Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	85126.03	**Suburb:**	Wetherill Park	**To:**	Envirolab Services
Project Name:	Resource Recovery & Recycling Facility	**Order Number**			12 Ashley Street, Chatswood NSW 2067
Project Manager:	D Walker	**Sampler:**	DW/TG/JS	**Attn:**	Aileen
Emails:	david.walker@douglaspartners.com.au			**Phone:**	02 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☑			**Email:**	sydney@envirolab.com.au
Prior Storage:	☐ Esky ☑ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID 170447	Lab ID	Date Sampled	Sample Type S - soil W - water	Container Type G - glass P - plastic	Analytes: combo 1A	combo 5	combo 5a	combo 3	TRH BTEX Metals(8) PAH	VOC	PCB	asbestos	BTEX	Notes/preservation
BDA-050717	71	5/7	S	G	✓									
BDC-050717	72	5/7	S	G		✓								
BDB-040717	73	5/7	S	G			✓							
BD10/050717	74	5/7	S	G				✓						
BDC-040717		4/7	S	G					✓	✓				send to Envirolab for analysis
BD4/040717		4/7	S	G							✓			
BD9/050717		5/7	S	G					✓					
BD8/050717		5/7	S	G					✓					
A1	75	5/7	M									✓		
TB1	76	4/7	S										✓	
TS1	77	4/7	S										✓	
TB1	78	5/7	S										✓	
TS1	79	5/7	S										✓	
PQL (S) mg/kg														

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

ANZECC PQLs req'd for all water analytes ☐

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: 5

Relinquished by: DW

Transported to laboratory by: Courier

Send Results to: Douglas Partners Pty Ltd

Address 96 Hermitage Road, West Ryde

Phone: 98090666 **Fax:** 98094095

Signed:

Received by: Ursula Long / Envirolab

Date & Time: 7/7 4.23pm

2140-4-0-5 S0
unlabelled S1

Relinquished by: Kevin Wong

ELS 7/7/17

553545

Data File C:\DATA\2017\07_17\110717\F0000025.D
Sample Name: s170847-46

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Acq. Instrument : GC#4                              Location : Vial 25
Injection Date  : 11/07/2017 11:13:22 PM                 Inj :   1
                                                  Inj Volume : 1 µl
Acq. Method     : C:\CHEM32\1\METHODS\NEPM JF.M
Last changed    : 15/04/2016 5:27:11 PM
Analysis Method : C:\METHODS\2017\07_17\110717F-PROCESSING.M
Last changed    : 12/07/2017 9:37:52 AM
                  (modified after loading)
Method Info     : FAST TPH WITH 15M HP5 COLUMNS
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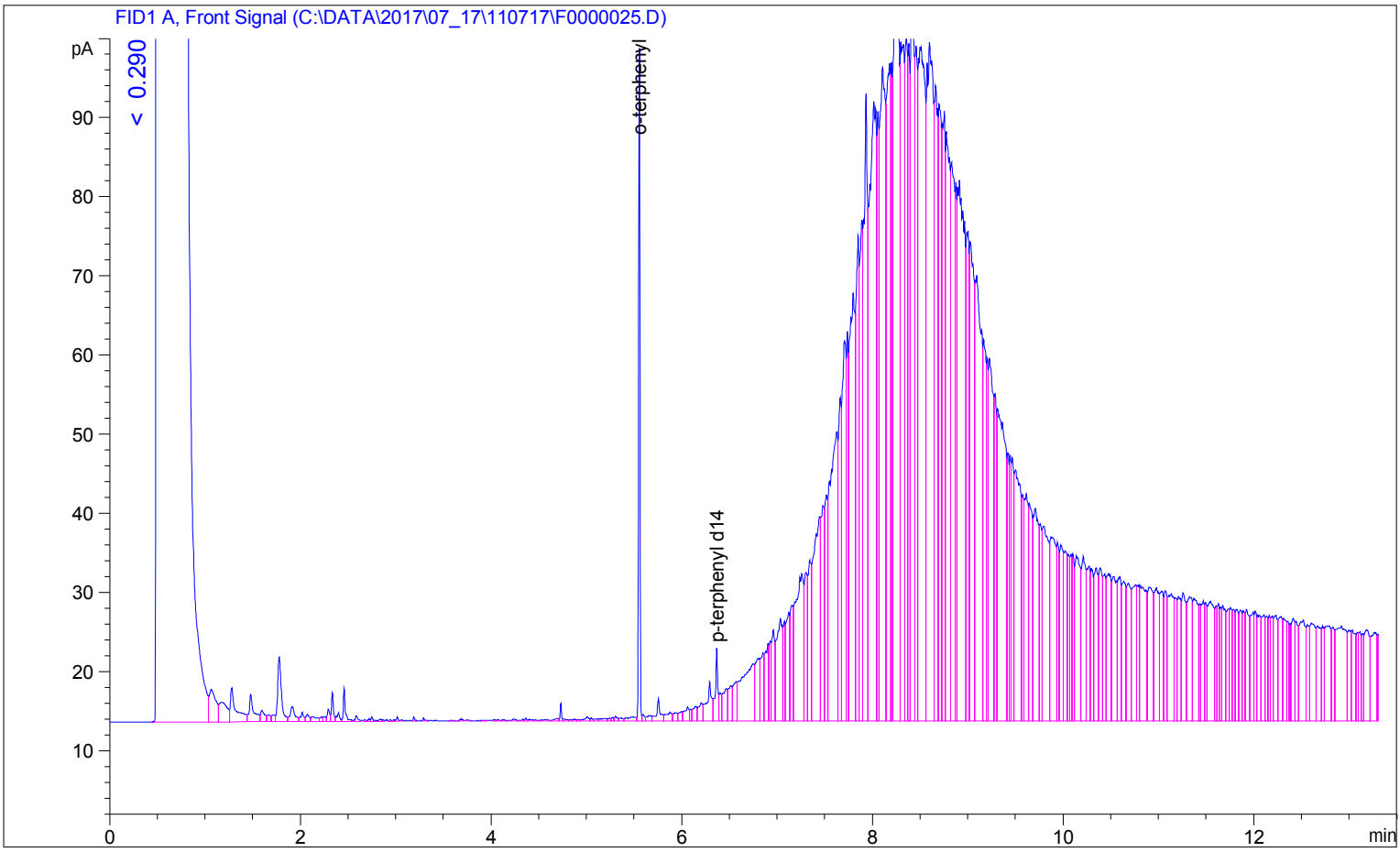


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==========================================================================
                    External Standard Report
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Sorted By             :      Signal
Calib. Data Modified  :      12/07/2017 9:35:51 AM
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Dilution:                     :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs

Signal 1: FID1 A, Front Signal

RetTime  Type     Area     Amt/Area    Amount   Grp   Name
 [min]          [pA*s]                 [mg/L]
-------|------|----------|----------|----------|--|------------------
  5.556 VV    I   79.30943 1.53429e-1   12.16839    o-terphenyl
  6.368 VV    I   17.35059 1.77717e-1    3.08349    p-terphenyl d14
```

Data File C:\DATA\2017\07_17\110717\F0000025.D
Sample Name: s170847-46

Totals : 15.25188

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Summed Peaks Report

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Signal 1: FID1 A, Front Signal

Name	Start Time [min]	End Time [min]	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	2.050	4.130	33.57932	5.8372
NEPM >C10-C16	2.580	4.830	17.85381	3.1036
TRH C15-C28	4.131	7.850	1625.99338	283.8155
NEPM >C16-C34	4.831	8.950	6947.25630	1.213e3
TRH C29-C36	7.851	9.310	6312.20710	1.158e3
NEPM >C34-C40	8.951	10.370	2600.95080	477.3603

Totals : 3141.2515

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Final Summed Peaks Report

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Signal 1: FID1 A, Front Signal

Name	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	33.57932	5.8372
NEPM >C10-C16	17.85381	3.1036
TRH C15-C28	1625.99338	283.8155
NEPM >C16-C34	6947.25630	1.213e3
TRH C29-C36	6312.20710	1.158e3
NEPM >C34-C40	2600.95080	477.3603
o-terphenyl	79.30943	12.1684
p-terphenyl d14	17.35059	3.0835

Totals : 3156.5034

*** End of Report ***

Data File C:\DATA\2017\07_17\110717\B0000065.D
Sample Name: s170847-29 rr

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Acq. Instrument  : GC#4                               Location  : Vial 140
Injection Date   : 12/07/2017 2:53:27 PM                  Inj   :  1
                                                      Inj Volume : 1 µl
Acq. Method      : C:\CHEM32\1\METHODS\NEPM JF.M
Last changed     : 15/04/2016 5:27:11 PM
Analysis Method  : C:\METHODS\2017\07_17\110717B-PROCESSING.M
Last changed     : 14/07/2017 3:32:47 PM
                   (modified after loading)
Method Info      : FAST TPH WITH 15M HP5 COLUMNS
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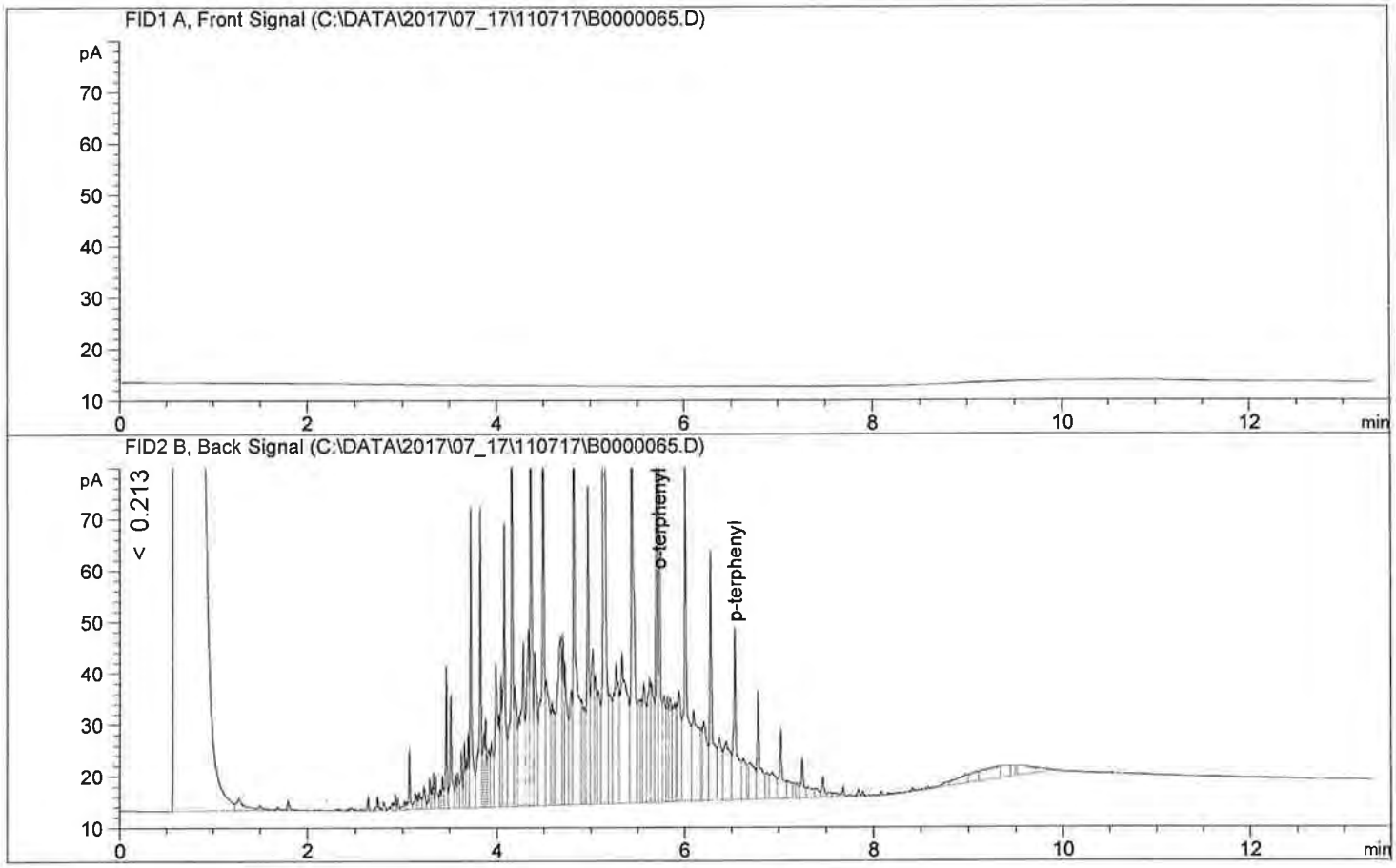


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================================================================================
                        External Standard Report
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Dilution:                     :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs

Signal 2: FID2 B, Back Signal

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]           [pA*s]                 [mg/L]
-------|------|----------|----------|----------|--|------------------
  5.731 VV    I  119.84213 1.74312e-1   20.88992     o-terphenyl
  6.534 VV    I   80.09118 1.93298e-1   15.48146     p-terphenyl

Totals :                                36.37138
```

Data File C:\DATA\2017\07_17\110717\B0000063.D
Sample Name: s170847-6 rr

```
==========================================================================
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Acq. Instrument : GC#4                               Location : Vial 138
Injection Date  : 12/07/2017 2:16:47 PM                   Inj :   1
                                                  Inj Volume : 1 µl
Acq. Method     : C:\CHEM32\1\METHODS\NEPM JF.M
Last changed    : 15/04/2016 5:27:11 PM
Analysis Method : C:\METHODS\2017\07_17\110717B-PROCESSING.M
Last changed    : 12/07/2017 9:04:03 AM
                  (modified after loading) (Current integration events modified)
Method Info     : FAST TPH WITH 15M HP5 COLUMNS
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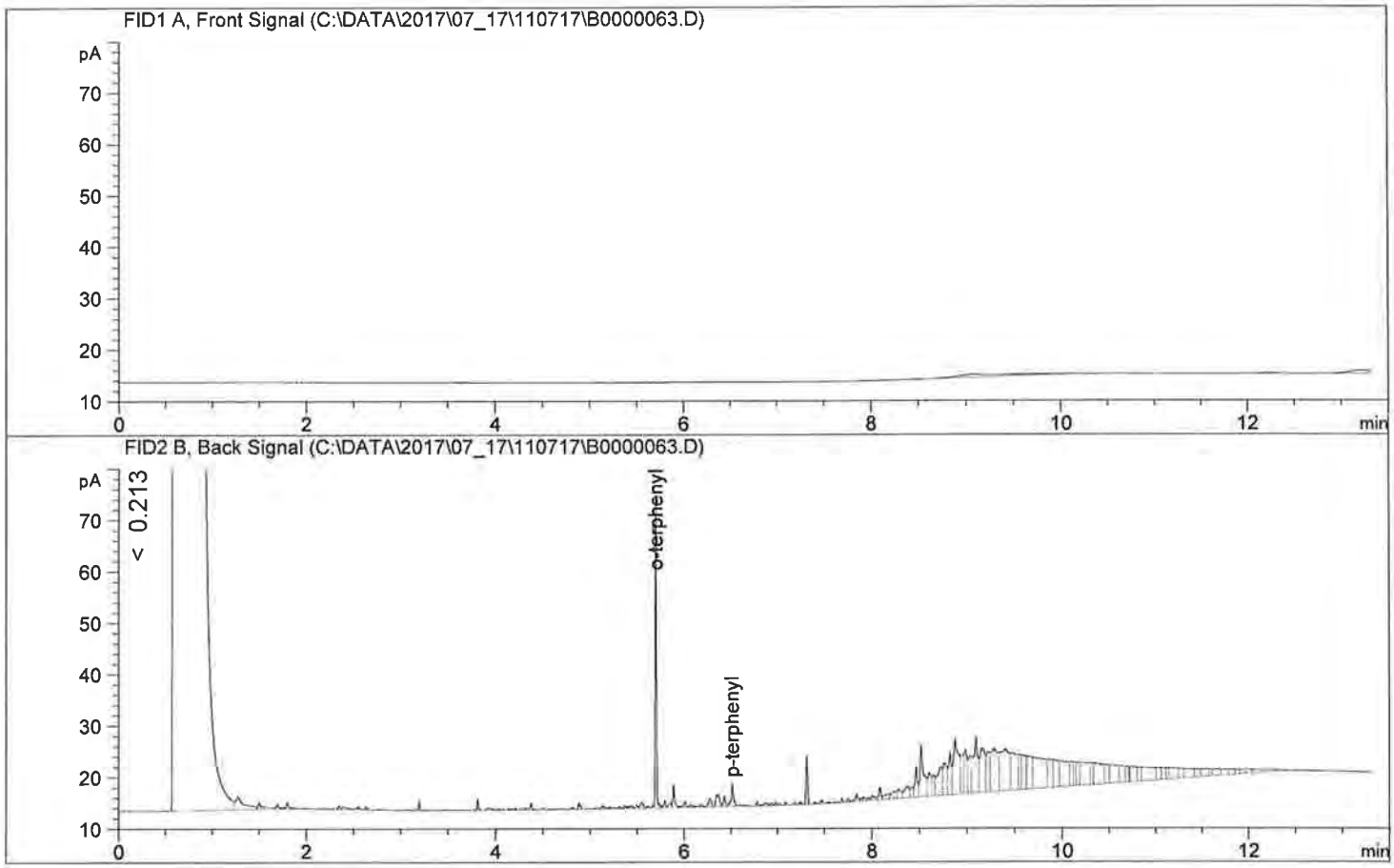


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==========================================================================
                        External Standard Report
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Sorted By             :      Signal
Calib. Data Modified  :      12/07/2017 6:49:30 AM
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs

Signal 2: FID2 B, Back Signal

RetTime  Type      Area      Amt/Area    Amount    Grp   Name
 [min]           [pA*s]                 [mg/L]
-------|------|----------|----------|----------|--|------------------
  5.700 VV    I   55.10866 1.74312e-1    9.60610     o-terphenyl
  6.515 VV    I    7.53561 1.93298e-1    1.45662     p-terphenyl

Totals :                                 11.06272
```

Data File C:\DATA\2017\07_17\110717\B0000041.D
Sample Name: s170847-22

```
==========================================================================
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Acq. Instrument : GC#4                              Location : Vial 116
Injection Date  : 12/07/2017 3:51:29 AM                  Inj :   1
                                                 Inj Volume : 1 µl
Acq. Method     : C:\CHEM32\1\METHODS\NEPM JF.M
Last changed    : 15/04/2016 5:27:11 PM
Analysis Method : C:\METHODS\2017\07_17\110717B-PROCESSING.M
Last changed    : 12/07/2017 8:59:56 AM
Method Info     : FAST TPH WITH 15M HP5 COLUMNS
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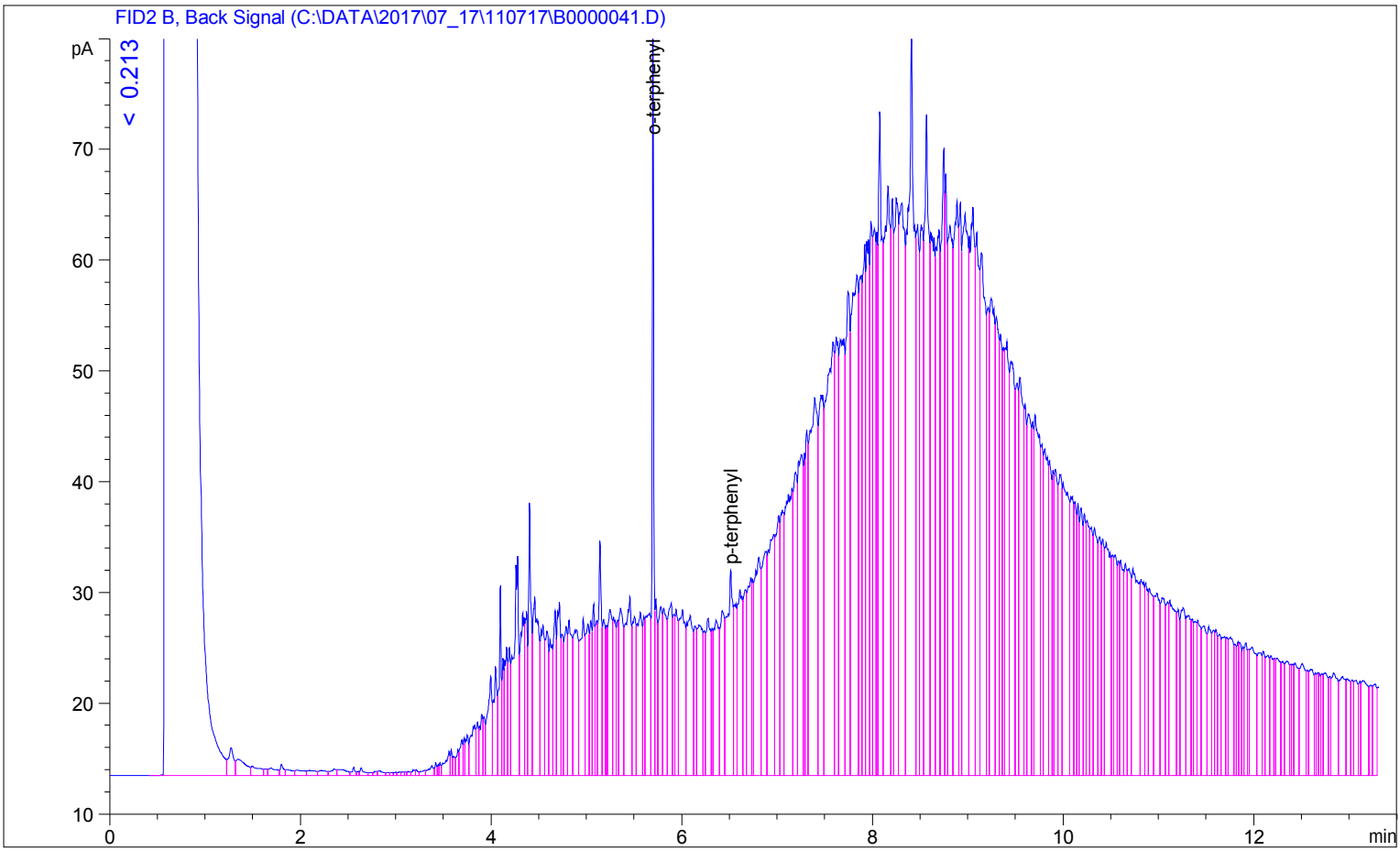


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==========================================================================
                      External Standard Report
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Sorted By             :      Signal
Calib. Data Modified  :      12/07/2017 6:49:30 AM
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs

Signal 1: FID2 B, Back Signal

RetTime  Type     Area     Amt/Area    Amount    Grp   Name
 [min]          [pA*s]                [mg/L]
-------|------|----------|----------|----------|--|------------------
  5.700 VV    I   91.81767 1.74312e-1   16.00492    o-terphenyl
  6.515 VV    I   83.50942 1.93298e-1   16.14220    p-terphenyl

Totals :                               32.14712
```

Data File C:\DATA\2017\07_17\110717\B0000041.D
Sample Name: s170847-22

Summed Peaks Report

Signal 1: FID2 B, Back Signal

Name	Start Time [min]	End Time [min]	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	2.220	4.250	254.64638	50.3151
NEPM >C10-C16	2.720	4.950	814.63279	160.9617
TRH C15-C28	4.251	7.960	4340.09655	854.4608
NEPM >C16-C34	4.951	9.100	7236.70777	1.425e3
TRH C29-C36	7.961	9.460	4370.51010	899.6127
NEPM >C34-C40	9.110	10.630	2663.69980	548.2880
Totals :				3938.3723

Final Summed Peaks Report

Signal 1: FID2 B, Back Signal

Name	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	254.64638	50.3151
NEPM >C10-C16	814.63279	160.9617
TRH C15-C28	4340.09655	854.4608
NEPM >C16-C34	7236.70777	1.425e3
TRH C29-C36	4370.51010	899.6127
NEPM >C34-C40	2663.69980	548.2880
o-terphenyl	91.81767	16.0049
p-terphenyl	83.50942	16.1422
Totals :	3970.5194	

