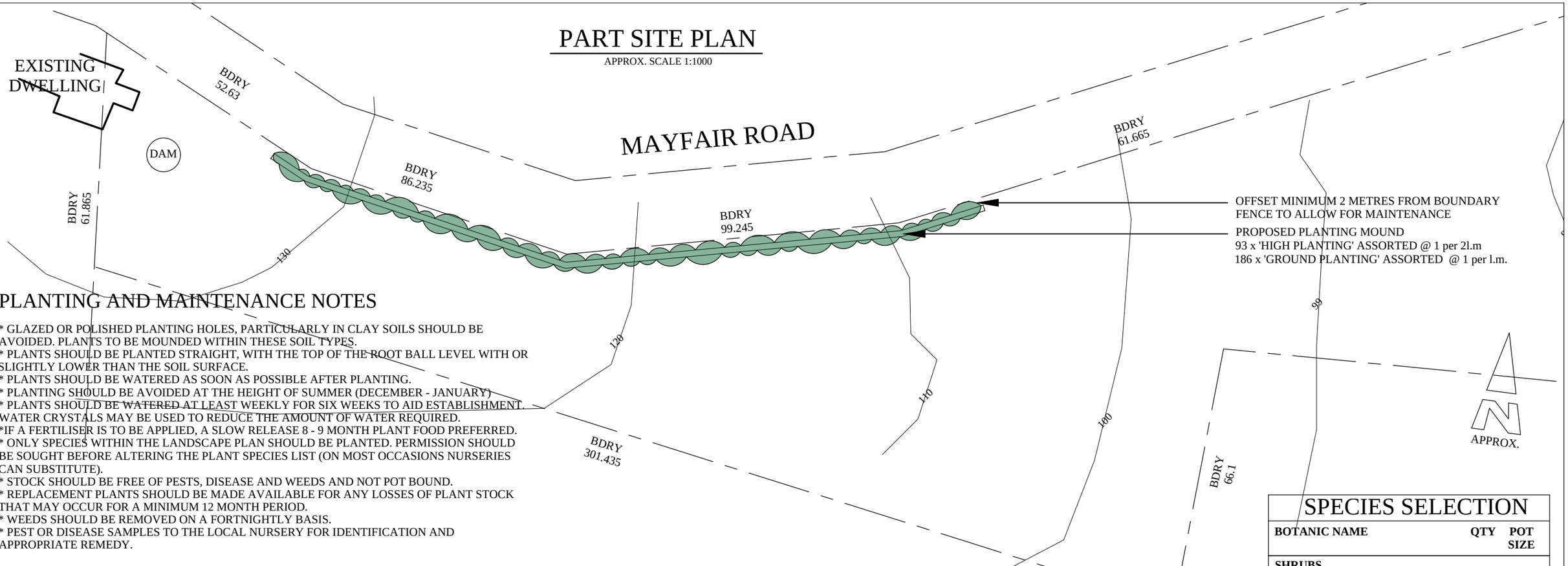
Preparation Methods	Method	Matrix	Method Descriptions
Microwave Digest for Metals in Soils, Sediments and Sludges	EN31	SOIL	In house: Referenced to USEPA SW 846 - 3051. Microwave Assisted Nitric Acid Digestion 1.0g of sample is mixed with 10 mL conc. Nitric acid in a closed, high pressure vessel, and heated using a specific program. Digest is appropriate for selected metals analysis in sludge, sediments, soils and oils. This method is compliant with NEPM (2013) Schedule B(3) (Method 203)
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.