*** End of Report ***

Data File C:\DATA\2017\07_17\110717\B0000015.D
Sample Name: s170847-2

```
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Acq. Operator   :                                  Seq. Line :  15
Acq. Instrument : GC#4                              Location : Vial 90
Injection Date  : 11/07/2017 8:18:59 PM                  Inj :   1
                                                 Inj Volume : 1 µl
Acq. Method     : C:\CHEM32\1\METHODS\NEPM JF.M
Last changed    : 15/04/2016 5:27:11 PM
Analysis Method : C:\METHODS\2017\07_17\110717B-PROCESSING.M
Last changed    : 12/07/2017 8:59:56 AM
Method Info     : FAST TPH WITH 15M HP5 COLUMNS
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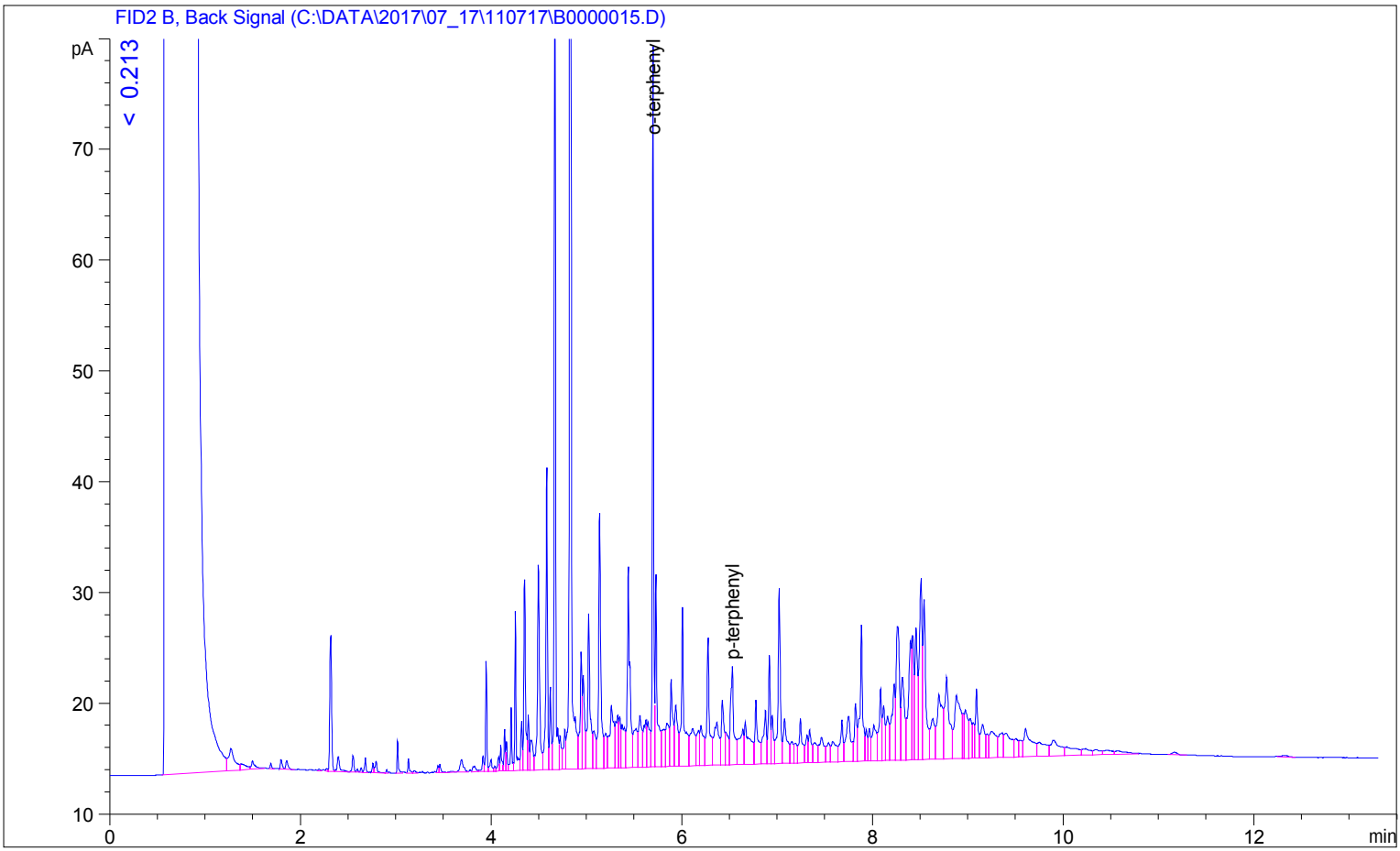


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==========================================================================
                      External Standard Report
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Sorted By             :      Signal
Calib. Data Modified  :      12/07/2017 6:49:30 AM
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs

Signal 1: FID2 B, Back Signal

RetTime  Type     Area     Amt/Area    Amount    Grp   Name
 [min]          [pA*s]                [mg/L]
-------|------|----------|----------|----------|--|------------------
  5.700 VV    I   62.61361 1.74312e-1   10.91430    o-terphenyl
  6.532 VV    I   21.86334 1.93298e-1    4.22614    p-terphenyl

Totals :                               15.14044
```

Data File C:\DATA\2017\07_17\110717\B0000015.D
Sample Name: s170847-2

Summed Peaks Report

Signal 1: FID2 B, Back Signal

Name	Start Time [min]	End Time [min]	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	2.220	4.250	64.25458	12.6959
NEPM >C10-C16	2.720	4.950	441.78871	87.2921
TRH C15-C28	4.251	7.960	1023.49144	201.5009
NEPM >C16-C34	4.951	9.100	990.23919	194.9543
TRH C29-C36	7.961	9.460	412.27000	84.8604
NEPM >C34-C40	9.110	10.630	103.66366	21.3378
Totals :				602.6415

Final Summed Peaks Report

Signal 1: FID2 B, Back Signal

Name	Total Area [pA*s]	Amount [mg/L]
TRH C10-C14	64.25458	12.6959
NEPM >C10-C16	441.78871	87.2921
TRH C15-C28	1023.49144	201.5009
NEPM >C16-C34	990.23919	194.9543
TRH C29-C36	412.27000	84.8604
NEPM >C34-C40	103.66366	21.3378
o-terphenyl	62.61361	10.9143
p-terphenyl	21.86334	4.2261
Totals :		617.7820

*** End of Report ***

Appendix F

Locating Report & GPR Scan Images

Hunter Smith Management Pty. Ltd.

Locating Report

Date: 13/07/2017

Client: Douglas Partners
Contact: David Walker
Site: 24 Davis Road, Wetherill Park
Site Date: 30/06/2017
Equipment: Radio Detection RD7000 EMF locator (EMF)
IDS Ouverture Ground Penetrating Radar (GPR)

A large number of GPR scans were carried out over a wide area at 24 Davis Road, Wetherill Park to determine the location and possible whereabouts of any remaining (underground storage tanks) UST's.

Although there are a number of anomalies shown in various scans, there is nothing to suggest that any tanks remain in the ground.
There are a total of 112 scans recorded and submitted with this report.

Every precaution is taken by Hunter Smith to ensure the work has been carried out as safely and responsibly as possible.

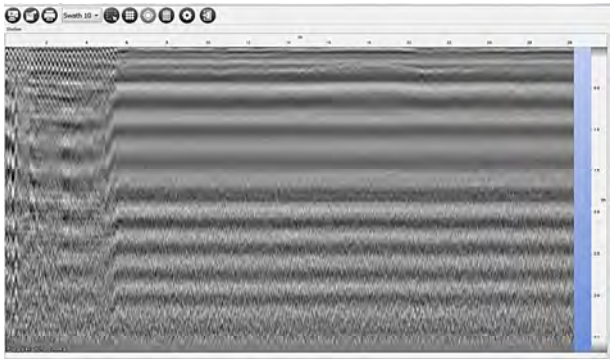
IMPORTANT DISCLAIMER Due to the limitations of the equipment as described above and ground conditions, there will on occasion be no indication of the presence of underground objects, cavities or concealed services, including pipes or cables. The environment can also hinder or prevent accurate feedback or information. Trained staff will determine the location and position of concealed objects, cavities and services, to the best of their ability with the latest equipment. All results relayed to the Client will be the most accurate information possible, for the Client to then use at their discretion. *Hunter Smith* will not be liable for any actual or consequential costs incurred by the Client due to the existence of undetected objects, cavities or services.

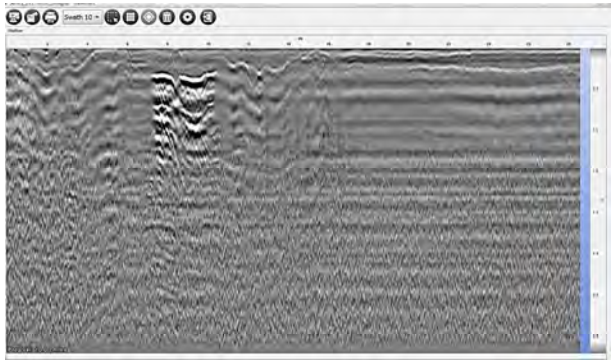
Hunter Smith Management Pty Ltd ABN 96002594658
48 Britannia Road, Castle Hill NSW 2154
Ph: 02 80902695 Fax: 02 82825056 Mob: 0422224761

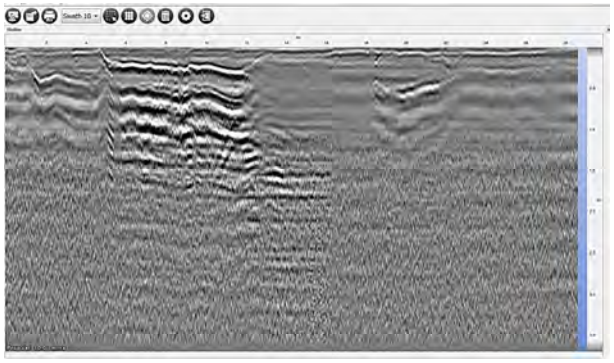
Member of National Utility Locating Contractors Association Australia Incorporated

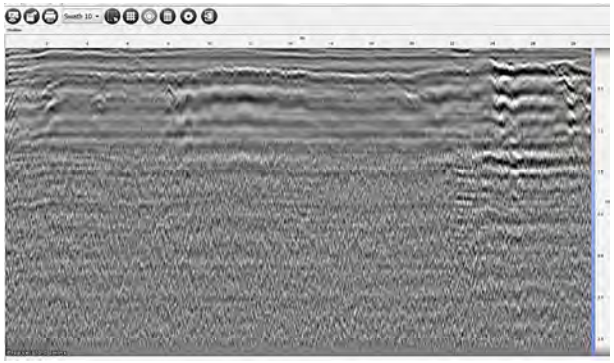
NULCA

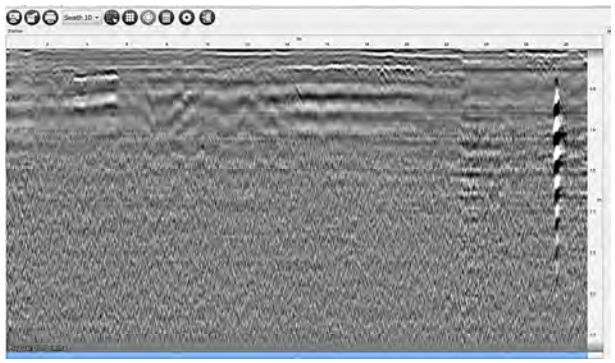
DIAL BEFORE YOU DIG® CERTIFIED LOCATOR

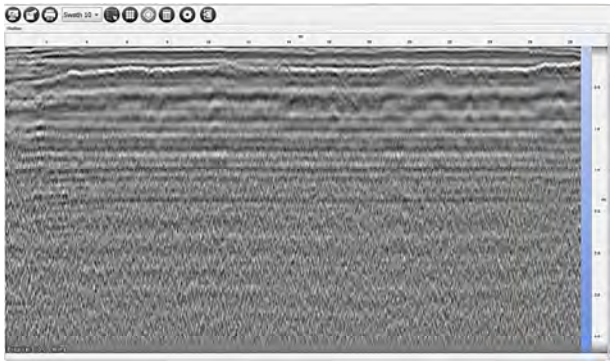


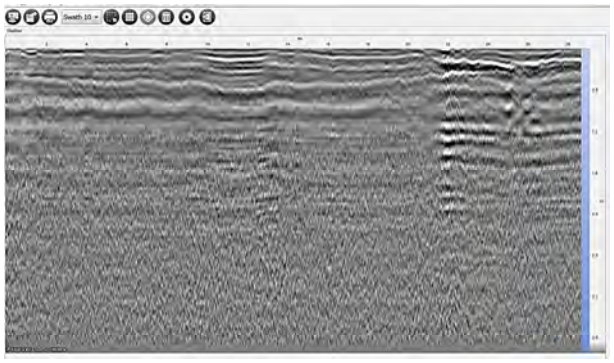


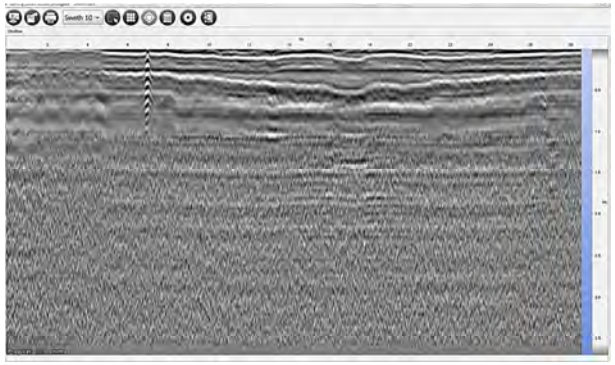


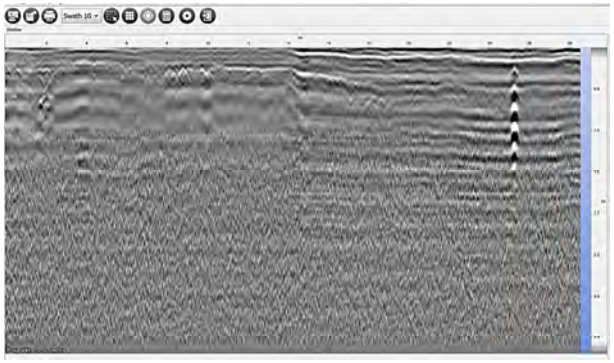


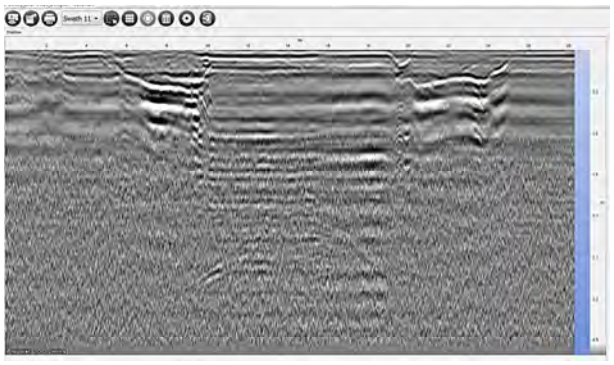


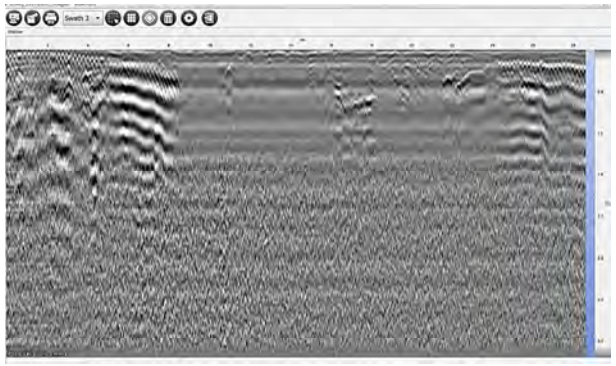


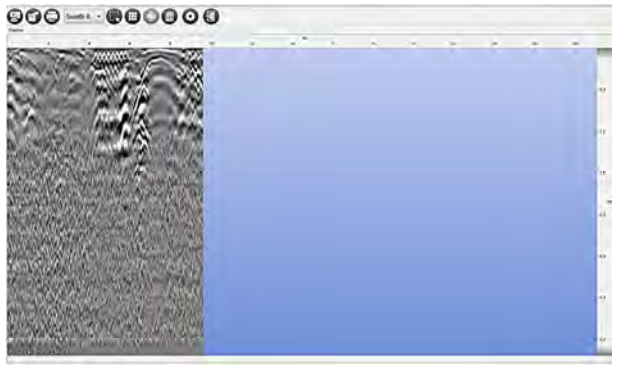


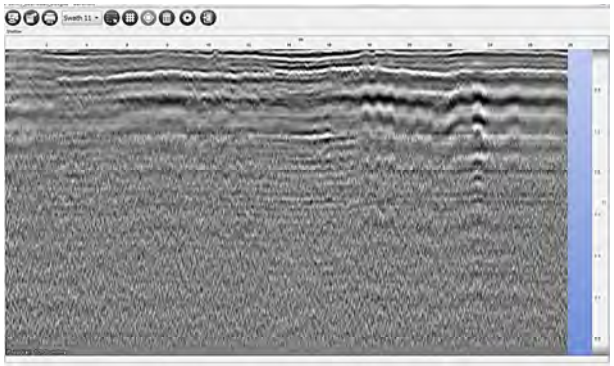


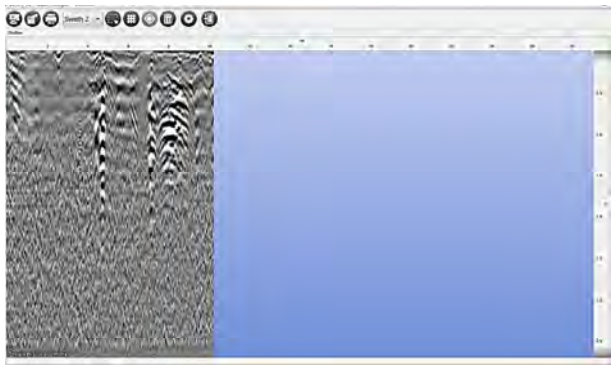


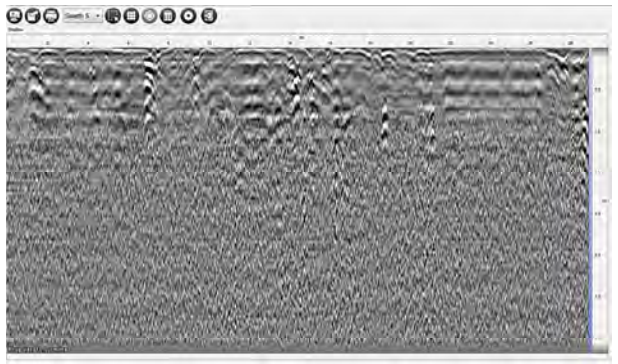


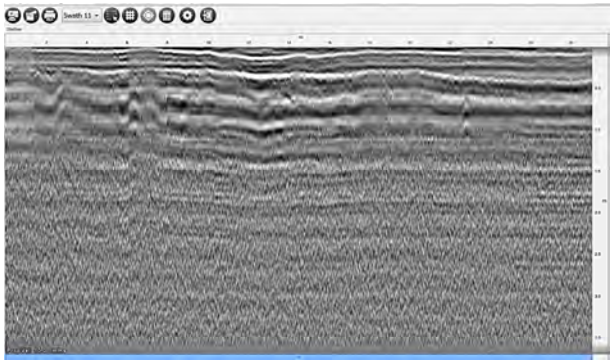


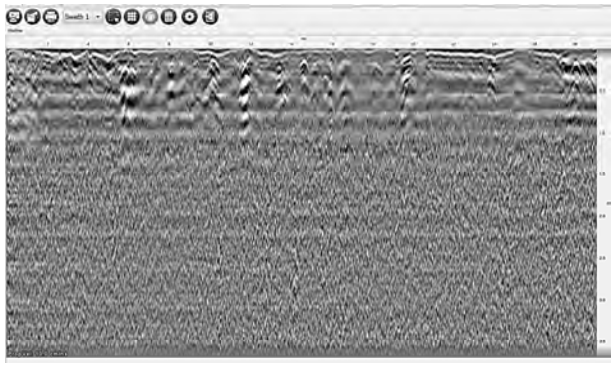


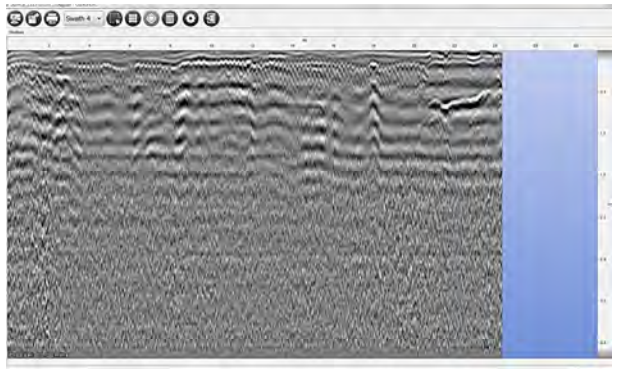


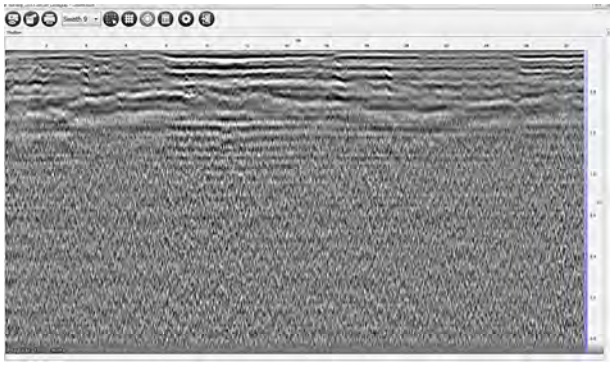


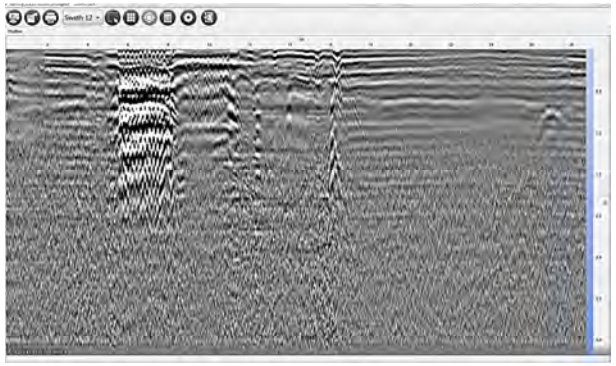


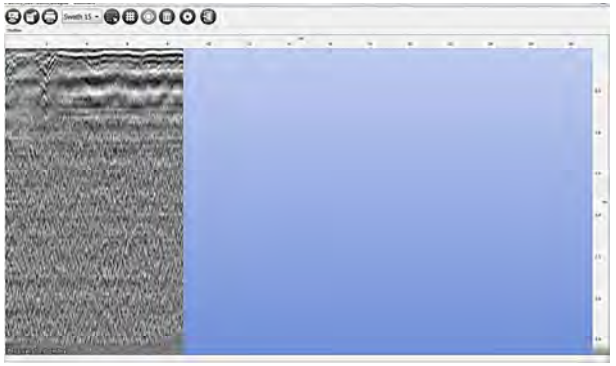


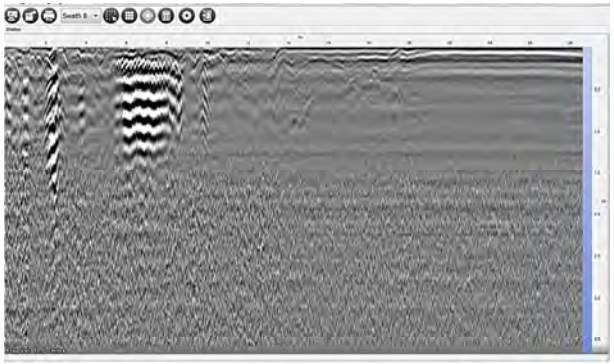


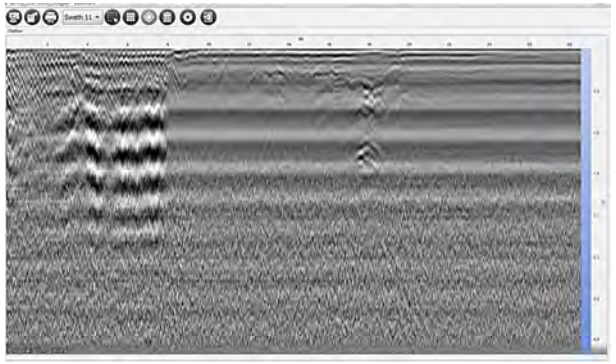


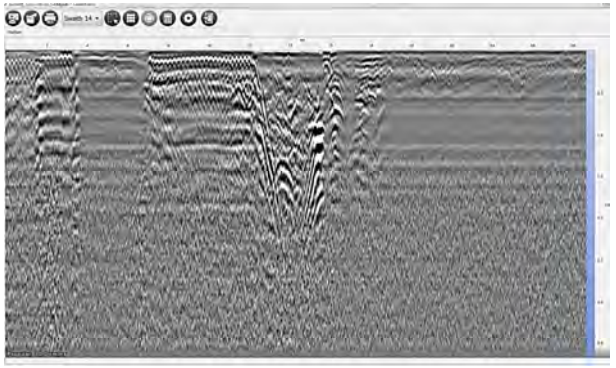


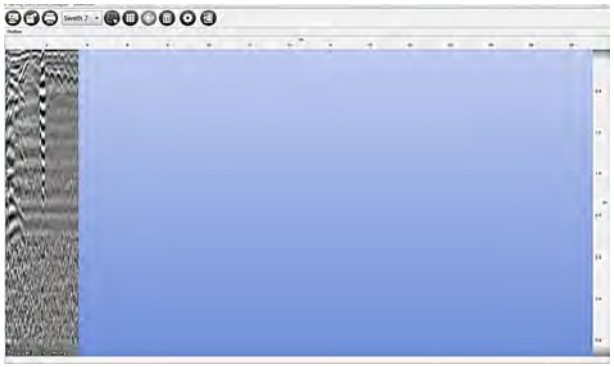


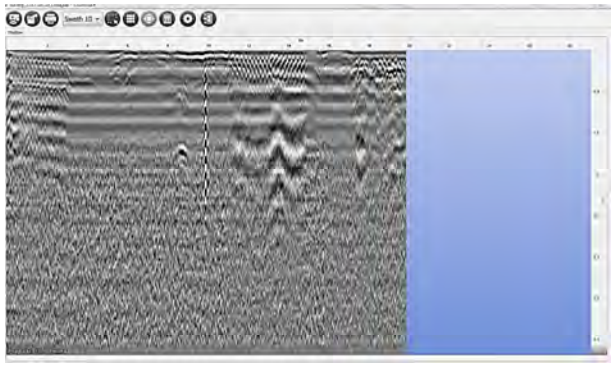


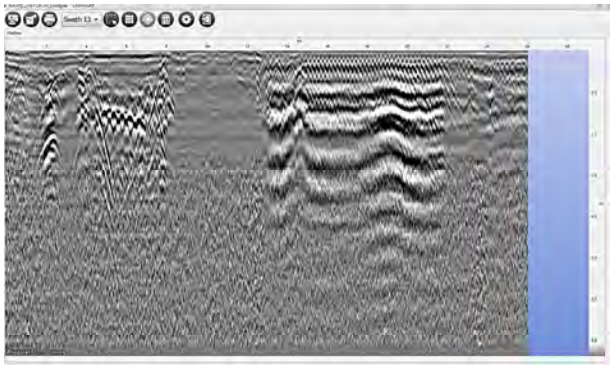


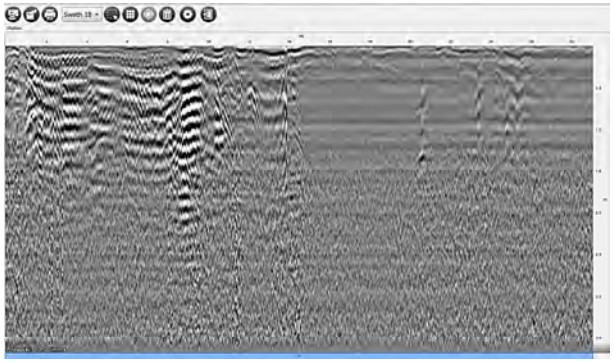


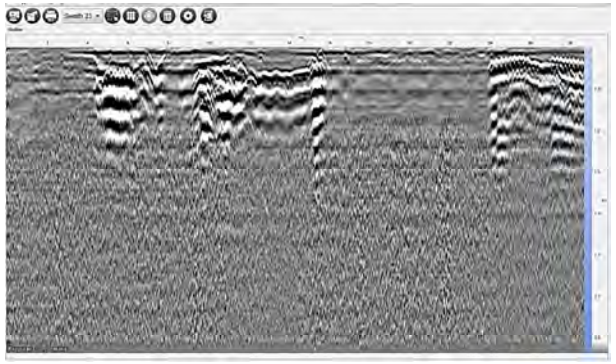


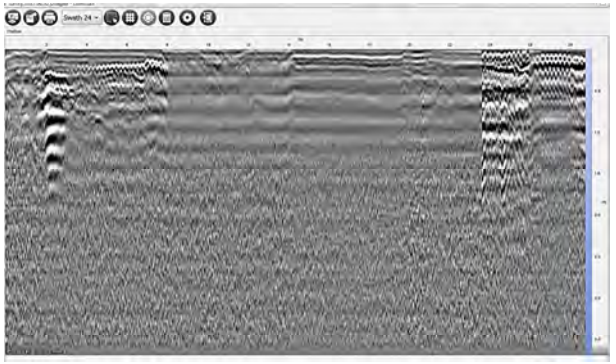


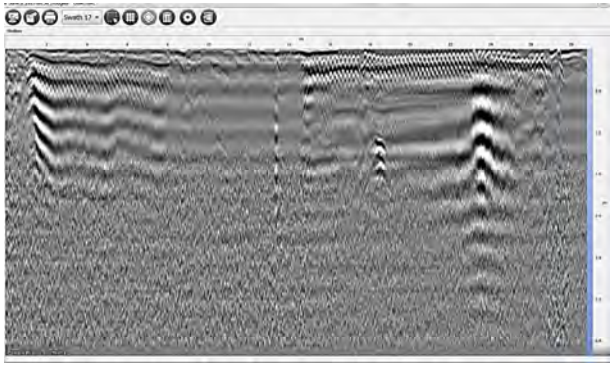


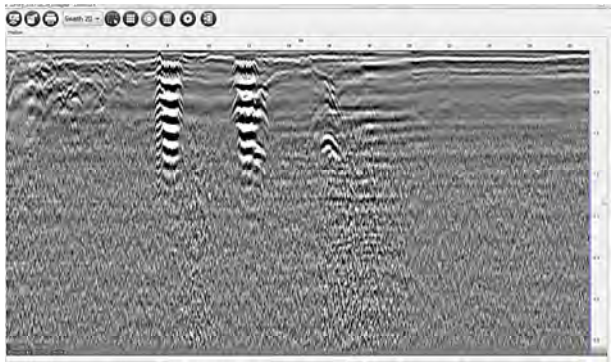


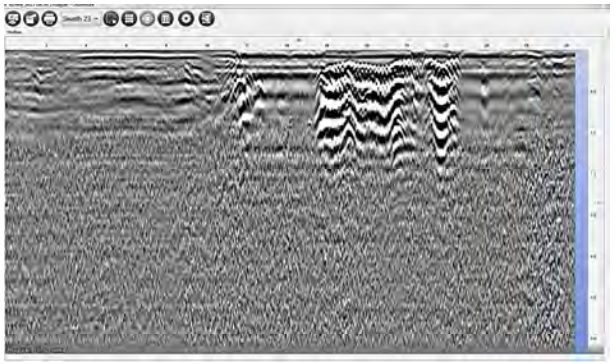


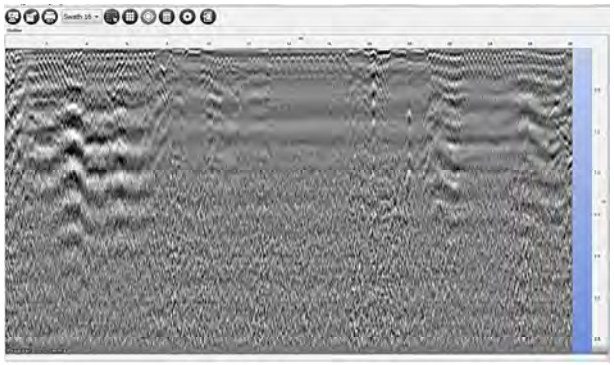


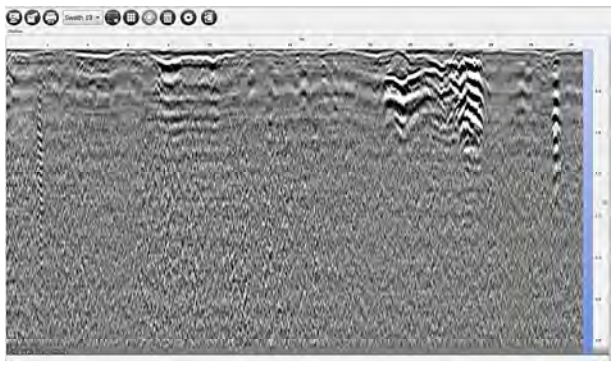


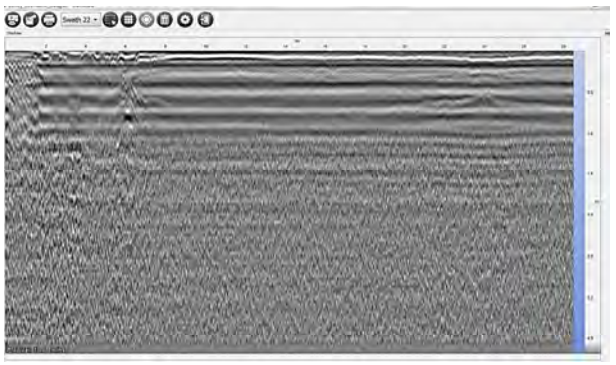


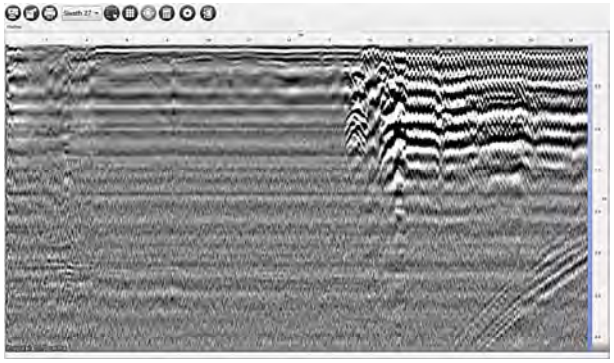


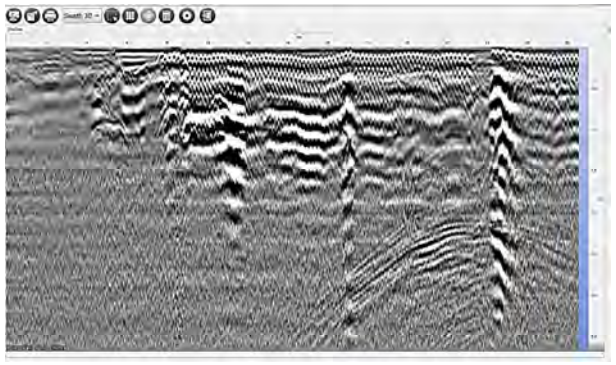


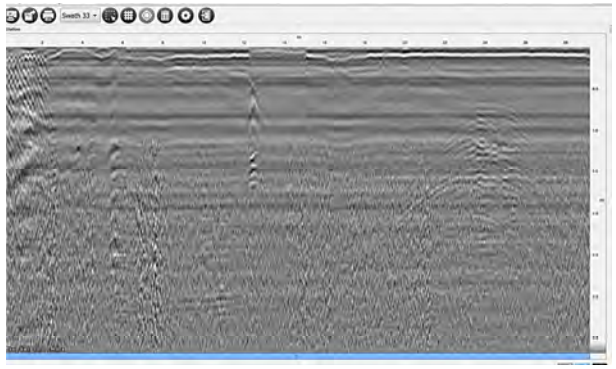


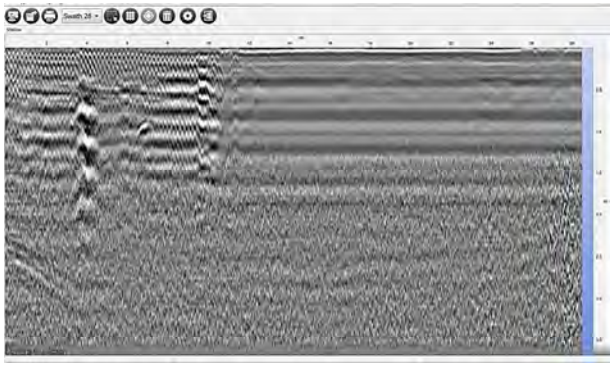


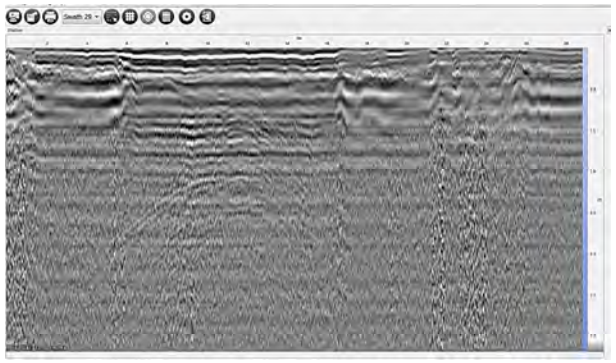


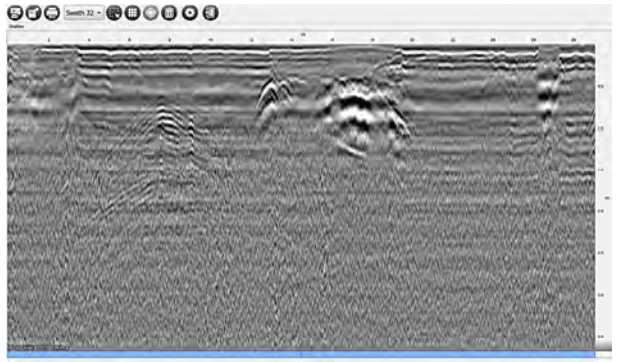


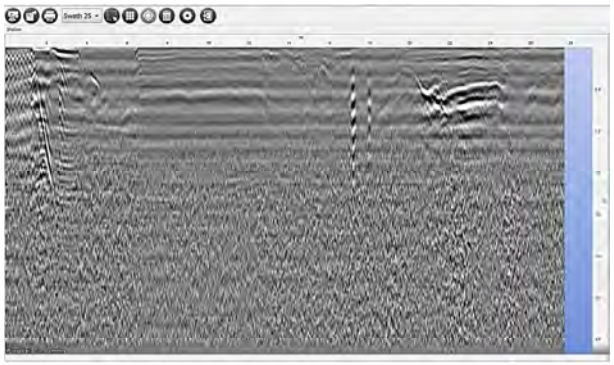


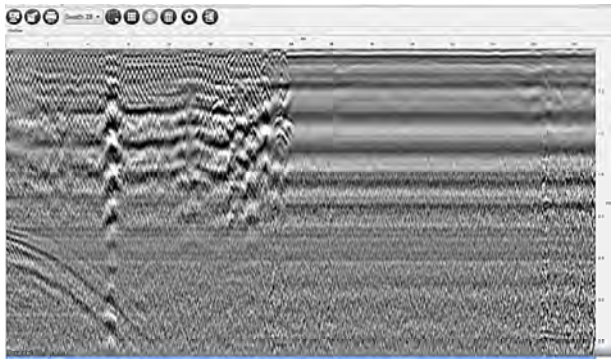


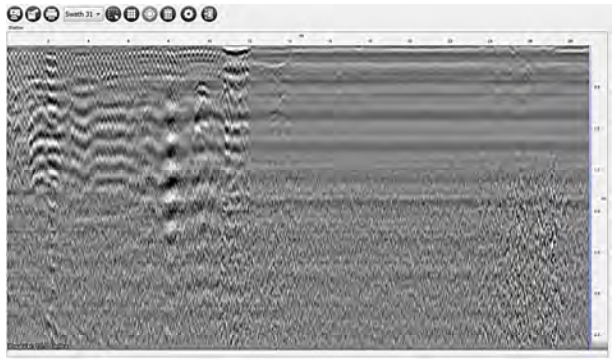


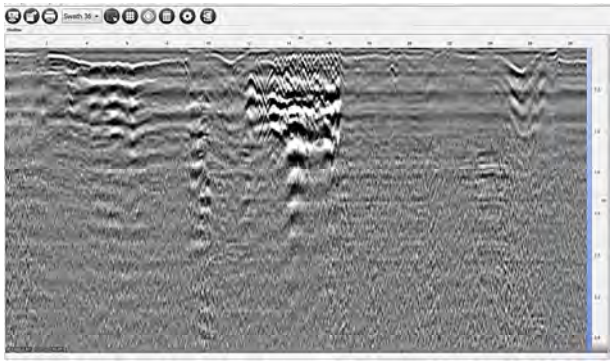


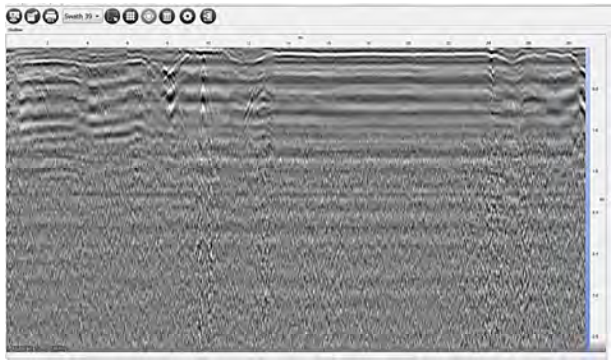


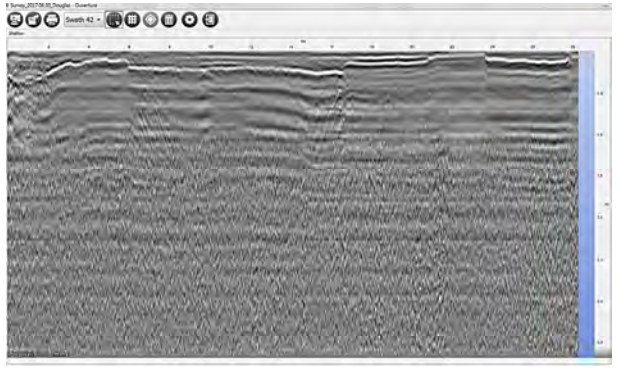


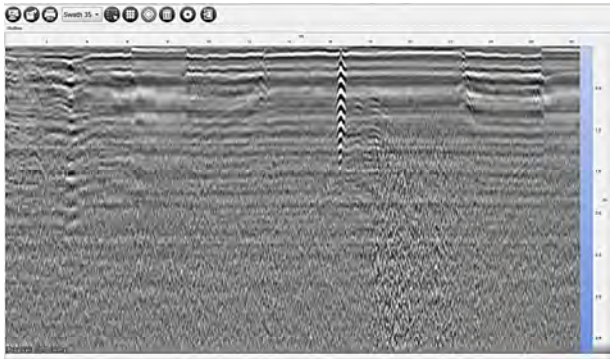


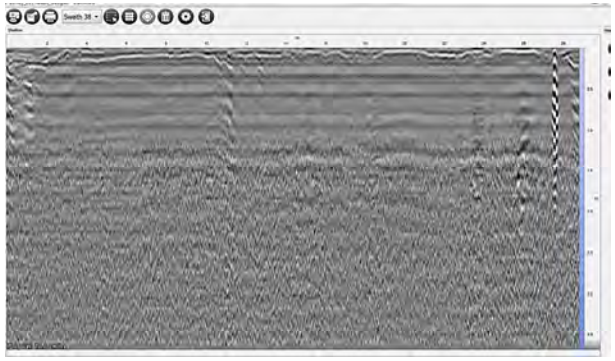


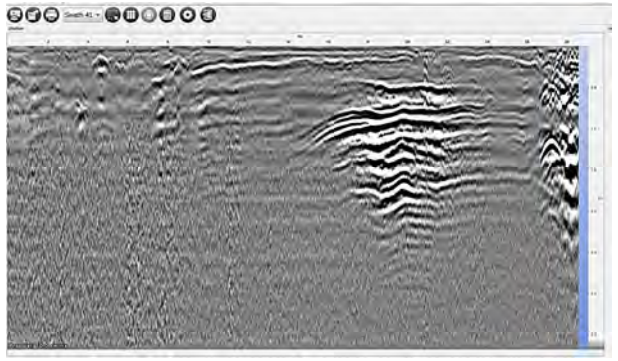


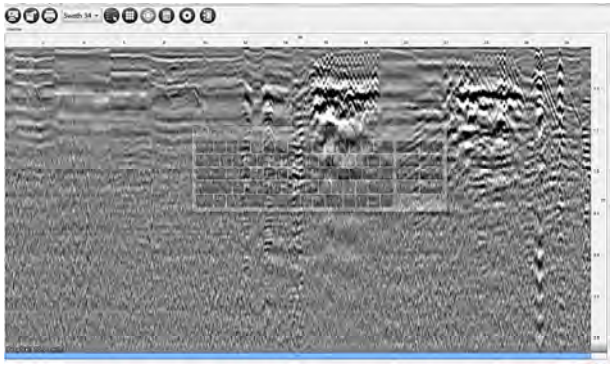


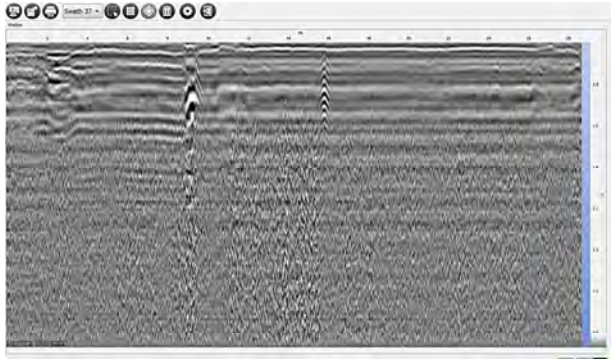


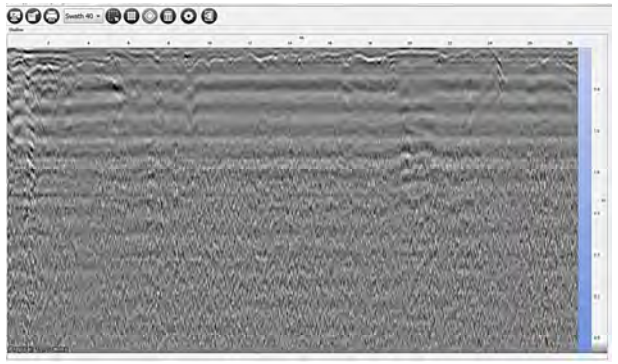


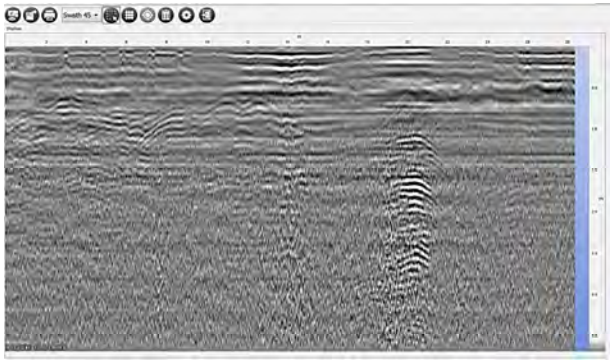


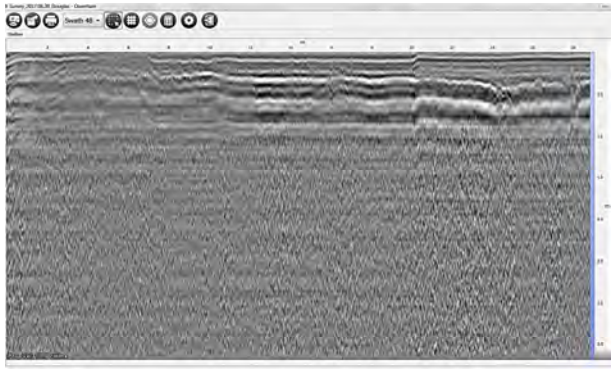


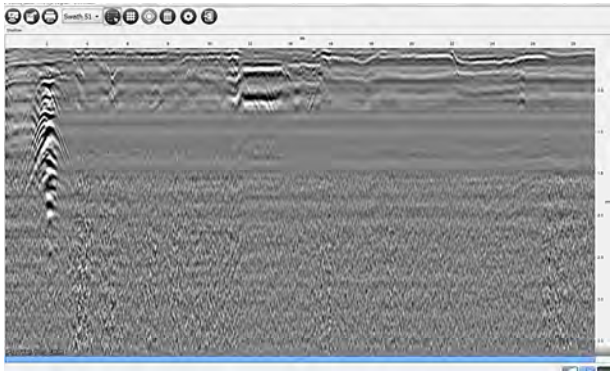


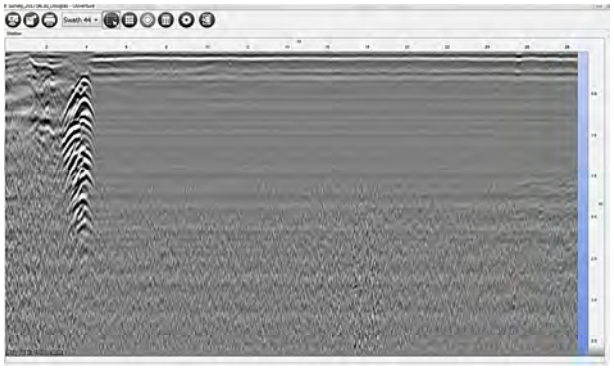


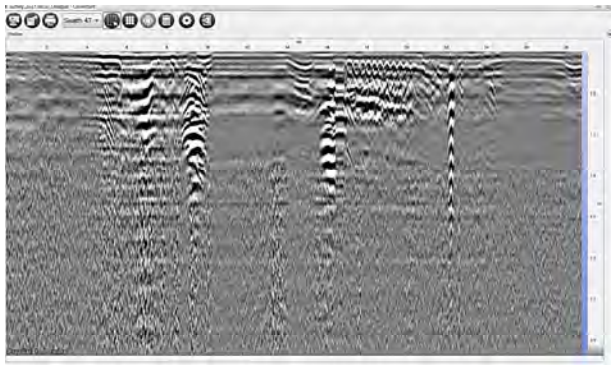


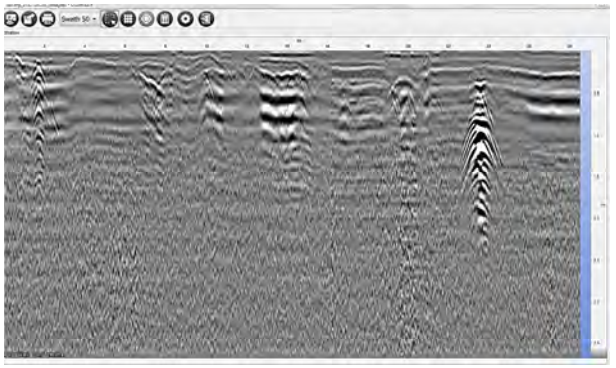


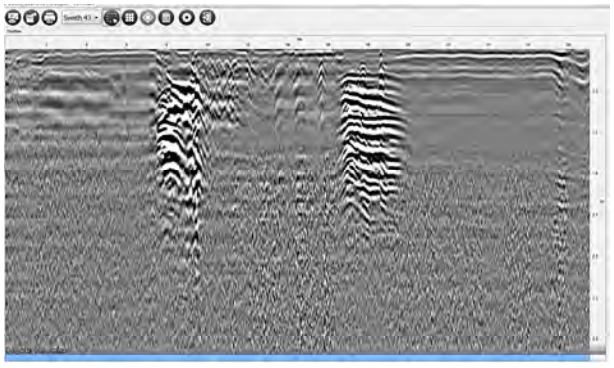


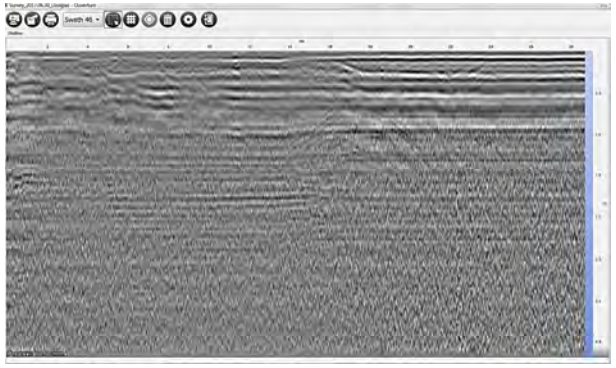


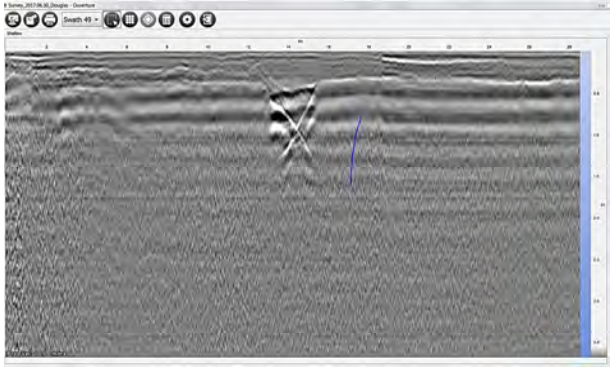


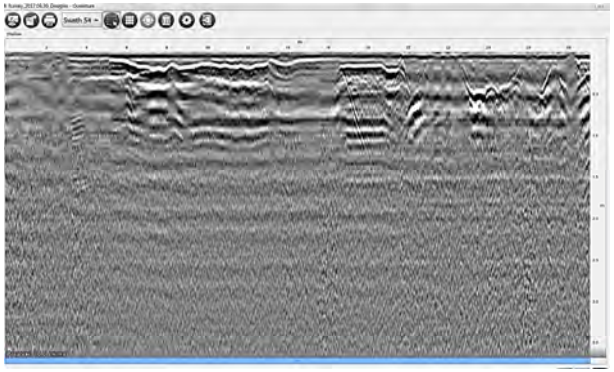


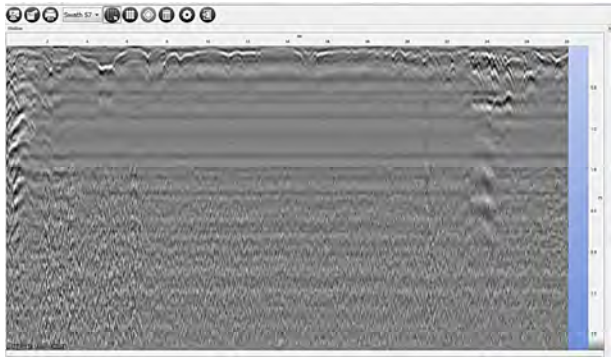


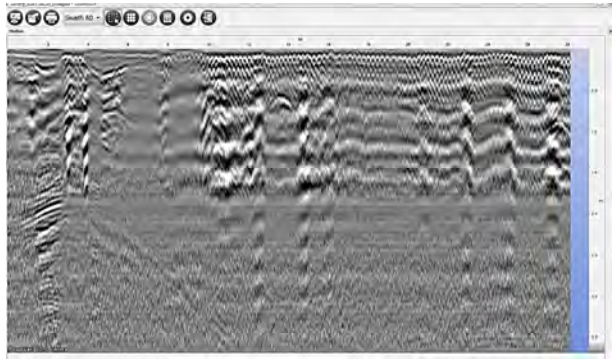


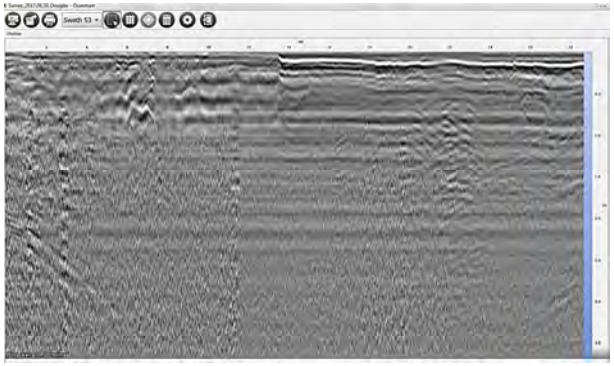


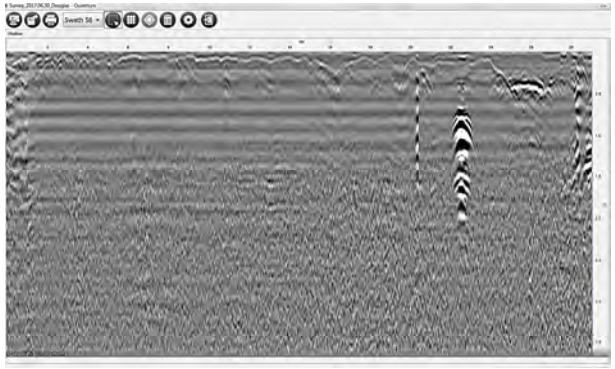


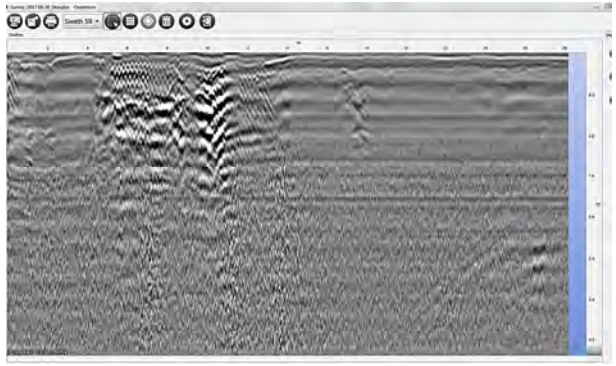


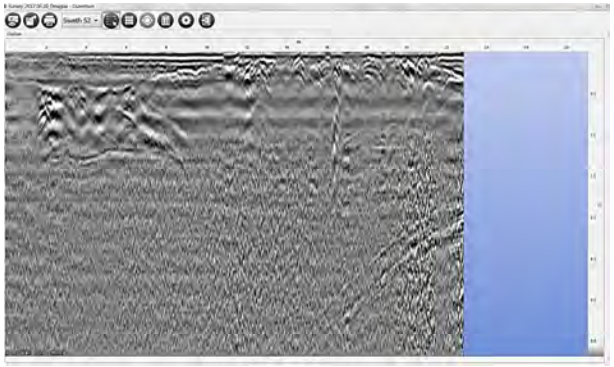


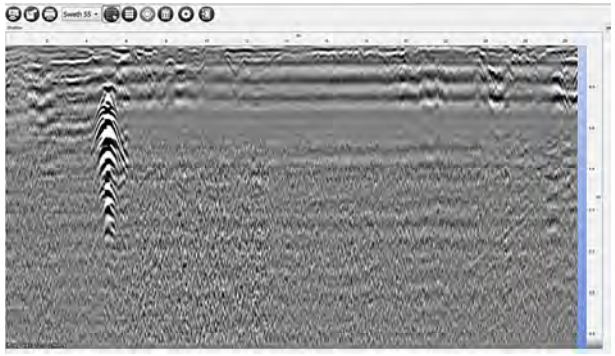


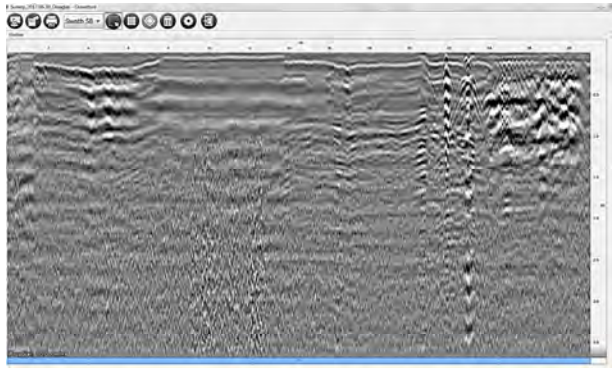


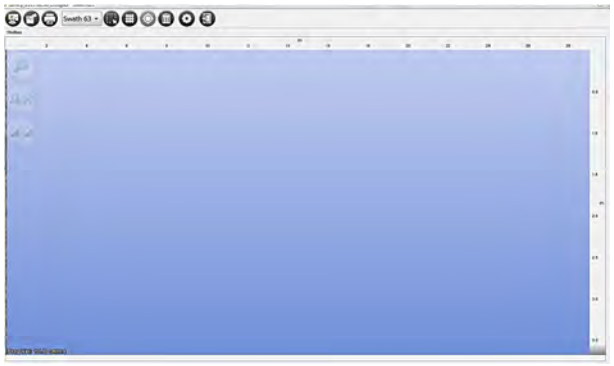


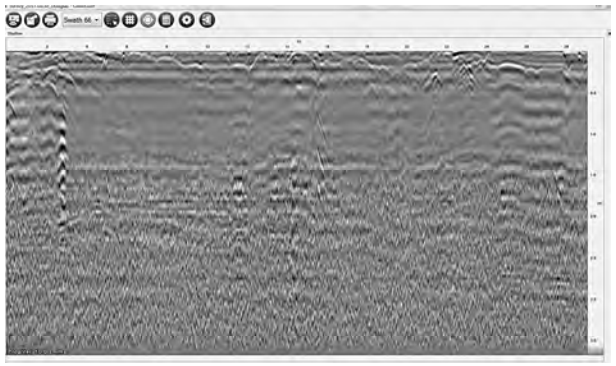


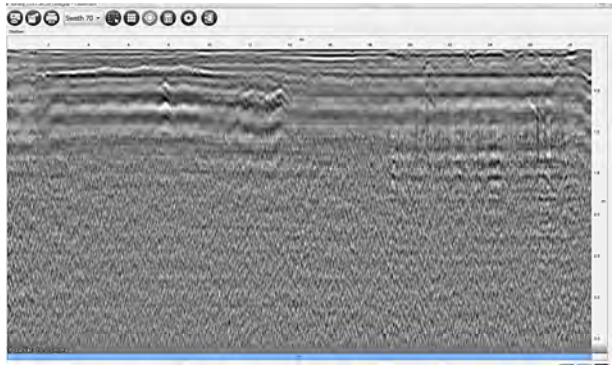


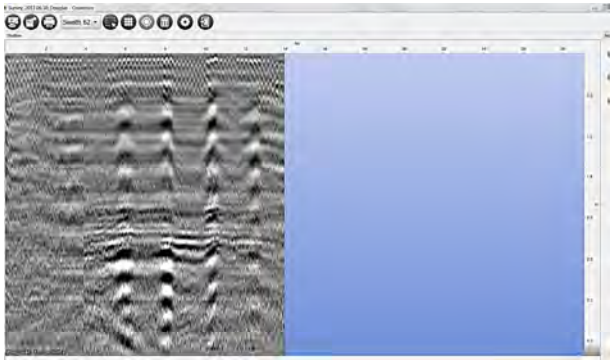


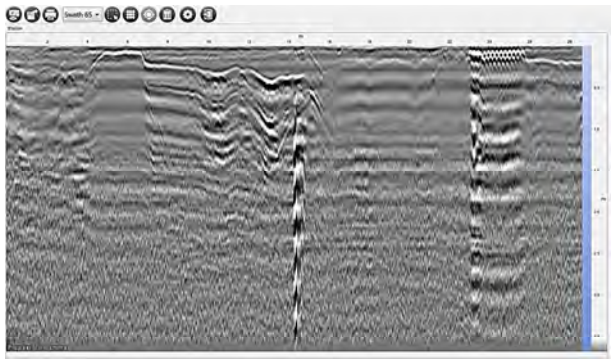


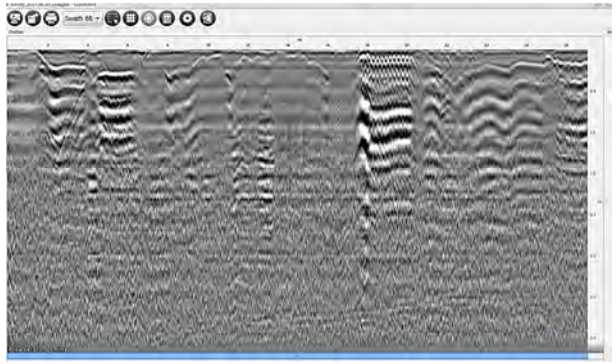


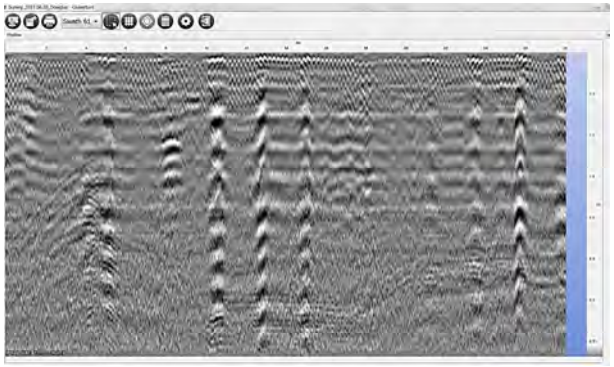


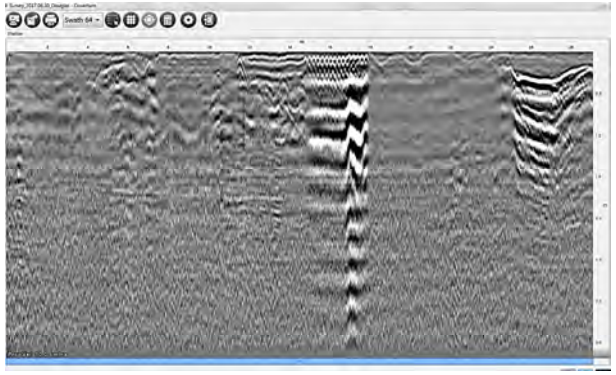


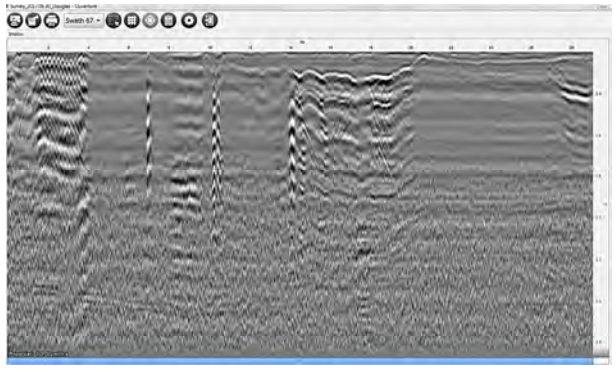


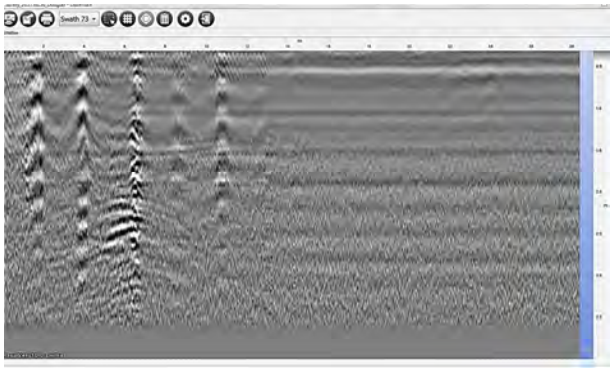


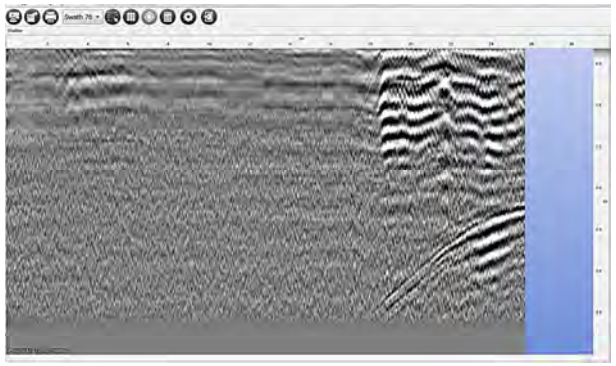


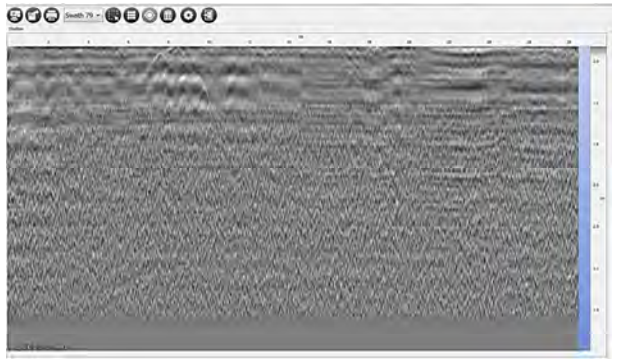


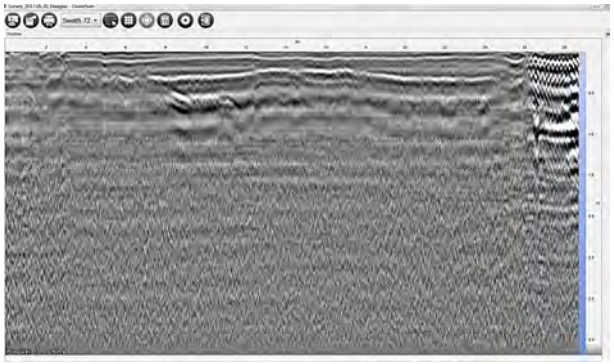


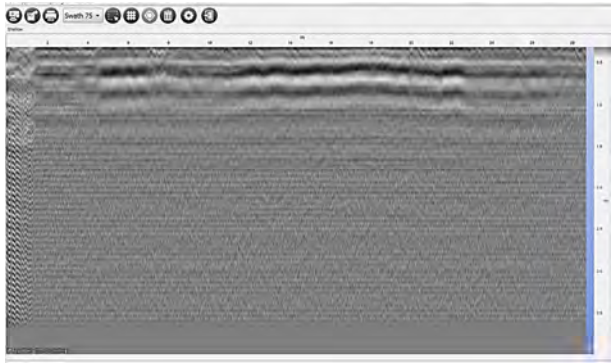


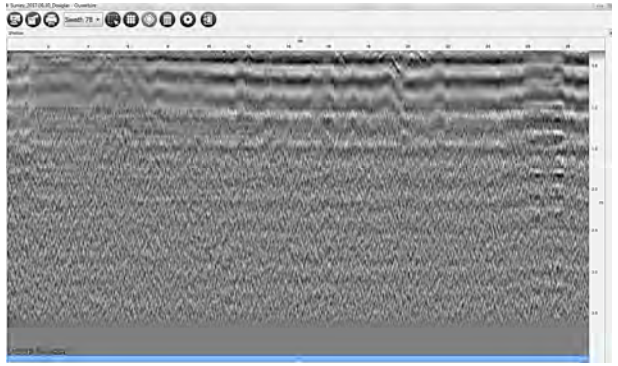


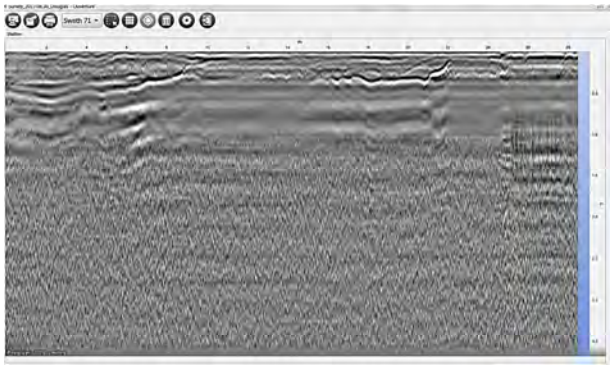


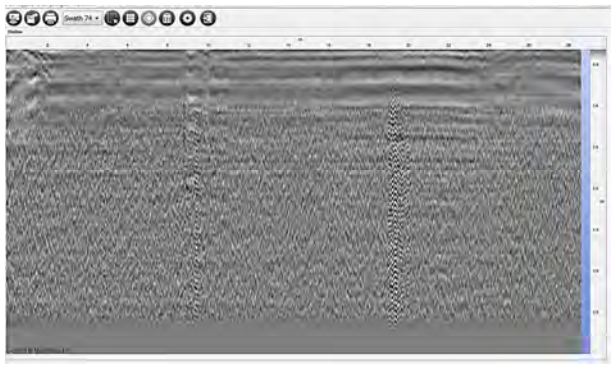


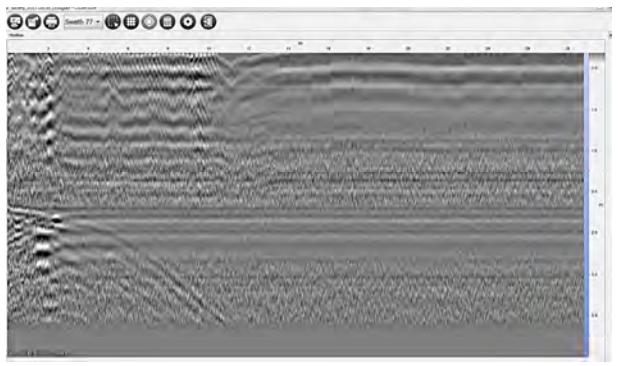


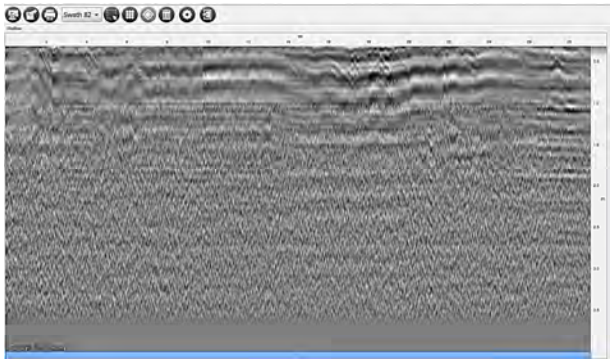


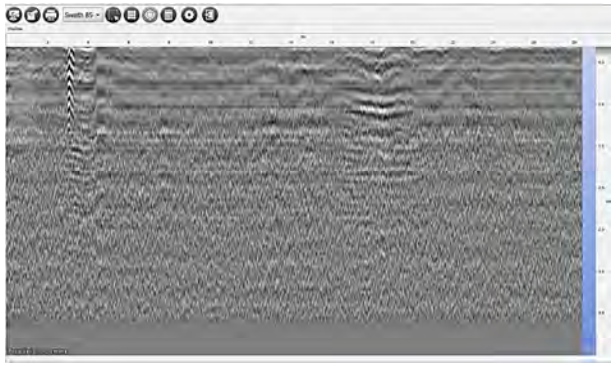


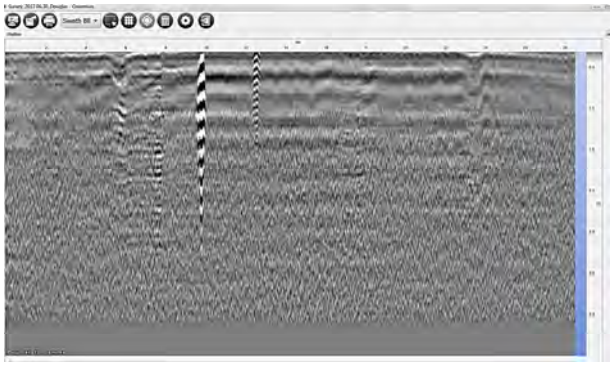


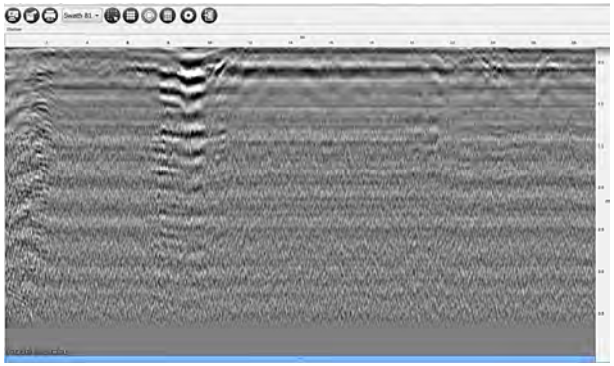


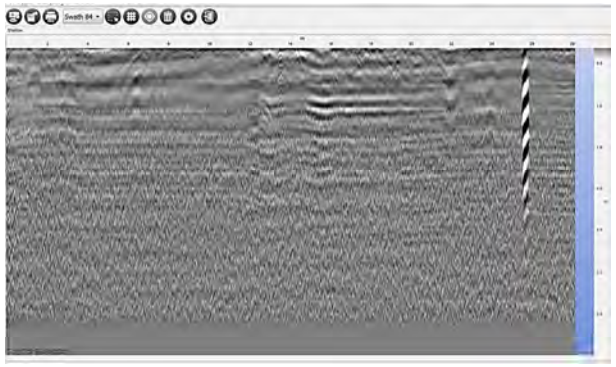


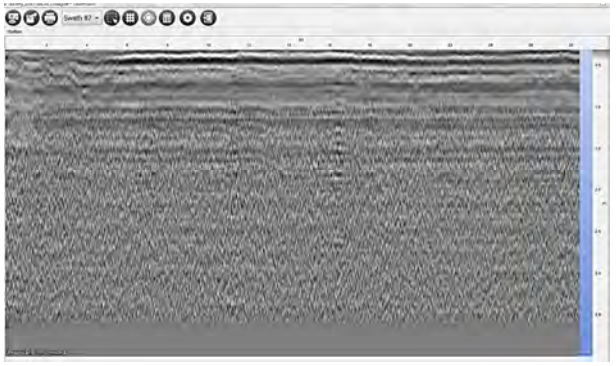


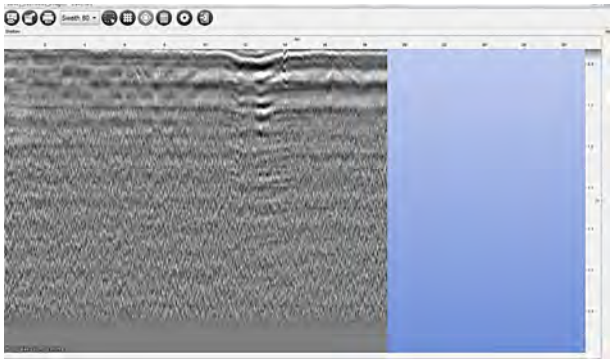


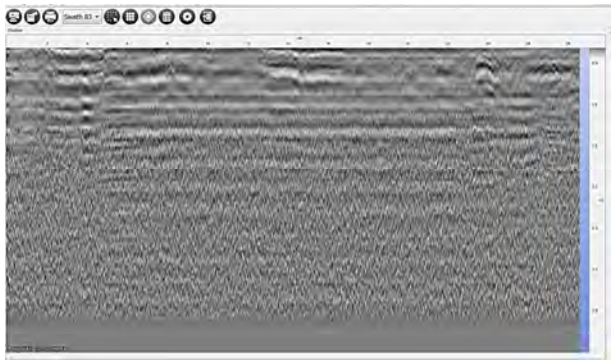


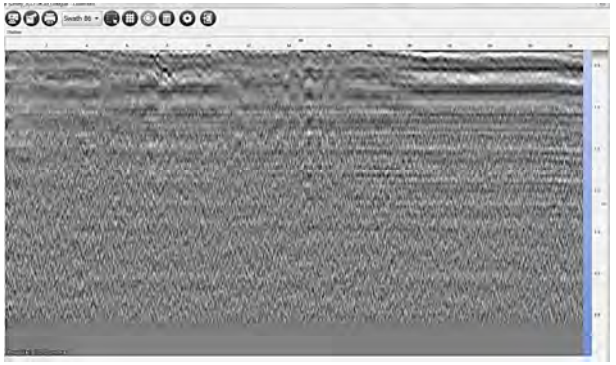


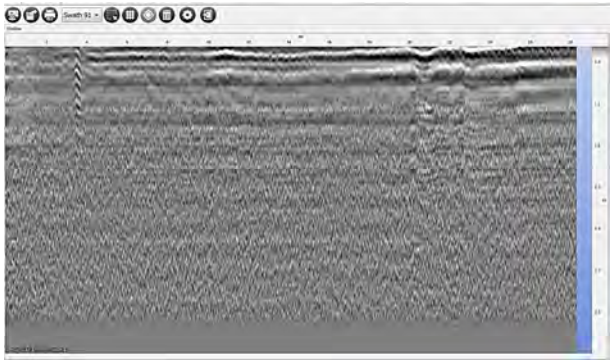


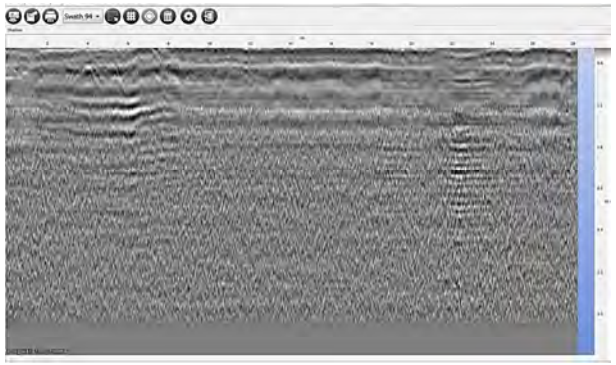


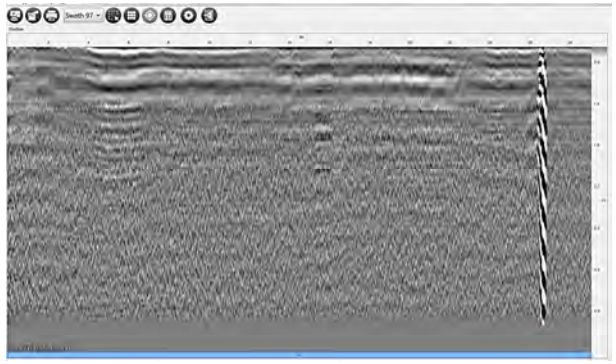


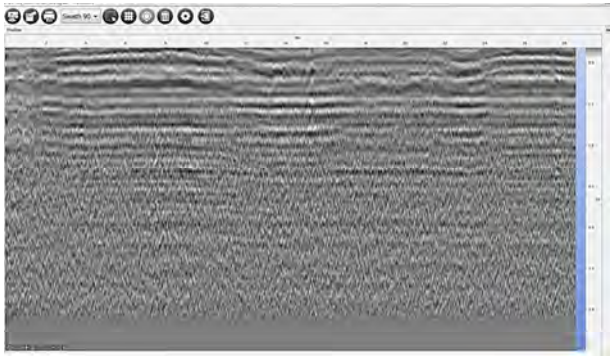


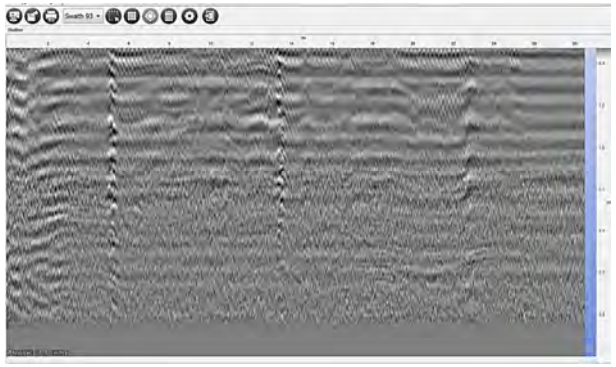


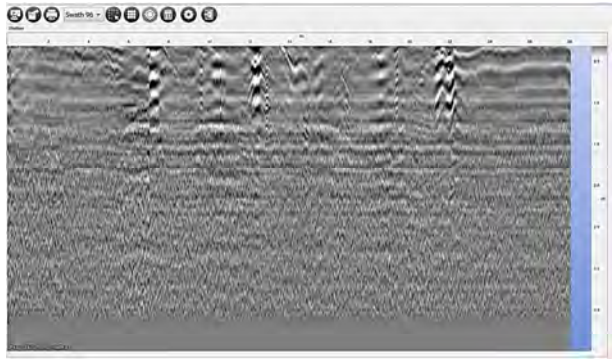


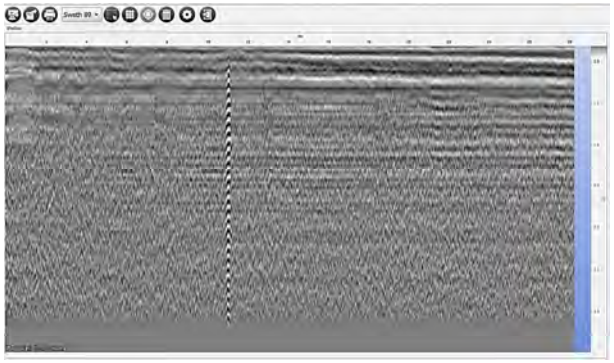


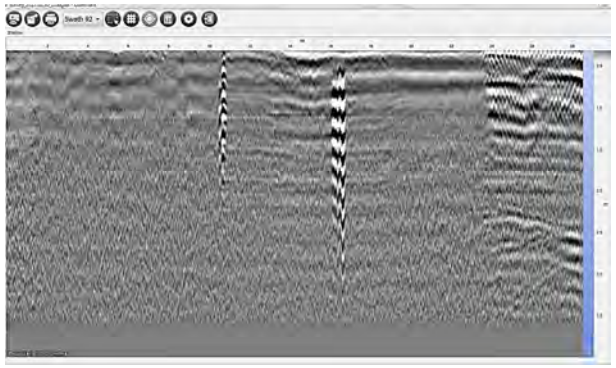


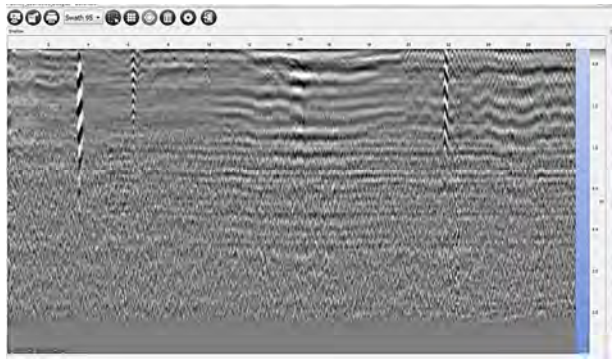


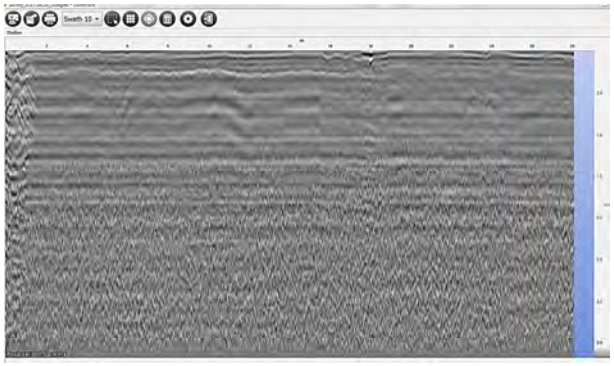


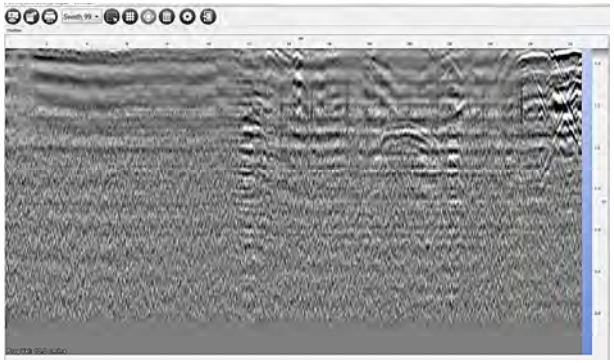


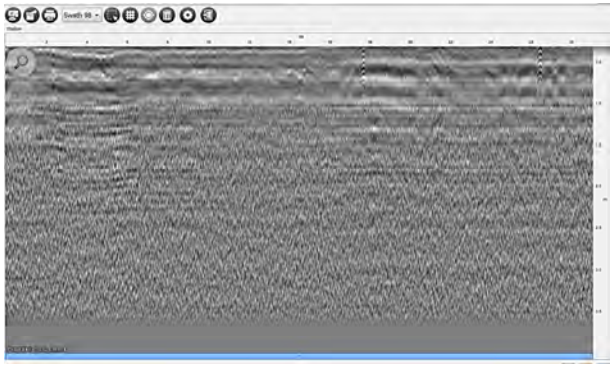












Appendix G

Borehole Logs
& Notes About this Report

About this Report

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Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Sampling Methods

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Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

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Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

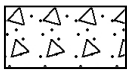
Symbols & Abbreviations

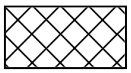
Graphic Symbols for Soil and Rock

General

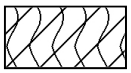

Asphalt

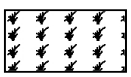

Road base

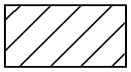

Concrete