Preparation Methods	Method	Matrix	Method Descriptions
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

APPENDIX B: LANDSCAPE PLANS

PART SITE PLAN

APPROX. SCALE 1:1000



PLANTING AND MAINTENANCE NOTES

* GLAZED OR POLISHED PLANTING HOLES, PARTICULARLY IN CLAY SOILS SHOULD BE AVOIDED. PLANTS TO BE MOUNDED WITHIN THESE SOIL TYPES.
* PLANTS SHOULD BE PLANTED STRAIGHT, WITH THE TOP OF THE ROOT BALL LEVEL WITH OR SLIGHTLY LOWER THAN THE SOIL SURFACE.
* PLANTS SHOULD BE WATERED AS SOON AS POSSIBLE AFTER PLANTING.
* PLANTING SHOULD BE AVOIDED AT THE HEIGHT OF SUMMER (DECEMBER - JANUARY)
* PLANTS SHOULD BE WATERED AT LEAST WEEKLY FOR SIX WEEKS TO AID ESTABLISHMENT. WATER CRYSTALS MAY BE USED TO REDUCE THE AMOUNT OF WATER REQUIRED.
*IF A FERTILISER IS TO BE APPLIED, A SLOW RELEASE 8 - 9 MONTH PLANT FOOD PREFERRED.
* ONLY SPECIES WITHIN THE LANDSCAPE PLAN SHOULD BE PLANTED. PERMISSION SHOULD BE SOUGHT BEFORE ALTERING THE PLANT SPECIES LIST (ON MOST OCCASIONS NURSERIES CAN SUBSTITUTE).
* STOCK SHOULD BE FREE OF PESTS, DISEASE AND WEEDS AND NOT POT BOUND.
* REPLACEMENT PLANTS SHOULD BE MADE AVAILABLE FOR ANY LOSSES OF PLANT STOCK THAT MAY OCCUR FOR A MINIMUM 12 MONTH PERIOD.
* WEEDS SHOULD BE REMOVED ON A FORTNIGHTLY BASIS.
* PEST OR DISEASE SAMPLES TO THE LOCAL NURSERY FOR IDENTIFICATION AND APPROPRIATE REMEDY.

TYPICAL PLANT SELECTION CRITERIA - AS2303-2015 'TREE STOCK FOR LANDSCAPE USE' FOR FULL SPEC.

ENSURE GOOD HEALTH AND VIGOUR. ENSURE FREEDOM FROM PESTS, DISEASES AND INJURY.

SPECIMENS SHOULD BE SELF SUPPORTING AT TIME OF PLANTING - STAKING ONLY TO BE USED WHEN NECESSARY- 1 GROWING SEASON MAX.

ENSURE EVIDENCE OF STEM TAPER - (INCREASE IN CALIPER DOWN THE STEM).

PRUNING:-
*ENSURE CLEAN STEM HEIGHT DOES NOT EXCEED 40% OF PLANT HEIGHT.
*ENSURE CUTS ARE AT BRANCH COLLAR ARE CLEAN WITH NO TEARS.

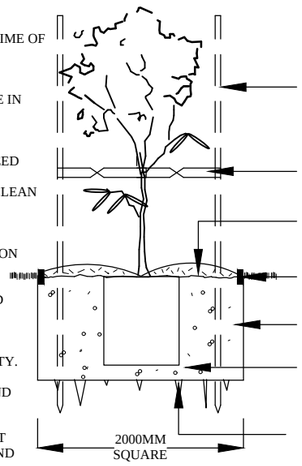
ENSURE APICAL DOMINANCE FOR TREES WITH TYPICAL EXCURRENT FORM - LEADER DEVIATION <15%.

ENSURE GOOD CROWN SYMMETRY AND SOUND STEM JUNCTIONS - NO INCLUDED BARK.

ENSURE SPECIMENS / BATCHES ARE CLEARLY LABELED - NOTING SPECIES CULTIVAR / VARIETY.

ENSURE SPECIMENS ARE FREE OF GIRDLING AND SUCKERING ROOTS.

ENSURE TRUNK POSITION IS WITHIN 10% OF POT CENTRE. IF TREE IS GRAFTED ENSURE SCION AND ROOTSTOCK ARE SOUND.