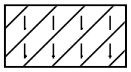

Filling

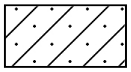
Soils


Topsoil

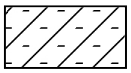

Peat

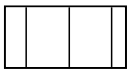

Clay

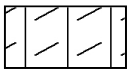

Silty clay

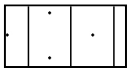

Sandy clay

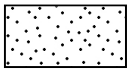

Gravelly clay

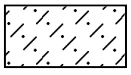

Shaly clay

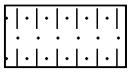

Silt


Clayey silt


Sandy silt

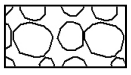

Sand

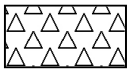

Clayey sand


Silty sand


Gravel

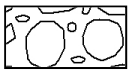

Sandy gravel


Cobbles, boulders

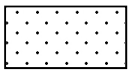

Talus

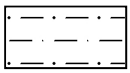
Sedimentary Rocks

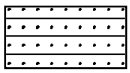

Boulder conglomerate

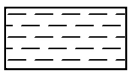

Conglomerate


Conglomeratic sandstone

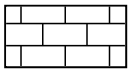

Sandstone


Siltstone

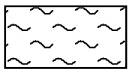

Laminite

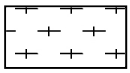

Mudstone, claystone, shale

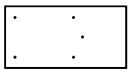

Coal


Limestone

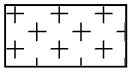
Metamorphic Rocks

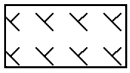

Slate, phyllite, schist

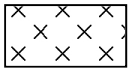

Gneiss

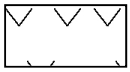

Quartzite

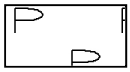
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 36.9 AHD^
EASTING: 305703
NORTHING: 6254016
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
36.8	0.1	CLAYEY SILT - brown clayey silt with some fine sand and a trace of rootlets and ironstone gravel (possible filling)		E*	0.0				
				E	0.1				
36.7	0.23	SILTY CLAY - brown silty clay			0.2				
		Bore discontinued at 0.23m - refusal on very stiff to hard silty clay							
36	1								1
35	2								2
34	3								3
33	4								4
32									

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BDA-050717 is blind replicate from 0.0-0.1m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 37.0 AHD^
EASTING: 305665
NORTHING: 6254012
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
37	0.05	CLAYEY SILT - brown clayey silt with a trace of fine to medium sand and rootlets (possible filling)		E	0.0		PID<1		
				E	0.05		PID<1		
	0.17	SILTY CLAY - brown silty clay			0.12				
		Bore discontinued at 0.17m - refusal on stiff to hard silty clay							
36	1								1
35	2								2
34	3								3
33	4								4

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 37.9 AHD^
EASTING: 305701
NORTHING: 6254036
DIP/AZIMUTH: 90°/--

BORE No: 203
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
37	0.0	FILLING - apparently medium dense, brown silty sand filling with rootlets, organic matter and a trace of gravel		E	0.0		PID<1		
	0.2	SILTY CLAY - firm, mottled brown, red and orange silty clay with some rootlets and a trace of ironstone gravel		E	0.2		PID<1		
	0.7	CLAY - stiff, mottled grey and red clay with a trace of ironstone gravel		E	0.5		PID<1		
36	1.4	SHALE - extremely low strength, extremely weathered, grey shale		E	0.7		PID<1		
	1.9	SHALE - extremely low to very low strength, extremely weathered, brown and grey shale		E	1.0		PID<1		
35	2.2	Bore discontinued at 2.2m - refusal in weathered shale		E	1.4		PID<1		
34				E	1.7		PID<1		
33				E	2.0		PID<1		
				E	2.2				

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.5 AHD^
EASTING: 305745
NORTHING: 6254061
DIP/AZIMUTH: 90°/--

BORE No: 204
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39.5	0.0	FILLING - brown silty gravel filling with some clay and sand		E*	0.0		PID<1		
	0.2	- trace asphalt pieces to 0.05m depth			0.15				
		Bore discontinued at 0.2m to avoid encroaching on buried electricity cable							
39	1								1
38	2								2
37	3								3
36	4								4
35									

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS: *BDB-050717 is blind replicate from 0.0-0.15m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 44.6 AHD^
EASTING: 305745
NORTHING: 6254129
DIP/AZIMUTH: 90°/--

BORE No: 205
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.12	FILLING - brown silty clay filling with a trace of charcoal and rootlets (possibly natural)		E	0.0		PID<1		
		SILTY CLAY - very stiff to hard, brown silty clay with a trace of ironstone nodules			0.1				
					0.3				
44				E			PID<1		
					0.6				
	0.8	SILTY CLAY - hard, brown, grey and white silty clay with some fine sand and a trace of ironstone gravel			0.8				
	1			E			PID<1		1
					1.1				
43									
					1.7				
				E			PID<1		
	2				2.0				2
	2.1	CLAY - hard, light grey clay			2.2				
				E			PID<1		
	2.4	Bore discontinued at 2.4m - refusal on shale			2.4				
42									
	3								3
41									
	4								4
40									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 40.1 AHD^
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 206
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
40	0.13	CONCRETE							
	0.15	FILLING - brown sand filling		E	0.13 0.15		PID<1 minimal samle recovered		
		SHALE - extremely low to very low strength, extremely weathered, grey and brown shale with a trace of ironstone gravel		E	0.2		PID<1		
					0.5				
					0.7				
				E			PID<1		
	1				1.0				1
39	1.1	Bore discontinued at 1.1m - refusal on shale							
	2								2
38									
	3								3
37									
	4								4