TYPICAL PLANTING CRITERIA

*SEEK ADVICE BEFORE SUBSTITUTING SPECIES
*REPLACEMENTS TO BE MADE WITHIN 12 MONTHS

3 x 40MM HARDWOOD STAKES AS REQUIRED. DON'T PIERCE ROOT BALL

(NOTE:- ONLY REQUIRED IN WINDY ENVIRONMENTS, VERY SANDY SOIL AND VERY WET CLAY - IF STAKING REQUIRED - REMOVE AS SOON AS PRACTICALLY POSSIBLE).

50MM WIDE JUTE WEBBING - TWIST ONCE AND GAL. STAPLE TO OUTSIDE OF STAKE. ENSURE TREE HAS AMPLE MOVEMENT

75 - 100MM SELECTED MULCH - DISH AROUND BASE OF TRUNK. TOP OF ROOT BALL TO FINISH FLUSH WITH TOP OF SOIL

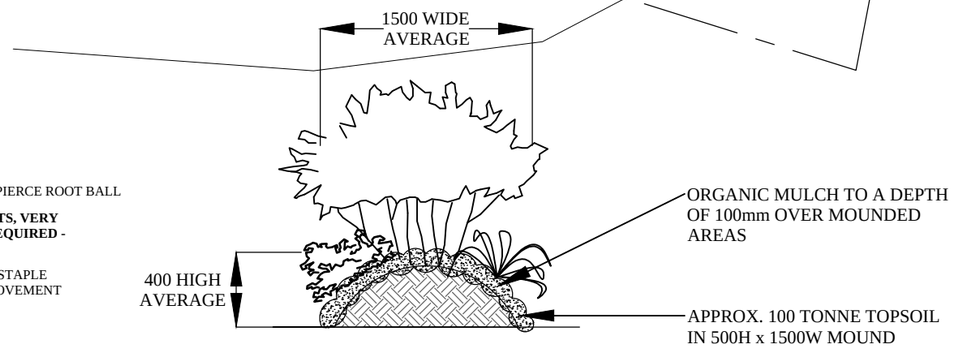
SELECTED EDGING - REFER TO DETAIL

EXCAVATE HOLE AND INCORPORATE SOIL AMENDMENTS TO 30% MAX. IF REQUIRED.

TAMP SOIL GENTLY AROUND AND BENEATH ROOT BALL SO ROOT BALL DOES NOT MOVE - WATER WEEKLY FOR MINIMUM 4 WEEKS TO ESTABLISH.

SCARIFY SUB SOIL AND SIDES TO 100MM MINIMUM IN HEAVY CLAY SOILS. MAY BE REQUIRED TO MOUND PLANT.

45-75LTR TYPICAL PLANTING
(NTS)



SECTION
SCALE 1:50

SPECIES SELECTION

BOTANIC NAME	QTY	POT SIZE
SHRUBS		
HIGH PLANTING:-	93	200MM
ACMENA SMITHII 'MINOR'*		
CALLISTEMON 'VARIETIES'*		
GREVILLEA 'VARIETIES'*		
LEPTOSPERMUM POLYGALIFOLIUM*		
SYZYGIUM 'CULTIVARS'		
GROUND PLANTING:-	186	TUBE
LOMANDRA LONGIFOLIA*		
GREVILLEA 'ROYAL MANTLE'*		
GREVILLEA 'CARPET QUEEN'*		
HARDENBERGIA VIOLACEA*		
DIANELLA LONGIFOLIA*		

* = NATIVE SPECIES

PLANTING SKETCH

DATE:	SCALE:	SHEET No:
01 APRIL 19	A / N - A3	1 OF 1
JOB No.	DRAWN:	
5293	CJ / PM	

PROJECT:
PROPOSED EARTH MOUND

CLIENT:
SIENNA WATERS PL

ADDRESS:
LOT 12 No. 44 MAYFAIR ROAD
MULGOA

MONACO
DESIGNS PL
14 York Street, Glenbrook NSW, 2773
ph & fax: 0247395136 mb: 0409123200
email: paul@monaco.net.au