36									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Diacore to 0.13m then 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 40.0 AHD^
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 207
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
40		CONCRETE			0.14		PID<1		
	0.14			E	0.19		minimal sample recovered		
	0.19	FILLING - grey-brown sandy gravel and clay filling		E	0.2		PID<1		
	0.3	SILTY CLAY - very stiff, grey and orange-brown silty clay			0.3				
		SHALE - extremely low to very low strength, extremely weathered, grey and brown shale			0.4				
				E			PID<1		
					0.6				
					0.9				
39	1			E			PID<1		1
	1.2	Bore discontinued at 1.2m - refusal on shale			1.2				
38	2								2
37	3								3
36	4								4

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Diacore to 0.14m then 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 40.0 AHD^
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 208
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
40		CONCRETE							
	0.18				0.18				
		FILLING - brown gravelly sand filling with some sandstone fragments and a trace of clay		E					
	0.28			E	0.28				
	0.31	FILLING - brown and grey silty clay filling with a trace of fine sand (possible reworked natural)			0.31				
		Bore discontinued at 0.31m - refusal on very stiff clay							
39	1								1
38	2								2
37	3								3
36	4								4

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Diacore to 0.18m then hand auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 40.1 AHD^
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 209
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
40	0.18	CONCRETE							
	0.3	FILLING - brown clayey sand filling with some sandstone pieces and gravel		E	0.2 0.3		PID<1		
	0.6	FILLING - grey, fine to coarse sand filling with a trace of silt		E	0.5		PID<1		
		Bore discontinued at 0.6m - refusal on concrete (possible buried stormwater service)							
39	1								1
38	2								2
37	3								3
36	4								4

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased
TYPE OF BORING: Diacore to 0.18m then hand auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 40.0 AHD^
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 210
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
40	0.16	CONCRETE							
	0.24	FILLING - grey sandy gravel filling		E*	0.16 0.24		PID<1		
		SHALE - extremely low to very low strength, extremely weathered, grey and brown shale with a trace of ironstone gravel			0.4				
				E			PID<1		
					0.6				
					0.8				
				E			PID<1		
39	1				1.0				1
	1.1	Bore discontinued at 1.1m - refusal on shale							
38	2								2
37	3								3
36	4								4

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Diacore to 0.16m then 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BDC-040717 is blind replicate from 0.16-0.24m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.9 AHD^
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 211
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.16	CONCRETE							
	0.28	FILLING - grey sandy gravel filling		E	0.16				
	0.3	- some brown silt and clay from 0.23m			0.23				
		SILTY CLAY - very stiff, light brown silty clay (possibly reworked)		E	0.28				
		Bore discontinued at 0.3m			0.3				
		- refusal on very stiff to hard silty clay							
39	1								1
38	2								2
37	3								3
36	4								4
35									

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Diacore to 0.16m then hand auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.7 AHD^
EASTING: 305736
NORTHING: 6254063
DIP/AZIMUTH: 90°/--

BORE No: 212
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.12	FILLING - brown silty clay filling with some fine to medium sand and rock fragments		E*	0.0 0.1		PID<1		
	0.3	SILTY CLAY - stiff, light brown silty clay		E	0.2 0.3		PID<1		
		Bore discontinued at 0.3m - refusal on stiff to hard silty clay							

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BDC-050717 is blind replicate from 0.0-0.1m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.8 AHD^
EASTING: 305724
NORTHING: 6254064
DIP/AZIMUTH: 90°/--

BORE No: 213
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		CONCRETE							
	0.2				0.2				
	0.25	FILLING - brown gravelly sandy clay filling		E	0.25		PID<1		
		SILTY CLAY - stiff, grey and brown silty clay		E	0.3 0.4		PID<1		
	0.45	SHALE - very low strength, extremely weathered, grey and brown shale							
39	1				0.9				1
				E			PID<1		
					1.2				
	1.4	Bore discontinued at 1.4m - refusal on shale							
38	2								2
37	3								3
36	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.4 AHD^
EASTING: 305720
NORTHING: 6254107
DIP/AZIMUTH: 90°/--

BORE No: 214
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - grey gravelly sand filling with a trace of asphalt fragments		E	0.0		PID<1		
	0.2	CLAY - stiff, grey and brown clay with a trace of gravel and shale (possible filling)		E	0.2		PID<1		
	0.3	SHALE - extremely low to very low strength, extremely weathered, grey and brown shale			0.3				
				E*	0.4		PID<1		
	1				0.6				1
					0.9				
				E			PID<1		
	1.2	Bore discontinued at 1.2m - refusal on shale			1.2				
38	2								2
37	3								3
36	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BDA-040717 is blind replicate from 0.4-0.6m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.4 AHD^
EASTING: 305723
NORTHING: 6254104
DIP/AZIMUTH: 90°/--

BORE No: 215
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - brown and grey gravelly clay filling with a trace of sand		E	0.0		PID<1		
	0.2	FILLING - grey, brown and orange gravelly silty clay filling		E	0.2		PID<1		
	0.4	FILLING - black, brown, grey and orange gravelly sandy clay filling with some ash and bitumen			0.4				
				E*	0.5		PID<1		
					0.8				
	0.9	SILTY CLAY - stiff, grey silty clay		E	0.9		PID<1		
	1.0	SHALE - very low strength, extremely weathered, grey shale			1.0				
	1.2	Bore discontinued at 1.2m - refusal on shale							

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: *BD11-050717 is blind replicate from 0.5-0.8m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.5 AHD^
EASTING: 305713
NORTHING: 6254084
DIP/AZIMUTH: 90°/--

BORE No: 216
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - firm, grey, brown and orange sandy silty gravelly clay filling		E	0.0		PID<1		
	0.2				0.2				
	0.3	FILLING - firm, grey, light brown, red and orange silty clay filling with some sand and a trace of gravel			0.4				
	0.4			E	0.4		PID=2		
	0.6				0.6				
	1								1
	1.1	SHALE - extremely low to very low strength, extremely weathered, brown and grey shale			1.1				
38	1.1			E	1.1		PID<1		
	1.4	SHALE - very low strength, extremely weathered, grey shale			1.4				
	1.4			E	1.4		PID<1		
	1.7	Bore discontinued at 1.7m - refusal on shale			1.7				
	2								2
37									
	3								3
36									
	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.5 AHD^
EASTING: 305715
NORTHING: 6254092
DIP/AZIMUTH: 90°/--

BORE No: 217
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - grey sandy clayey gravel filling with some black bituminous substance and a trace of metal		E	0.0		PID<1		
	0.25	FILLING - grey sandy clayey gravel filling with a trace of charcoal		E	0.25		PID<1		
					0.5				
	0.7	CLAY - hard grey clay		E	0.7		PID<1		
	0.9	SHALE - very low strength, extremely weathered, grey and brown shale with trace of ironstone nodules			0.9				
38	1				1.2				1
				E			PID<1		
	1.7	Bore discontinued at 1.7m - refusal on shale			1.5				
	2								2
37									
	3								3
36									
	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.5 AHD^
EASTING: 305708
NORTHING: 6254090
DIP/AZIMUTH: 90°/--

BORE No: 218
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0			E	0.0		PID<1		
	0.1	FILLING - dark grey gravelly sand filling with a trace of possible ash and asphalt			0.1		minimal sample recovered		
		FILLING - grey sandy gravel filling with a trace of clay			0.2				
				E*			PID<1		
39	0.5	SHALE - extremely low strength, extremely weathered, grey and orange-brown shale (soil properties)			0.5				
					0.6				
				E			PID<1		
	1				0.9				1
	1.2	SHALE - extremely low to very low strength, extremely weathered, grey and brown shale with some sandy clay bands							
38					1.3				
				E					
					1.6				
	1.8	Bore discontinued at 1.8m - refusal on shale							
	2								2
37									
	3								3
36									
	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BDB-040717 is blind replicate from 0.2-0.5m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.3 AHD^
EASTING: 305709
NORTHING: 6254083
DIP/AZIMUTH: 90°/--

BORE No: 219
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - soft to firm, brown, grey and orange sandy gravelly clay filling with a trace of rootlets and silt		E	0.0		PID<1		
					0.2				
	0.6	FILLING - firm, grey, brown and green gravelly sandy clay filling		E*	0.7		PID<1		
	1 1.0	CLAY - stiff, orange and brown clay with some silt and a trace of sand			1.0				1
				E	1.1		PID<1		
38	1.3	SHALE - very low strength, extremely weathered, brown and grey shale			1.3				
				E	1.4		PID<1		
				E	1.6		PID<1		
	1.8	Bore discontinued at 1.8m - refusal on shale			1.8				
	2								2
37									
	3								3
36									
	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD2-040717 is blind replicate from 0.7-1.0m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.5 AHD^
EASTING: 305704
NORTHING: 6254090
DIP/AZIMUTH: 90°/--

BORE No: 220
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - black clayey gravelly silty sand filling with a trace of rootlets		E	0.0		PID<1		
	0.2	CLAY - firm, light brown and grey clay with a trace of sand and gravel			0.2				
				E*	0.3		PID<1		
					0.6				
	0.7	CLAY - stiff, grey and light brown clay		E	0.7		PID<1		
	1.0	SHALE - very low strength, extremely weathered, grey shale			1.0				
				E	1.1		PID<1		
	1.4	SHALE - very low strength, extremely weathered, brown and grey shale			1.3				
38				E	1.5		PID<1		
	1.8	Bore discontinued at 1.8m - refusal on shale			1.7				
37	2								2
36	3								3
35	4								4

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD3-040717 is blind replicate from 0.3-0.6m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.2 AHD^
EASTING: 305703
NORTHING: 6254080
DIP/AZIMUTH: 90°/--

BORE No: 221
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - medium dense, brown and grey sandy clay filling with some silt and gravel		E	0.0		PID<1		
	0.2				0.1				
	0.2	FILLING - firm, grey and light brown silty clay filling with some gravel		E			PID<1		
	0.3				0.3				
	0.3	FILLING - firm, grey, red and light brown gravelly clay filling with some sand and cobbles		E			PID<1		
	0.5				0.5				
	0.5	CLAY - firm, grey, red and light brown clay with a trace of sand and rootlets			0.6				
				E			PID<1		
	0.8	SHALE - extremely low strength, extremely weathered, light brown and grey shale			0.8				
38	1				1.2				1
				E			PID<1		
					1.5				
					1.9				
	2	- becoming very low strength from 1.9m		E			PID<1		2
37	2.2				2.1				
		Bore discontinued at 2.2m - refusal on shale							
36	3								3
35	4								4

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.1 AHD^
EASTING: 305702
NORTHING: 6254081
DIP/AZIMUTH: 90°/--

BORE No: 222
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.1	FILLING - medium dense, brown gravelly sandy silt filling		E	0.0		PID<1		
		FILLING - firm, brown and grey, sandy clay filling with some gravel and silt, and a trace of ash and slag			0.1				
				E	0.3		PID<1		
					0.5				
	0.7	FILLING - soft, grey, brown and orange gravelly clay filling with some sand and a trace of silt		E*	0.7		PID=2		
38	1			E	1.0		PID<1		1
	1.3	FILLING - black bituminous sandy gravel with a trace of clay		E	1.3		PID<1 strong bitumen odour		
	1.4	CLAY - stiff, grey and light brown clay with a trace of silt			1.4				
	1.6	SHALE - extremely low to very low strength, extremely weathered, grey and brown shale			1.7		PID<1		
37	2			E	2.0				2
	2.6	Bore discontinued at 2.6m - refusal on shale							
36	3								3
35	4								4

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD1-040717 is blind replicate from 0.7-1.0m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.4 AHD^
EASTING: 305690
NORTHING: 6254101
DIP/AZIMUTH: 90°/--

BORE No: 223
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.1	CONCRETE			0.1				
	0.3	FILLING - brown and grey silty clay filling with a trace of gravel		E	0.3		PID<1		
		SILTY CLAY - hard, grey silty clay with a trace of sand			0.4				
	0.6			E	0.6		PID<1		
		SHALE - extremely low strength, extremely weathered, brown and grey shale			0.7				
	1			E	1.0		PID<1		1
38	1.2	SHALE - extremely low to very low strength, extremely weathered, brown and grey shale with a trace of ironstone nodules			1.2				
				E	1.5		PID<1		
	1.6	Bore discontinued at 1.6m - refusal on shale							
	2								2
37									
	3								3
36									
	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.4 AHD^
EASTING: 305682
NORTHING: 6254102
DIP/AZIMUTH: 90°/--

BORE No: 224
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - brown, black and grey silty sand filling with some clay, rootlets, organic matter and a trace of gravel		E	0.0		PID<1		
	0.2				0.2				
	0.3	SHALE - extremely low strength, extremely weathered, grey and brown shale			0.4				
	0.4			E*			PID<1		
	0.6				0.6				
	0.7	SHALE - extremely low to very low strength, extremely weathered, grey and brown shale with a trace of ironstone nodules			0.8				
38	1			E	1.0		PID<1		1
	1.1	Bore discontinued at 1.1m - refusal on shale							
	2								2
37									
	3								3
36									
	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD4-040717 is blind replicate from 0.4-0.6m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 40.6 AHD^
EASTING: 305671
NORTHING: 6254093
DIP/AZIMUTH: 90°/--

BORE No: 225
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
40	0.0	FILLING - medium dense, brown silty sand filling with rootlets, organic matter and a trace of gravel		E	0.0		PID<1		
	0.2	CLAY - stiff, brown mottled red, yellow and orange clay with some rootlets			0.2				
				E	0.3		PID<1		
					0.5				
	0.8	CLAY - very stiff, grey mottled orange and red clay with ironstone nodules							
39	1			E	1.0		PID<1		1
					1.2				
	1.6	SHALE - extremely low strength, extremely weathered, grey, red and brown shale							
	2			E	1.8		PID<1		2
					2.0				
	2.2	Bore discontinued at 2.2m - target depth reached							
38	3								3
37	4								4
36									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 39.5 AHD^
EASTING: 305664
NORTHING: 6254075
DIP/AZIMUTH: 90°/--

BORE No: 226
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
39	0.0	FILLING - brown, silty clay filling with some organic matter and a trace of rootlets		E	0.0		PID<1		
					0.2				
	0.3	CLAY - stiff, mottled grey, orange and red clay with some ironstone nodules							
				E	0.5		PID<1		
					0.7				
38	1								1
	1.6	SHALE - extremely low strength, extremely weathered, grey shale							
				E	1.7		PID=2		
	2				1.8				2
37	2.4	Bore discontinued at 2.4m - target depth reached							
	3								3
36									
	4								4
35									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** JS **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 43.3 AHD^
EASTING: 305674
NORTHING: 6254127
DIP/AZIMUTH: 90°/--

BORE No: 227
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
43	0.0	FILLING - grey gravel filling (roadbase)		E	0.3 0.4		PID<1		
	0.5	SILTY CLAY - stiff, grey mottled brown and orange silty clay		E	0.6 0.7		PID<1		
	0.8	CLAY - stiff, orange mottled brown clay		E	1.0 1.1		PID<1		
42	1								1
	1.7	SHALE - extremely low strength, extremely weathered, grey-brown shale		E	1.8 1.9		PID<1		
41	2								2
	2.5	Bore discontinued at 2.5m - refusal on shale							
	3								3
40	4								4
39									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** JS **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 43.7 AHD^
EASTING: 305697
NORTHING: 6254124
DIP/AZIMUTH: 90°/--

BORE No: 228
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
43	0.0	FILLING - grey and brown gravel filling (roadbase) with some black bituminous material		E	0.4 0.5		PID<1		
	0.6	CLAY - firm, brown mottled orange clay		E	1.0 1.1		PID<1		
42	1.3	SHALE - extremely low strength, extremely weathered, grey mottled brown shale		E	1.5 1.6		PID<1		
41	3.1	Bore discontinued at 3.1m - refusal on grey weathered shale							
40									
39									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** JS **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 43.8 AHD^
EASTING: 305703
NORTHING: 6254121
DIP/AZIMUTH: 90°/--

BORE No: 229
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
43	0	FILLING - dark grey gravel filling (roadbase)		E*	0.2 0.3		PID<1		
	1	1.0							1
		CLAY - firm, grey mottled orange clay with some angular gravel		E	1.6 1.7		PID<1		
42	2	2.1							2
		SHALE - extremely low strength, extremely weathered, grey mottled brown shale		E	2.2 2.3		PID<1		
41	3	3.0							3
		Bore discontinued at 3.0m - refusal on grey shale							
40	4								4
39									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** JS **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: *BD5-040717 is blind replicate from 0.2-0.3m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.4 AHD^
EASTING: 305742
NORTHING: 6254160
DIP/AZIMUTH: 90°/--

BORE No: 230
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE			0.1				
		FILLING - brown, red, yellow and grey sandy clay filling with some gravel and a trace of silt		E*			PID<1		
					0.4				
				E	0.7		PID<1		
	0.9	FILLING - yellow, orange, brown and grey sandy clay filling with a trace of gravel			0.9				
	1				1.0				1
				E			PID<1		
45					1.3				
					1.8				
	2			E			PID<1		2
	2.2	SANDY CLAY - very stiff, grey and brown sandy clay with some silt			2.1				
					2.3				
44				E			PID<1		
					2.6				
	2.7	SANDSTONE - extremely low to very low strength, extremely weathered, grey sandstone							
	2.8	Bore discontinued at 2.8m - refusal on sandstone							
	3								3
43									
	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD10-050717 is blind replicate from 0.1-0.4m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.5 AHD^
EASTING: 305739
NORTHING: 6254160
DIP/AZIMUTH: 90°/--

BORE No: 231
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE							
		FILLING - brown, red and yellow gravelly clay filling with some sand and concrete fragments		E	0.2		PID<1		
					0.5				
	0.8	FILLING - yellow, grey, brown and red sandy clay filling with some concrete and ironstone fragments		E	0.9		PID<1		
45	1				1.2				1
				E	1.7		PID<1		
	2				2.0				2
44	2.1	SANDSTONE - extremely low strength, extremely weathered, grey, orange, yellow and light brown sandstone (soil properties remoulds to stiff sandy clay)							
	2.8	Bore discontinued at 2.8m - target depth reached							
43	3								3
	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.3 AHD^
EASTING: 305734
NORTHING: 6254159
DIP/AZIMUTH: 90°/--

BORE No: 232
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE							
	0.12	FILLING - dark grey angular gravel filling							
		FILLING - brown, red, orange and yellow gravelly clay filling with some sand, ash and a trace of silt (a slight odour and possible staining observed)		E	0.15		PID<1		
					0.3				
				E	0.5		PID<1		
	0.8	FILLING - grey, yellow, light brown and orange sandy clay filling with some sandstone fragments and a trace of silt			0.8				
45	1								1
				E	1.5		PID<1		
	2				1.8				2
44	2.2	SILTY CLAY - stiff, light brown silty clay with some weathered shale fragments							
	2.4	Bore discontinued at 2.4m - target depth reached							
	3								3
43									
	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.4 AHD^
EASTING: 305730
NORTHING: 6254162
DIP/AZIMUTH: 90°/--

BORE No: 233
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE			0.1				
		FILLING - brown, red and yellow, gravelly clay filling with some sand, wood and ash fragments and a trace of silt		E*	0.3				
				E	0.7				
45	1.0	FILLING - light brown, yellow and grey sandy clay filling with some gravel and a trace of ash and silt			1.0				
					1.1				
				E	1.4				
				E	1.8				
					2.1				
44	2.2	SANDY CLAY - stiff, grey, brown and orange sandy clay with a trace of weathered shale fragments		E	2.2				
					2.5				
	2.6	Bore discontinued at 2.6m - target depth reached							
43									
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD9-050717 is blind replicate from 0.1-0.3m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.3 AHD^
EASTING: 305725
NORTHING: 6254159
DIP/AZIMUTH: 90°/--

BORE No: 234
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE							
		FILLING - brown, red, grey and yellow sandy clay filling with some gravel and a trace of ash		E	0.2				
					0.5				
	0.7	FILLING - grey, yellow, brown and orange sandy clay filling with some gravel, sandstone fragments and a trace of silt		E	0.8				
45	1				1.1				1
				E	1.5				
					1.8				
	2			E	2.2				2
44					2.5				
	2.8	SANDY CLAY - stiff, grey, mottled light brown and orange sandy clay with a trace of silt		E	2.9				
	3				3.2				3
43	3.4	SHALE - extremely low to very low strength, extremely weathered, grey and brown shale		E	3.5				
					3.8				
	4								4
42	4.0	Bore discontinued at 4.0m - refusal on shale							

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.4 AHD^
EASTING: 305723
NORTHING: 6254160
DIP/AZIMUTH: 90°/--

BORE No: 235
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE			0.1				
		FILLING - brown, red and black clay filling with some sand and gravel and a trace of concrete fragments		E	0.3				
	0.4	FILLING - grey, brown, yellow and orange sandy clay filling with some gravel and sandstone fragments and trace silt		E*	0.5				
					0.7				
	1			E	1.0				1
					1.3				
45				E	1.5				
					1.8				
	2								2
	2.3	SANDY CLAY - stiff, grey and orange sandy clay with a trace of silt		E	2.3				
44	2.4	Bore discontinued at 2.4m - target depth reached			2.4				
	3								3
43									
	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD8-050717 is blind replicate from 0.5-0.7m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.8 AHD^
EASTING: 305743
NORTHING: 6254164
DIP/AZIMUTH: 90°/--

BORE No: 236
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE							
	0.15	FILLING - grey, angular gravel filling							
		SANDY CLAY - stiff, grey, yellow and brown sandy clay with a trace of silt and ironstone gravel		E	0.2		PID<1		
					0.5				
	0.8	SILTY CLAY - stiff, mottled brown, red and yellow silty clay with a trace of sand							
	1			E	1.0		PID<1		1
					1.3				
	1.5	Bore discontinued at 1.5m - refusal on sandstone							
45	2								2
44	3								3
43	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.9 AHD^
EASTING: 305740
NORTHING: 6259167
DIP/AZIMUTH: 90°/--

BORE No: 237
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE			0.1				
		FILLING - firm, grey, orange, yellow and brown sandy clay filling with some gravel and concrete fragments		E	0.3		PID<1		
				E	0.7		PID<1		
	1				1.0				1
	1.2	FILLING - firm, brown and red sandy clay filling with some concrete fragments		E	1.2		PID<1		
	1.6	SILTY CLAY - stiff, mottled brown and orange silty clay with a trace of ironstone gravel		E	1.5		PID<1		
45	2				1.7				2
	2.1	Bore discontinued at 2.1m - target depth reached			2.0				
44	3								3
43	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.7 AHD^
EASTING: 305734
NORTHING: 6254166
DIP/AZIMUTH: 90°/--

BORE No: 238
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE			0.1				
	0.3	FILLING - brown and red, gravelly clay filling with some sand		E	0.3		PID<1		
	0.6	FILLING - extremely low strength, grey shale (floater)							
	1	FILLING - light brown, orange, yellow and red sandy clay filling with some gravel			0.7				1
45				E	1.0		PID<1		
	2				1.8				2
	2.1	SANDY CLAY - stiff, grey, brown, yellow and orange sandy clay with a trace of silt		E	2.1		PID<1		
44	2.8	Bore discontinued at 2.8m - target depth reached							
	3								3
43	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.7 AHD^
EASTING: 305240
NORTHING: 6254167
DIP/AZIMUTH: 90°/--

BORE No: 239
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.13	CONCRETE							
		CLAY - very stiff to hard, brown and red-brown clay with a trace of silt - possibly reworked to 0.2m		E	0.2 0.5		PID<1		
	0.7	SANDSTONE - extremely low to very low strength, extremely weathered, red-brown, white and orange fine to medium grained sandstone		E	0.9 1.2		PID<1		
45				E	1.9 2.2		PID<1		
	2.4	Bore discontinued at 2.4m - target depth reached							
44									
43									
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased
TYPE OF BORING: 65mm diameter Push Tube
WATER OBSERVATIONS: No free groundwater observed
REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.6 AHD^
EASTING: 305726
NORTHING: 6254167
DIP/AZIMUTH: 90°/--

BORE No: 240
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.1	CONCRETE			0.1				
		FILLING - brown-grey sandy clay filling with a trace of ash and gravel		E	0.3		PID<1		
				E	0.5		PID<1		
	0.7	FILLING - grey, yellow and brown sandy clay filling with gravel and ash fragments			0.7				
	1			E	0.8		PID<1		1
					1.0				
45					1.4				
				E			PID<1		
					1.7				
	1.9	SANDY CLAY - stiff, grey, brown and orange sandy clay with a trace of silt and ironstone gravel							
	2			E	2.0		PID<1		2
44					2.3				
	2.8	Bore discontinued at 2.8m - target depth reached							
	3								3
43									
	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.7 AHD^
EASTING: 305722
NORTHING: 6254169
DIP/AZIMUTH: 90°/--

BORE No: 241
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.12	CONCRETE			0.12				
		FILLING - brown gravelly clay filling		E			PID<1		
	0.4	CLAY - very stiff, grey and brown to red-brown clay with a trace of silt			0.4				
					0.5				
				E*			PID<1		
	1				0.8				1
	1.1	SANDSTONE - extremely low to very low strength, extremely weathered, orange, white and brown fine to medium grained sandstone							
					1.3				
45				E			PID<1		
					1.5				
	2								2
					2.3				
				E			PID<1		
	2.5	Bore discontinued at 2.5m - refusal in sandstone			2.5				
44									
	3								3
43									
	4								4
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BDD-040717 is blind replicate from 0.5-0.8m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 47.2 AHD^
EASTING: 305743
NORTHING: 6254178
DIP/AZIMUTH: 90°/--

BORE No: 242
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
47	0.1	CONCRETE							
	0.13	FILLING - loose, angular grey gravel filling with a trace of sand			0.2				
		CLAY - firm, red, brown, yellow and orange clay with a trace of sand and ironstone gravel		E			PID<1		
	0.6				0.5				
		SANDY CLAY - stiff grey, yellow and orange sandy clay with some silt and a trace of gravel			0.7				
46	1			E	1.0		PID<1		1
	2.0	Bore discontinued at 2.0m - target depth reached							
45	2								2
44	3								3
43	4								4

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 47.2 AHD^
EASTING: 305734
NORTHING: 6254179
DIP/AZIMUTH: 90°/--

BORE No: 243
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
47	0.1	CONCRETE							
	0.13	FILLING - loose, grey angular gravel filling		E	0.15		PID<1		
	0.3	CLAY - firm, red, brown and grey clay with a trace of sand and ironstone gravel			0.3				
		SANDY CLAY - stiff, grey, light brown, yellow and red sandy clay with some silt and a trace of gravel			0.4				
				E*			PID<1		
					0.7				
46	1								1
					1.2				
				E			PID<1		
					1.5				
45	2								2
	3								3
	3.0	Bore discontinued at 3.0m - target depth reached							
44	4								4
43									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD7-040717 is blind replicate from 0.4-0.7m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 46.9 AHD^
EASTING: 305675
NORTHING: 6254228
DIP/AZIMUTH: 90°/--

BORE No: 244
PROJECT No: 85126.03
DATE: 4/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
46	0.0	FILLING - medium dense, black, grey and brown gravelly sand filling with some silt, rootlets and a trace of organic matter		E*	0.0 - 0.3		PID<1		
	0.6	FILLING - firm, brown gravelly clay filling with some concrete fragments		E	0.7 - 1.0		PID<1		
45	1.4	FILLING - firm, brown, orange and grey gravelly sand clay filling with some concrete fragments		E	1.5 - 1.7		PID<1		
				E	2.2		PID<1		
44	2.5	SANDY CLAY - firm, mottled brown, grey and orange sandy clay		E	2.5 - 2.6 - 2.8		PID<1		
	3.0	Bore discontinued at 3.0m - target depth reached							
43									
42									

RIG: Geoprobe 7822DT **DRILLER:** Terratest **LOGGED:** TG **CASING:** Uncased

TYPE OF BORING: 65mm diameter Push Tube

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *BD6-040717 is blind replicate from 0.0-0.3m. ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Bettergrow Pty Ltd
PROJECT: Proposed Resource Recovery & Recycling Centre
LOCATION: 24 Davis Road, Wetherill Park

SURFACE LEVEL: 40.0 AHD^
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 245
PROJECT No: 85126.03
DATE: 5/7/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
40		CONCRETE - concrete extends on southern side of hole (possible footing)							
	0.29	FILLING - grey sandy gravel filling		E	0.3				
	0.5	- some brown clay and silt from 0.4m			0.5				
		Bore discontinued at 0.5m - collapse of filling							
39	1								1
38	2								2
37	3								3
36	4								4

RIG: Hand auger **DRILLER:** DW **LOGGED:** DW **CASING:** Uncased

TYPE OF BORING: Diacore to 0.29m then hand auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: ^Level interpolated from survey by RPS dated 14/10/2015

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix H

ProUCL 5.0 Data and Outputs

	A	B	C
1			Zinc
2	203	0-0.2	52
3	204	0-0.15	120
4	205	0-0.1	140
5	207	0.14-0.17	37
6	208	0.18-0.28	35
7	208	0.28-0.31	63
8	209	0.2-0.3	44
9	209	0.3-0.5	32
10	210	0.16-0.24	60
11	211	0.16-0.23	42
12	212	0-0.1	61
13	213	0.2-0.25	51
14	214	0-0.2	53
15	215	0-0.2	68
16	215	0.5-0.8	48
17	216	0-0.2	78
18	216	0.4-0.6	42
19	217	0-0.25	11
20	217	0.25-0.5	71
21	218	0-0.1	33
22	218	0.2-0.5	40
23	219	0-0.2	61
24	220	0-0.2	40
25	221	0-0.1	41
26	221	0.3-0.5	20
27	222	0.3-0.5	65
28	222	1.3-1.4	31
29	223	0.1-0.3	120
30	224	0-0.2	740
31	225	0-0.2	220
32	226	0-0.2	88
33	227	0.3-0.4	41
34	228	0.4-0.5	100
35	229	0.2-0.3	44
36	230	0.1-0.4	62
37	231	0.2-0.5	39
38	231	0.9-1.2	89
39	232	0.15-0.3	67
40	BD9/05071	0.1-0.3	73
41	233	1.1-1.4	33
42	234	0.2-0.5	52
43	235	0.1-0.3	49
44	BD8/05071	0.5-0.7	72
45	236	0.2-0.5	85
46	237	0.1-0.3	55
47	238	0.1-0.3	52
48	240	0.1-0.3	37
49	240	0.8-1.0	75
50	241	0.12-0.4	47
51	242	0.2-0.5	55
52	244	0-0.3	46
53	244	1.5-1.7	62
54	245	0.3-0.5	51

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	25/07/2017 10:49:06 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Zinc

General Statistics

Total Number of Observations	53	Number of Distinct Observations	40
		Number of Missing Observations	0
Minimum	11	Mean	73.45
Maximum	740	Median	52
SD	99.03	Std. Error of Mean	13.6
Coefficient of Variation	1.348	Skewness	6.143

Normal GOF Test

Shapiro Wilk Test Statistic	0.377	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.122	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	96.23	95% Adjusted-CLT UCL (Chen-1995)	108.1
		95% Modified-t UCL (Johnson-1978)	98.15

Gamma GOF Test

A-D Test Statistic	3.895	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.762	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.208	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.092	k star (bias corrected MLE)	1.986
Theta hat (MLE)	35.11	Theta star (bias corrected MLE)	36.98
nu hat (MLE)	221.8	nu star (bias corrected)	210.5
MLE Mean (bias corrected)	73.45	MLE Sd (bias corrected)	52.12
		Approximate Chi Square Value (0.05)	178
Adjusted Level of Significance	0.0455	Adjusted Chi Square Value	177.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	86.9	95% Adjusted Gamma UCL (use when n<50)	87.31

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	7.4063E-5	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.131	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.122	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level		
Lognormal Statistics		
Minimum of Logged Data	2.398	Mean of logged Data 4.039
Maximum of Logged Data	6.607	SD of logged Data 0.596
Assuming Lognormal Distribution		
95% H-UCL	79.63	90% Chebyshev (MVUE) UCL 85.29
95% Chebyshev (MVUE) UCL	93.34	97.5% Chebyshev (MVUE) UCL 104.5
99% Chebyshev (MVUE) UCL	126.4	
Nonparametric Distribution Free UCL Statistics		
Data do not follow a Discernible Distribution (0.05)		
Nonparametric Distribution Free UCLs		
95% CLT UCL	95.83	95% Jackknife UCL 96.23
95% Standard Bootstrap UCL	94.66	95% Bootstrap-t UCL 146.2
95% Hall's Bootstrap UCL	184.9	95% Percentile Bootstrap UCL 98.53
95% BCA Bootstrap UCL	113.8	
90% Chebyshev(Mean, Sd) UCL	114.3	95% Chebyshev(Mean, Sd) UCL 132.7
97.5% Chebyshev(Mean, Sd) UCL	158.4	99% Chebyshev(Mean, Sd) UCL 208.8
Suggested UCL to Use		
95% Chebyshev (Mean, Sd) UCL	132.7	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.		
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)		
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.		
For additional insight the user may want to consult a statistician.		

Appendix 6

Site Audit Report & Site Audit Statement

Site Audit Report

24 Davis Road, Wetherill Park NSW
MP 109

Prepared for:
Bettergrow Pty Ltd ABN 71 062 888 117
48 Industry Road
Vineyard NSW 2765

30 August 2017

Distribution

Site Audit Report,
Proposed Resource Recovery and Recycling Centre, 24 Davis Road, Wetherill Park
MP109

30 August 2017

Copies	Recipient	Copies	Recipient
1 PDF	**Mr Neil Schembri** **c/o Shaun Smith** Bettergrow Pty Ltd ABN 71 062 888 117 48 Industry Road Vineyard NSW 2765	1 PDF	**Senversa Project File**

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4 **Confidentiality** – This report was prepared for Bettergrow Pty Ltd ABN 71 062 888 117 and may contain confidential information. If you receive this report in error, please contact Senversa and we will arrange collection of this document.

Senversa Pty Ltd
ABN: 89 132 231 380
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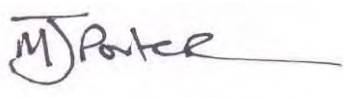


Melissa Porter
EPA Accredited Site Auditor 0803

NSW Site Auditor Scheme
SITE AUDIT STATEMENT

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the* Contaminated Land Management Act 1997 *on 31st October 2012. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. MP 109

This site audit is a ~~**statutory audit**~~**/non-statutory audit*** within the meaning of the *Contaminated Land Management Act 1997*.

Site auditor details (as accredited under the *Contaminated Land Management Act 1997*)

Name: Melissa Porter Company: Senversa Pty Ltd

Address: Level 5, The Grafton Bond Building, 201 Kent Street, Sydney NSW

Postcode: 2000

Phone: 02 9994 8016 Fax: NA

Site details

Address: 24 Davis Road, Wetherill Park, NSW

Postcode: 2164

Property description *(attach a list if several properties are included in the site audit)*

Lot 18 Deposited Plan 249417

Local Government Area: Fairfield City Council

Area of site (e.g. hectares): 20,280m^2 (2 ha) Current zoning: IN1 - Industrial

To the best of my knowledge, the site ~~**is**~~**/is not*** the subject of a declaration, order, agreement or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

Declaration/Order/Agreement/Proposal/Notice* no(s): N/A

Strike out as appropriate

Site audit commissioned by

Name: Neil Schembri Company: Bettergrow Pty Ltd

Address: 48 Industry Road, Vineyard NSW

Postcode: 2765

Name and phone number of contact person (if different from above)

Shaun Smith RPS Australia East, Ph 0419 715 665

Purpose of site audit

☑ A. To determine land use suitability *(please specify intended use[s]):*

Resource recovery and recycling facility

OR

☐ B(~~i) To determine the nature and extent of contamination, and/or~~

☐ ~~B(ii) To determine the appropriateness of an **investigation/remedial action/management plan***, and/or~~

☐ ~~B(iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified **remedial action plan/management plan*** *(please specify intended use[s])*~~

……..

Information sources for site audit

Consultancy(ies) which conducted the site investigation(s) and/or remediation

- URS Australia Pty Ltd (URS); and
- Douglas Partners Pty Ltd (DP).

Title(s) of report(s) reviewed:

- Targeted Site Investigation for Contamination, Proposed Resource Recovery and Recycling Depot, 24 Davis Road, Wetherill Park NSW', August 2017, Douglas Partners Pty Ltd (DP) (DP 2017a) (Data Gap Report).
- 'Sampling and Analysis Quality Plan, Proposed Resource Recovery and Recycling Depot, 24 Davis Road, Wetherill Park NSW', June 2017, DP (DP 2017b) (SAQP)
- 'Review of Contamination Reports, Proposed Resource Recovery and Recycling Depot, 24 Davis Road, Wetherill Park NSW', October 2015, DP (DP 2015); and
- 'Environmental Summary Report, Former Emoleum Depot (6F01), 24 Davis Road, Wetherill Park NSW', 2 May 2013, URS Australia Pty Ltd (URS) (URS 2013a) (Summary Report).

Consideration of the following supporting information provided within the URS 2013a report:

- 'Soil Validation Report, Former Emoleum Depot (6F01), 24 Davis Road, Wetherill Park NSW (reference 42424433), 2013', URS 2013b (Validation Report);
- 'Letter Report – Groundwater Monitoring Well Decommissioning, Former Emoleum Depot, Wetherill Park NSW (6F01) (reference 42424443), 2013, URS (URS 2013c);

Strike out as appropriate

- Annual Groundwater Monitoring Event Former Mobil Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park, (reference 42424273), 2012, URS (URS 2012a);
- 'Post Phase 2 Environmental Site Assessment, Former Mobil Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park, (reference 42424444), 2012, URS (URS 2012b);
- 'Final Report for Hazardous Materials Survey, Former Emoleum Depot, Davis Road, Wetherill Park NSW 2164, (reference 56572) 2012, Hibbs & Associates Pty Ltd;
- 'Dilapidation Survey, Former Mobil Emoleum Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park (reference 42424436), 2012, URS (URS 2012c);
- 'Clearance Certificate – Asbestos Removal Works at 24 Davis Road, Wetherill Park NSW 2164, (reference 50620) October 2012, Prensa Pty Ltd;
- 'Clearance Certificate – Asbestos Removal Works at 24 Davis Road, Wetherill Park NSW 2164, (reference 50578) September 2012, Prensa Pty Ltd;
- 'Post Phase 2 Environmental Site Assessment, Former Mobil Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park, (reference 42424444), 2012, URS (URS 2012d);
- 'Annual Groundwater Monitoring Event, Former Mobil Emoleum Depot (Site No.6F01), 24 Davis Road, Wetherill Park, (reference 42424273/01), 2010, URS (URS 2010); and
- 'Phase 2 Environmental Site Assessment, Emoleum Depot, 24 Davis Road, Wetherill Park NSW, (reference 42423822), 2006, URS (URS 2006).
- Mobil Site Audit Assessment Form', Dames and Moore, October 1990, Summary and Figure included as appendix in URS 2006'

Site audit report

Title:… Site Audit Report – Bettergrow Pty Ltd, 24 Davis Road, Wetherill Park NSW

Report no. MP 109 (Senversa Ref: S13375)

Date: 30 August 2017

PART II: Auditor's findings

Please complete either Section A or Section B, **not** both. *(Strike out the irrelevant section.)*

Use Section A where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land use(s).

Use Section B where the audit is to determine the nature and extent of contamination and/or the appropriateness of an investigation or remedial action or management plan and/or whether the site can be made suitable for a specified land use or uses subject to the successful implementation of a remedial action or management plan.

Section A

☑ **I certify that, in my opinion, the site is SUITABLE for the following use(s)** *(tick all appropriate uses and strike out those not applicable)*:

- ~~☐ Residential, including substantial vegetable garden and poultry~~
- ~~☐ Residential, including substantial vegetable garden, excluding poultry~~
- ~~☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
- ~~☐ Day care centre, preschool, primary school~~
- ~~☐ Residential with minimal opportunity for soil access, including units~~
- ~~☐ Secondary school~~
- ~~☐ Park, recreational open space, playing field~~
- ☑ Commercial/industrial
- ~~☐ Other *(please specify)* ……~~

~~**subject to compliance with the following environmental management plan** *(insert title, date and author of plan)* **in light of contamination remaining on the site: …**~~

~~**OR**~~

~~☐ **I certify that, in my opinion, the site is NOT SUITABLE for any use due to the risk of harm from contamination.**~~

Overall comments…

The site was used an emoleum plant for the past 20 to 30 years. Remedial works included the removal of three above ground storage tanks and associated pipework, two partial underground storage tanks, two interceptor pits and associated pipework and loose asbestos cement sheeting from two surface locations. The site was successfully validated.

The expected conditions at the site are fill (sand, silty sand) overlying natural (sandy silty clay) and shale with no odour or staining. Where removal of pavement or concrete slabs is required, an unexpected finds protocol should be considered.

Section B

Purpose of the plan[1] which is the subject of the audit …

I certify that, in my opinion:

- ☐ **the nature and extent of the contamination HAS/HAS NOT* been appropriately determined**

AND/OR

- ☐ **the investigation/remedial action plan/management plan* IS/IS NOT* appropriate for the purpose stated above**

AND/OR

- ☐ **the site CAN BE MADE SUITABLE for the following uses** *(tick all appropriate uses and strike out those not applicable):*
  - ☐ Residential, including substantial vegetable garden and poultry
  - ☐ Residential, including substantial vegetable garden, excluding poultry
  - ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
  - ☐ Day care centre, preschool, primary school
  - ☐ Residential with minimal opportunity for soil access, including units
  - ☐ Secondary school
  - ☐ Park, recreational open space, playing field
  - ☐ Commercial/industrial
  - ☐ Other *(please specify)* ……

if the site is remediated/managed* in accordance with the following remedial action plan/management plan* *(insert title, date and author of plan)*

subject to compliance with the following condition(s):

Overall comments

…

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

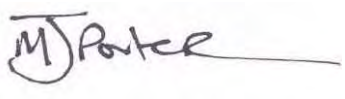
PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. 0803).

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997,* and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed…  Date…30 August 2017

PART IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remedial action or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use(s) of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A or Section B of Part II, **not** both.

In **Section A** the auditor may conclude that the land is *suitable* for a specified use(s) OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further remediation or investigation of the site was needed to render the site fit for the specified use(s). Any **condition** imposed should be limited to implementation of an environmental management plan to help ensure the site remains safe for the specified use(s). The plan should be legally enforceable: for example a requirement of a notice under the *Contaminated Land Management Act 1997* (CLM Act) or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979*.

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

In **Section B** the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or whether land can be made suitable for a particular land use or uses upon implementation of a remedial action or management plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

In **Part III** the auditor certifies his/her standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to:

EPA (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
nswauditors@epa.nsw.gov.au

AND

the **local council** for the land which is the subject of the audit.

Contents

List of Acronyms

Acronym	Definition
%	per cent
µg/L	Micrograms per Litre
ha	Hectare
km	Kilometres
m	Metre
mAHD	Metres Australian Height Datum
mbgl	Metres below ground level
mg/kg	Milligrams per Kilogram
ABC	Added Background Concentrations
ACL	Added Contaminant Limit
ACM	Asbestos Containing Material
ADWG	Australian Drinking Water Guidelines
AF	Asbestos Fines
AHD	Australian Height Datum
AST	Aboveground Storage Tank
ANZECC	Australian and New Zealand Environment and Conservation Council
BaP	Benzo(a)pyrene
BGL	Below Ground Level
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes & Naphthalene
CLM Act	NSW Contaminated Land Management Act 1997
COC	Chain of Custody
Council	Fairfield City Council
CT	Certificate of Title
DA	Development Application
DP	Douglas Partners Pty Ltd
DQI	Data Quality Indicator
DQO	Data Quality Objective

Acronym	Definition
EIL	Ecological Investigation Level
Envirolab	Envirolab Services Pty Ltd
EPA	Environment Protection Authority (NSW)
ESL	Ecological Screening Level
EX	Excavation
HIL	Health Investigation Level
HSL	Health Screening Level
IAA	Interim Audit Advice
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
ML	Management Limits
MS	Matrix Spike
NATA	National Association of Testing Authorities
ND	Not Detected
NEPM	National Environment Protection Measure
NL	Non-Limiting
n	Number of Samples
OCPs	Organochlorine Pesticides
OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
pH	A measure of acidity, hydrogen ion activity
PID	Photoionisation Detector
PQL	Practical Quantitation Limit
PSH	Phase Separated Hydrocarbon
QA/QC	Quality Assurance/Quality Control
RAP	Remediation Action Plan
RPD	Relative Percent Difference
SAQP	Sampling Analysis and Quality Plan
SAR	Site Audit Report
SAS	Site Audit Statement

Acronym	Definition
SILs	Soil Investigation Levels
SWL	Standing Water Level
TPHs	Total Petroleum Hydrocarbons
TRHs	Total Recoverable Hydrocarbons
UST	Underground Storage Tank
URS	URS Australia Pty Ltd
VOCs	Volatile Organic Compounds
-	On tables is "not calculated", "no criteria" or "not applicable"

1.0 Introduction

A site contamination audit has been conducted in relation to the site at 24 Davis Street, Wetherill Park, NSW.

The Audit was conducted to provide an independent review by an Environment Protection Authority (EPA) Accredited Auditor of whether the land is suitable for any specified use or range of uses i.e. a "Site Audit" as defined in Section 4 (1) (b) (iii) of the New South Wales (NSW) Contaminated Land Management Act 1997 (the CLM Act).

Details of the Audit are:

Requested by:	Neil Schembri on behalf of Bettergrow Pty Ltd
Request/Commencement Date:	31 May 2017
Auditor:	Melissa Porter
Accreditation No.:	0803

The scope of the Audit included:

- Review of the following reports:
  - 'Targeted Site Investigation for Contamination, Proposed Resource Recovery and Recycling Depot, 24 Davis Road, Wetherill Park NSW', August 2017, Douglas Partners Pty Ltd (DP) (DP 2017a) (Data Gap Report).
  - 'Sampling and Analysis Quality Plan, Proposed Resource Recovery and Recycling Depot, 24 Davis Road, Wetherill Park NSW', June 2017, DP (DP 2017b) (SAQP)
  - 'Review of Contamination Reports, Proposed Resource Recovery and Recycling Depot, 24 Davis Road, Wetherill Park NSW', October 2015, DP (DP 2015); and
  - 'Environmental Summary Report, Former Emoleum Depot (6F01), 24 Davis Road, Wetherill Park NSW', 2 May 2013, URS Australia Pty Ltd (URS) (URS 2013a) (Summary Report).
- Consideration of the following supporting information provided within the URS 2013a report:
  - 'Soil Validation Report, Former Emoleum Depot (6F01), 24 Davis Road, Wetherill Park NSW (reference 42424433), 2013', URS 2013b (Validation Report);
  - 'Letter Report – Groundwater Monitoring Well Decommissioning, Former Emoleum Depot, Wetherill Park NSW (6F01) (reference 42424443), 2013, URS (URS 2013c);
  - Annual Groundwater Monitoring Event Former Mobil Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park, (reference 42424273), 2012, URS (URS 2012a);
  - 'Post Phase 2 Environmental Site Assessment, Former Mobil Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park, (reference 42424444), 2012, URS (URS 2012b);
  - 'Final Report for Hazardous Materials Survey, Former Emoleum Depot, Davis Road, Wetherill Park NSW 2164, (reference 56572) 2012, Hibbs & Associates Pty Ltd;
  - 'Dilapidation Survey, Former Mobil Emoleum Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park (reference 42424436), 2012, URS (URS 2012c);
  - 'Clearance Certificate – Asbestos Removal Works at 24 Davis Road, Wetherill Park NSW 2164, (reference 50620) October 2012, Prensa Pty Ltd;
  - 'Clearance Certificate – Asbestos Removal Works at 24 Davis Road, Wetherill Park NSW 2164, (reference 50578) September 2012, Prensa Pty Ltd;

  - ‘Post Phase 2 Environmental Site Assessment, Former Mobil Depot Wetherill Park (6F01), 24 Davis Road, Wetherill Park, (reference 42424444), 2012, URS (URS 2012d);
  - ‘Annual Groundwater Monitoring Event, Former Mobil Emoleum Depot (Site No.6F01), 24 Davis Road, Wetherill Park, (reference 42424273/01), 2010, URS (URS 2010); and
  - ‘Phase 2 Environmental Site Assessment, Emoleum Depot, 24 Davis Road, Wetherill Park NSW, (reference 42423822), 2006, URS (URS 2006).
  - ‘Mobil Site Audit Assessment Form’, Dames and Moore, October 1990, Summary and Figure included as appendix in URS 2006
- A site visit by the Auditor on 4 July 2017.
- Discussions with DP who undertook the recent investigation.

Historically, the site was used as an emoleum depot, for manufacturing and storing bitumen (also known as asphalt) since the 1970’s. The site was decommissioned in 2006, and subsequently remediated by URS in 2012. All identified fuel infrastructure, residual bitumen and contaminated soil were removed from the site.

Since the completion of these works, the site has remained vacant. Further data gap investigations by DP in 2017 were completed to compliment investigations carried out by URS.

2.0 Site Details

2.1 Location

The site locality is shown on Attachment 1, Appendix A.

The site details are as follows:

Street address:	24 Davis Road, Wetherill Park, NSW 2164
Identifier:	Lot 18 DP 249417
Local Government:	Fairfield City Council
Site Area:	Approximately 20,280 m^2

The site boundaries are well defined with site fencing with landscaping present along the southern fence line distinguishing the southern site boundary.

2.2 Zoning

The current zoning of the site is IN1 – General Industrial by Fairfield City Council Local Environmental Plan (LEP) 2013. Under the same plan, land to the north of the site is zoned SP2 – Infrastructure, with areas to the east, west and south zoned IN1.

2.3 Adjacent Uses

The site is located within an area of commercial/industrial land use. The surrounding site uses include:

North: Sydney water pipeline easement.

East: Commercial / Industrial units, followed by Arnott Place.

South: Davis Road, followed by Commercial / Industrial specifically commercial units including vehicle maintenance activities and a café.

West: Commercial / Industrial, specifically a metal recycling yard

Located approximately 450m north of the site is Prospect Creek which flows into Prospect Reservoir which is surrounded by bushland (classified as Cumberland Plain Woodland (CPW), which is listed as endangered by state and federal government).

2.4 Site Condition

The rectangular shaped site had an elevation of approximately 50m AHD to the north, reducing to an approximate 40m AHD to the south. The site consists of three distinct tiers with retaining walls, from north to south. Based on observations during site investigation, it was considered likely these were formed by cut and fill with reworked on-site material. A retaining wall is also present along the western boundary, with ground level for the neighbouring property (beyond the wall) 4-5 meters (m) below existing site ground level.

Remaining site slopes are directed to the south and an internal roadway lined with grass and trees connecting the tiers is present along the western boundary of the site. The north east and southern boundaries are vegetated with the southern portion considered CPW of low ecological value.

The tiers, referred to by DP as the higher, middle and lower levels, are mostly paved with either concrete or bitumen hardstand. Bare soils are exposed in areas related to former remedial works. The higher level of the site showed evidence of chemical storage, with foundations and footings from the

former bitumen above ground storage tanks (AST's) present in the east. Former site layout is shown on Attachment 2, Appendix A.

The middle level of the site, formerly the 'main manufacturing area' contained amenities buildings along the eastern boundary which housed a workshop, laboratory first aid room and storerooms. The amenities buildings were in a dilapidated state, and are known to hold asbestos containing materials, identified in previous hazardous material audits. Concrete flooring was in good condition throughout the former main processing area. General refuse was present over the concrete surface, in the stockpile bay located towards the centre of the middle level. A bitumen stockpile present on bare soil was observed along the eastern boundary during the previous investigations, however DP did not observe that stockpile during the recent (2017) investigations.

The lower level of the site appears to have housed a weighbridge and truck wash, and a vehicle parking area. An office building is also located on the lower level. Concrete covered most of this level, except for an area of landscaping running along the southern boundary which contains CPW. This landscaped part of the site not included within site fencing however is included within the boundary. A small cluster of (bonded) fibre cement sheeting was found by DP (2017) on the ground surface within the landscaping, and was assumed to be a result of 'fly tipping' as this area is not fenced.

The observations made by DP were consistent with those made by the Auditor during the site visit on 4 July 2017. Staining was noted on the wall and floor of the laboratory building and was targeted for investigation by DP.

2.5 Proposed Development

It is understood that the site is to be redeveloped by Bettergrow as a resource recovery and recycling facility. While existing structures will be utilised where possible, including underground services, Bettergrow plan to construct an above ground waste processing building, storage bays, vehicle weighbridge, parking and site amenities. It is understood that below ground excavations are likely to be limited to footings and service trenches, except for a second single level commercial waste processing building proposed for the central, middle tier. This waste processing building will house a pit for tipping wastes, and will require a bulk excavation of 12m x 6m, to 3m depth, within the north-central part.

For the purposes of this audit, the 'commercial/industrial' non-sensitive land use scenario will be assumed.

3.0 Site History

URS (2013) provided a summary of the site history based on aerial photographs, site photographs, NSW EPA records, WorkCover dangerous goods records and/or Certificates of Title. The Auditors' summary is provided below.

Table3.1: Site History

Date	Activity
1794 - 1965	Vacant and/or Pastoral land. Sydney Water pipeline observed in north of site. Filling associated with the construction of Prospect Dam visible to the north. Clearing present south of site, associated with electricity infrastructure.
1966 - 1985	Vacant and/or Pastoral land, with partial tree coverage Site ownership was commercialised from 1966 onwards. Allen Bros. Asphalt Ltd. take ownership of the site from 1978 onwards. Near the end of Davis Road, south west of the site, land filling activities appear from 1970 onwards. Davis Rd has been constructed by 1978, with industrial land uses encroaching.
1986 - 1995	Bitumen plant was constructed by 1986. Site appeared similar in topography to what is present today. Onsite infrastructure was observed and observations consistent with site records. Ownership was transferred to Emoleum (Australia) Limited in 1995. Surrounding commercial / industrial land activities had increased, and were now present along the sites eastern, western and southern boundaries. Prospect Reservoir is located to the north.
1995 - 2005	Site appears relatively unchanged, with the exception of the location and number of ASTs identified. Surrounding land use remains primarily commercial / industrial.
2005 - 2015	Site infrastructure related to the emoleum depot have all been removed as part of URS and DP remedial works, however building structures remain in a dilapidated condition. Post remediation, site has remained vacant, and fenced from public.
2015 - Present	Site remains vacant. Surrounding land use remains primarily commercial / industrial.

From the table above the site appears to have been privately owned and primarily vacant prior to 1966. Details regarding actual activities carried out at the site (i.e. agriculture, horticulture, vacant land) during this time are vague.

The site history indicates that the site has been used for bitumen manufacturing activities for approximately 10 to 20 years after which the site was acquired by a subsidiary of Mobil Australia Pty Ltd, and the emoleum depot continued operation for the following 10 years.

The Auditor considers that the site history is broadly understood and forms a basis for determining the likely contaminants of concern. The uncertainties include details of specific activities and filling history that have been taken into consideration in assessing the sampling densities and when drawing conclusions in relation to the site.

4.0 Contaminants of Concern

Given the site history, the Auditor considers that the main sources of contamination are:

- Former horticulture and/or agriculture use which occurred across the entire site; and
- Chemical storage and manufacturing activities related to the emoleum depot. Working areas were well defined, and are shown in Attachment 2, Appendix A.

The consultants identified chemicals of potential concern associated with the historical use of the site to include:

- Soil: Polycyclic aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRH), monocyclic aromatic hydrocarbons (benzene toluene, ethyl benzene and xylene) (BTEX), metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), organic chlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyl (PCBs), phenolics and asbestos.
- Groundwater: TRH, BTEX, PAHs and metals.

The Auditor considers that the identified COPC and the analyte list used by URS and DP (2017a) are consistent with the site history and field observations

5.0 Stratigraphy and Hydrogeology

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

The sub-surface profile of the site is summarised in Table 5.1.

Table 5.1: Stratigraphy

Approximate Depth (mbgl)	Subsurface Profile
0.0 – 0.2	Grass with topsoil, concrete paving or bitumen/asphalt
0.2– 1.2	Localised areas of FILL, brown and black sand, silty sand and gravel containing organic matter (max depth of 2.4 mbgl in remediated areas)
0.2 – 3.0	Sandy and Silty CLAY, stiff to hard, brown, mottled grey and red and mottled brown clay with ironstone gravel.
3.0 – 10	BEDROCK, weathered shale and siltstone bedrock. Sandstone was encountered at 2.1mbgl within the north-eastern corner of the site.

mbgl – metres below ground level

Significant filling was identified behind retaining walls in the north-eastern part of the site (0.7 – 2.4m thick), with shallow bedrock and minor soil lenses identified in west and southern areas of the site. Based on these observations, DP concluded the site was tiered using cutting, rather than filling, and it is likely the soil was sourced on- site. URS (2013) note the use of site material and virgin excavated natural materials (VENM) for backfilling of remedial excavations.

The Auditor considers that the stratigraphy is sufficiently well known.

5.2 Hydrogeology

Groundwater investigations were carried out by URS. Perched water was encountered at the fill and natural clay interface. The local aquifer, present within the Bringelly Shale bedrock, displayed physical parameters i.e high total dissolved solids (TDS) and salinity, consistent with a fractured rock aquifer. A search of registered groundwater bores in the NSW Department of Primary Industry (DPI) database identified twenty-three bores within a 1 kilometre (km) radius of the site. Twenty-two of these were installed for monitoring purposes, with the twenty third being a low yield extraction bore drilled to depths of greater than 50 mbgl. URS did not consider groundwater within this rock formation to be an economic resource for the area.

Standing water levels (SWL) at the site were noted by DP as 0.15 to 3 m below top of casing (bTOC). The Auditor notes that that no groundwater was observed in any of the soil borehole excavations, drilled up to 3m bgl. The shallow SWL may represent a slightly confined aquifer or local perched water.

Present to the north is Prospect Creek, however based on site topography, it is likely groundwater present beneath the site would flow towards the south, discharging to an unnamed stormwater course and ultimately the Prospect Creek outfall, 450m east of the site. Rainfall at the site would either fall directly to ground, in unpaved areas, or enter the municipal stormwater system which ultimately discharges at Prospect Creek.

The Auditor considers that the site geology and hydrogeology is well understood and adequately characterised.

6.0 Evaluation of Quality Assurance and Quality Control

The data sources are summarised in Table 6.1.

Table 6.1: Summary of Investigations

Investigations	Field Investigations	Analytical Data Obtained
URS 2006	Drilling of 31 soil bores with conversion of thirteen to monitoring wells (SB14-BS32 and MW1-MW13) (sampling August 2005)	PAHs, TRH/BTEX, Metals, VOCs
URS 2010	Gauging and sampling of 13 monitoring wells on-site (sampling October 2008)	PAHs, TRH/BTEX, Metals, VOCs
URS 2012a	Gauging and sampling of 13 monitoring wells on-site (sampling March 2010)	PAHs, TRH/BTEX, Metals, VOCs
URS 2012b	Test pitting to identify presence of USTs in two investigations areas (Investigation Area 1 and Investigation Area 2) a	PAHs, TRH/BTEX, Phenols. lead
URS 2012d	Drilling of 29 soil bores (SB101 to SB 129) and gauging and sampling of 13 monitoring wells on-site (sampling July 2012)	PAHs, TRH/BTEX, Phenols, lead
URS 2013b	Soil remediation and validation.	PAHs, TRH/BTEX, lead
URS 2013c	Groundwater monitoring wells were decommissioned by URS in 2013.	NA
DP (August 2017)	Soil investigations (45 Test pits) in the identified data gap areas. (BH200 to BH245)	Metals, PAHs, TRH/BTEX, OCPs, OPPs and Asbestos

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The Auditor's assessment follows in Tables 6.2 and 6.3.

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO) DP and URS investigations defined specific DQOs in accordance with the seven-step process outlined in DEC (2006) Guidelines for the NSW Site Auditor Scheme.	These were considered appropriate for the investigations conducted.
Sampling pattern, locations, density and depth - Soil URS soil samples were analysed from 64 test bores advanced using hand augering for the first metre, followed by solid auger and split spoon sampling or air hammering. 13 test pits were dug by excavator. Boreholes were drilled to depths ranging from 0.2 to 10.2m bgl and test pits were 0.5 to 1.3m bgl. Sampling was located across the site to target potential areas of environmental concern. URS surface validation samples were collected from the wall of the remedial excavation using a stainless-steel trowel, to a depth of 0.5m and collected using fresh disposable nitrile gloves. DP soil samples were analysed from 45 test bores) to target the approximate location of former features and structures such as the amenities building, former AST farms, oil water separators, and the truck wash. Test bores were	In the Auditor's opinion, these investigation locations adequately target the main areas of concern, sampling density was appropriate for the investigation and characterisation of the site was achieved.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
also targeting substations, stormwater management infrastructure, waste stockpiles and ecological areas proposed as part of the development. Boreholes were drilled to depths between 0.2 m and 3.0 m, and penetrated fill into natural ground, except for boreholes BH204, BH208, BH209and BH245 which were all found to refuse in filling materials. Soil samples were collected from fill and natural soil from a variety of depths. Additional samples were obtained when relatively deep fill (>0.5m) was encountered. Samples were obtained at either the target depth, or when there was a distinct change in lithology or based on the observations made during the investigation. **Sampling pattern, locations, density and depth – Groundwater** URS (2006) advanced 13 soil bores into bedrock, using solid flight auger followed by air hammer drilling techniques, and targeted the local aquifer within bedrock (between 5.5 and 10.2m bgl). These bores were converted to groundwater monitoring wells using 50mm Class 18 PVC threaded screen and casing. Wells were developed using a bailer, post installation.	
Sample collection method and decontamination procedures - Soil All borehole sample collection was via split spoon or push tube drilling methods. Push sampler tubes were fitted with clear PVC sleeves and catchers were used to prevent loss of sample. In areas with limited access, sample collection was via hand auger. Soils were collected from the auger flight, with external material removed prior to collecting the sample. Samples at the surface / wall were collected by hand, using disposable nitrile gloves. All sampling equipment was cleaned with detergent, tap water and then de-ionised water prior to sampling and between sampling events to prevent cross contamination. New gloves were reportedly used for each new sample and dedicated sampling liners were used for sampling using push tube. **Sample collection method and decontamination procedures - Groundwater** Four rounds of groundwater monitoring were competed by URS using the installed wells. Three well volumes were purged prior to sampling, with samples collected using a dedicated disposable bailer at each sample location. Prior to sample collection, wells were gauged using an interface meter to assess for the presence of phase separated hydrocarbons (PSH). Decontamination of the meter was completed using detergent, tap water and then de-ionised water prior to sampling and between sampling events to prevent cross contamination. Decontamination of sampling equipment was not required as dedicated items were used at each well.	The observations are considered adequate to determine the presence and depth of fill, and to assess groundwater quality present beneath the site. Overall, in consideration of the contamination encountered, the sample collection method for both soil and water was found to be acceptable.
Sample handling, containers and Chain of Custody (COC) All samples were placed into prepared and preserved sampling containers provided by the laboratory and chilled during storage and subsequent transport to the labs. DP samples for asbestos were not placed in ziplock bags. Instead, glass jar samples provided by the consultant were subsampled, and the laboratory could not guarantee a that the sub-sample collected was indicative of the entire sample. Primary samples collected by DP (2017) from BH232 1.5-1.8m and BH233 0.1 to 0.3m were reported by the laboratory to be below the required 500mL volumes required by Schedule B1, NEPM 2013. Completed chain of custody forms were provided in the report	Adequate.
Detailed description of field screening protocols Soil: Field screening for volatiles was undertaken using a PID. Soil sub-samples were placed in ziplock plastic bags and the headspace measured for VOCs after allowing time for equilibration. Calibration record for the PIDs used in each event were provided within appendices of each report. PIDs used were primarily hired, and calibration checks were completed by the suppliers prior to issue. Field checks were carried out by field personnel. All readings taken at the site were consistent with soil sampling results and olfactory observations.	Adequate.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Groundwater: Well headspace was analysed by URS using a PID, after allowing time for equilibration. PIDs used were primarily hired, and calibration checks were completed by the suppliers prior to issue.	
Sampling logs Soil logs were provided within each report by the consultants, indicating sample depth, PID readings and lithology. URS (2006) provided groundwater monitoring well logs detailing the installation of each monitoring well installed, and each well was surveyed to AHD.	Adequate.

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field quality control samples URS and DP field quality control samples included blind and split sample duplicates at a rate of 1 in 20 samples, and a daily rinsate wash on field equipment. URS and DP rinsate blanks reported concentrations of contaminants typically found in drinking water supply. Detections of were not considered affect the useability of the data. A trip blank and spike were analysed at a rate of one per day. URS noted concentrations of short chained hydrocarbons present within the field blank samples, and recovery percentages less than expected for trip spike analysis. However, as this contaminant was not identified within any primary sample, the error did not affect the validity of the data.	Adequate.
Field quality control results URS field quality control samples were generally within appropriate limits, with RPD exceedances related to soil homogeneity. DP (2017) field quality control samples were generally within appropriate limits, with the following exceptions: RPDs for four metals within a single blind sample ranged from 76 to 152%. The secondary result was lower than the primary result, indicating that the results are conservative and therefore appropriate for use in the assessment. TRH>C34-C40 also reported an exceeding RPD, however the secondary result was lower than the primary. Exceedances were due to soil homogeneity. RPDs for zinc within a single split sample were found to exceed acceptance limits but are less than 50%.	Overall, in the context of the dataset reported, the elevated RPD results are not considered significant and the field quality control results are adequate.
NATA and Analytical methods URS engaged ALS Environmental Pty LTD (ALS) as the primary laboratory, with Amdel Australia Pty Ltd (Amdel) as the secondary. Amdel changed name to MGT Labmark Pty Ltd (MGT) in later reports. All laboratories used were NATA accredited. DP (2017) engaged Envirolab Services Pty Ltd (Envirolab) as primary and Eurofins MGT Pty Ltd (Eurofins mgt) as secondary laboratory. Both laboratories are NATA accredited. Analytical methods were included in the laboratory test certificates It is noted that Asbestos ID is not included within the laboratories accreditation, however laboratory procedures used are consistent with Australian Standard AS4964-2004 and Schedule B1 of NEPM 2013.	The analytical methods are considered adequate for the purposes of the site audit, noting that the AS4964-2004 is currently the only available method in Australia for analysing asbestos. DOH (2009) and enHealth (2005) state that "until an alternative analytical technique is developed and validated the AS4964-2004 is recommended for use

Field and Lab QA/QC	Auditor's Opinion
Holding times and Practical Quantitation Limits (PQLs) Review of the COCs and laboratory certificates provided by DP indicate that the holding times were met. URS reported that holding times have been met where COCs were not received. Soil and Groundwater PQLs were generally less than the threshold criteria for the contaminants of concern.	Adequate
Laboratory quality control sampling and results Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the individual laboratories engaged. Results of laboratory quality control samples were generally within appropriate limits, and as all laboratories are NATA accredited, it is unlikely these exceedances will affect the reliability of the dataset. DP (2017) noted two acid digest metal results which exceeded criteria. These results were re-tested using a triplicate, which were acceptable.	Adequate
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) Predetermined data quality indicators (DQIs) were set for laboratory analyses including blanks, replicates, duplicates, laboratory control samples, matrix spikes, surrogate spikes and internal standards.	An assessment of the data quality with respect to the five category areas has been undertaken by the auditor and is summarised below.

In considering the data for its purpose, as a whole the Auditor concludes that:

- Duplicate samples, blanks and spikes produced acceptable RPDs and identified heterogeneity in soils. Primary and secondary laboratories have provided sufficient information to conclude that the dataset was precise.
- Samples were collected using suitable procedures, rinsate blanks indicated correct decontamination, and laboratory blank / spike samples were all considered acceptable. The data is considered accurate.
- Samples were collected under the instruction of an SAQP and sample integrity was upheld. There is a high degree of confidence that data was representative of the site, is reproducible and complete for the purpose of assessment.

7.0 Environmental Quality Criteria

The Auditor has assessed soil data provided by URS (2013a) and DP (2017) in reference to criteria from National Environmental Protection Council (NEPC) National Environmental Protection (Assessment of Site Contamination) Measure 1999, as Amended 2013 (NEPM, 2013).

Based on the proposed development, the Tier 1 (screening) criteria for 'commercial/industrial' was referred to.

- Human Health Assessment
  - Health Based Investigation Levels (HIL D)
  - Soil Health Screening Levels (HSL D) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m and sand.
  - Asbestos Health Screening Levels – All forms of Asbestos.
- Terrestrial Ecological Assessment
  - Ecological Screening Levels ESL (Commercial/Industrial) assuming coarse soil.
  - Ecological Investigation Levels EIL (Commercial/Industrial). In the absence of site specific soil data on pH, clay content, cation exchange capacity and background concentrations, the published range of the added contaminant values have been applied as an initial screen.
  - The criteria for 'areas of ecological significance' was considered for the area to the south of the site where CPW is identified.
- Management Limits (ML Commercial/Industrial) assuming coarse soil where ESLs were exceeded (if any).
- Aesthetics
  - The Auditor has considered the need for remediation based on the 'aesthetic' contamination as outlined in the NEPM (2013).

The environmental quality criteria referenced by the Auditor is generally consistent with those adopted by DP. However, due to the presence of CPW to the south of the site, the two bores installed by DP located in this area were assessed against EIL / ESLs for areas of ecological significance by the Auditor.

It is noted that the NEPM 2013 was issued after URS completed their investigations. URS applied the appropriate criteria at the time of investigation, however the Auditor has applied the NEPM 2013 values.

8.0 Evaluation of Soil Analytical Results

Investigations were undertaken by URS between 2005 and 2012.The investigation locations are shown in Attachment 3 to Appendix 5, Appendix A. Following the URS investigation, the ASTs, USTs, associated infrastructure and contaminated soil were removed from the site. The remediation details are discussed in Section 10. Investigations were undertaken by DP in 2017 following those remedial works (Appendix 6 Appendix A). The soil analytical data obtained by URS (included in the appendices in the URS 2013a summary report) and by DP (2017) are summarised in Table 8.1.

Table 8.1: Summary of Soil Investigation Analytical Results (mg/kg)

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
Benzene	235	0	<0.2	0 above HSL D 0-1 m, sand of 3 mg/kg	0 above ESL (commercial industrial - coarse) of 75 mg/kg
Toluene	235	1	1	Not Limiting for HSL D	0 above ESL (commercial industrial - coarse) of 135 mg/kg
Ethyl benzene	235	1	0.6	Not Limiting for HSL D	0 above ESL (commercial industrial - coarse) of 165 mg/kg
Total Xylenes	235	5	5.1	0 above HSL D 0-1 m, sand of 230 mg/kg	0 above ESL (commercial industrial - coarse) of 95 mg/kg
TRH C6-C10 [1]	235	12	347	1 above HSL D 0-1 m sand of 260 mg/kg 0 above ML (commercial industrial - coarse) of 700 mg/kg	1 above ESL (commercial industrial) (coarse/fine) of 215 mg/kg
TRH >C10-C16 [2]	235	22	4,730	Not Limiting for HSL D 7 above ML (commercial industrial - coarse) of 1,000 mg/kg	13 above ESL (commercial industrial) (coarse/fine) of 170 mg/kg
TRH >C16-C34 [3]	235	37	5,940	1 above ML (commercial industrial - coarse) of 3,500 mg/kg	3 above ESL (commercial/industrial - Coarse) of 1,700 mg/kg
TPH >C34-C40 [4]	235	27	3,160	0 above ML (commercial industrial - coarse) of 10,000 mg/kg	0 above ESL (commercial/industrial - Coarse) of 3,300
Naphthalene	235	4	2.3	Not Limiting for HSL D	0 above generic EIL (commercial industrial) of 370 mg/kg
Benzo(a)pyrene (BaP)	235	16	2.4	-	2 above ESL (commercial industrial) (coarse) of 1.4 mg/kg - not present in area designated for landscaping
BaP TEQ [5]	68	5	3.3	0 above HIL D 40 mg/kg	-
Total PAHs	235	22	25	0 above HIL D 4,000 mg/kg	-

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
Total Phenols	172	0	<0.5	0 above HIL D 660 mg/kg (pentachlorophenol)	-
Arsenic	100	30	12	0 above HIL D 3,000 mg/kg	0 above Generic EIL (commercial industrial) of 160 mg/kg
Cadmium	100	9	1	0 above HIL D 900 mg/kg	-
Chromium	100	100	75	0 above HIL D 3,600 mg/kg (Cr VI)	0 above ACL (commercial industrial) of 310 mg/kg (Cr III)
Copper	100	100	170	0 above HIL D 240,000 mg/kg	4 above ACL (commercial industrial) of 85 mg/kg **- n**ot present in area designated for landscaping
Lead	235	166	100	0 above HIL D of 1,500 mg/kg	0 above Generic ACL (commercial industrial) of 1,800 mg/kg
Mercury	100	1	0.1	0 above HIL D 730 mg/kg (inorganic)	-
Nickel	100	100	202	0 above HIL D 6,000 mg/kg	8 above ACL (commercial industrial) of 55 mg/kg - not present in area designated for landscaping
Zinc	100	100	740	0 above HIL D 400,000 mg/kg	7 above ACL (commercial industrial) of 110 mg/kg - not present in area designated for landscaping
VOCs	32	0	ND	-	-
Asbestos	37	0	ND	No asbestos detected	
Potential asbestos cement sheet fragments	1	1	AD	Asbestos confirmed	

1 – For 2005 investigations, TPH C6-C9 concentrations were assessed as F1 TPH (BTEX concentrations minimal)
2 – For 2005 investigations, TPH C10-C14 concentrations were assessed as F2 TPH (naphthalene concentrations minimal)
3 – For 2005 investigations, TPH C15-C28 concentrations were assessed as F3 TPH >C16 – C34
4 – For 2005 investigations, TPH C_{29}-C_{36} concentrations were assessed as F4 C_{34} – C_{40}
5 – Not reported for investigations prior to 2013, value shown is DP (2017) only
Note – Sample numbers have been manually calculated, minor discrepancies is not expected to effect the Audit

Of the 235 soil samples, only nine locations (13 samples) reported TRH concentrations above the adopted criteria. The samples that exceeded criteria are generally in the fill material and associated with petroleum infrastructure and the manufacturing area. The hydrocarbon contamination and associated site infrastructure was subsequently targeted for remediation that are described in Section 10.

A soil sample at MW13 collected from a depth of 0.1-0.2 in the northern portion of the site had concentrations above the relevant TPH criteria. This area was subsequently scraped and resampled by URS (SB103) and also resampled by DP (244) the concentrations in the resampled area are less than the criteria.

No USTs or associated infrastructure were identified during test pitting in Investigation Area 1 (Attachment 4 Appendix A). A partially decommissioned UST, one infilled tank pit and pipe

infrastructure was identified in Investigation Area 2 (Attachment 5 Appendix A). Samples collected near the UST, both laterally and vertically, indicated no residual impacts with all organics less than the adopted criteria. Hydrocarbon odours and staining was observed within Area 1 test pits. PID readings were all mostly less than 40 ppm, and the highest two readings less than 100 ppm. The GPR scan completed by DP in 2017 'did not indicate the presence of possible buried tanks'. This is consistent with the historical information and the borehole and test pit investigations completed across the site.

Subsurface soils surrounding current and former electrical substations were investigated by DP and no contaminants of concern were identified. Data gaps regarding soils present beneath the former solvent wash, truck wash bay, cold mix area, truck 'oil up stand', gross sediment traps and oil/water separators were all assessed as part of the DP investigation, and reported results suggest these features did not make these soils unsuitable for the proposed development.

Asphalt and charcoal pieces were identified within fill at 0.05m bgl, along the eastern boundary of the site, with long chain hydrocarbons detected in laboratory analysis well below the adopted criteria. Petroleum hydrocarbons were not detected above the PQLs in the underlying natural soils.

DP identified fill containing ash, trace asphalt and bitumen was identified in the north-eastern corner of the middle level, beneath the amenities building to a depth of 0.9m. Descriptions of fill appeared similar to reworked natural material, with the low concentrations of long chain hydrocarbons, consistent with field observations i.e. no odours, staining and low PID readings. Reported results were below criteria for commercial / industrial land use.

Landscaping present to the south of the site, along Davis Road has been identified as part of the CPW. Slightly elevated concentrations of heavy metals, particularly zinc, nickel and copper, were reported marginally above the ACL for 'areas of ecological significance' in the sampling conducted by DP. Concentrations of heavy metals from three natural soil samples were similar in concentrations for the exceeding heavy metals. Given that the CPW will be retained in this section of the site, the exceedances do not warrant further action. Long chained hydrocarbons were also identified in the CPW landscaping area. The TRH analysis was further assessed by the laboratory and it the concentrations were considered to represent the presence of eucalyptus woodchip, rather than anthropogenic effects.

In the Auditor's opinion, the soil analytical results are consistent with the site history and field observations. The results indicate that fill and natural soils across the site have been adequately characterised. Hydrocarbon impact was identified in the soil near petroleum infrastructure, remediation of these areas is discussed in Section 10.

Some exceedances of ecological criteria are identified, given the commercial industrial use of the site the exceedances are not considered significant. Overall, soils present within landscaping areas did not appear to present a significant risk to terrestrial ecology.

9.0 Evaluation of Groundwater Investigations

URS installed thirteen groundwater monitoring wells across the site (MW1-MW13) in 2005. Monitoring wells were screened across the shale/sandstone bedrock, and were expected to represent the local aquifer which flowed in a southerly to south easterly direction.

Four rounds of groundwater monitoring were completed in August 2005, October 2008, March 2010 and June 2012, and a summary of the results is presented in Table 9.1.

Table 9.1: Summary of Maximum Groundwater Investigation Analytical Results (µg/L)

Analyte	Summary of the 4 Rounds: 2005 - 2012		Final Sampling Round: 2012		
	Maximum over the four rounds (mg/L)	Location / date of maximum	Detections	Maximum / Location of Maximum	n >guideline
Benzene	<1	ND	0	ND	0 above HSL (commercial / industrial) clay of 4
Toluene	<2	ND	0	ND	NL
Ethylbenzene	<2	ND	0	ND	NL
Xylene	<2	ND	0	ND	NL
TRH (C_6-C_{10} minus BTEX)	<20	ND	0	ND	NL
TRH (C_{10}-C_{16} minus naphthalene)	100	Central part of site (MW07) / 2008	0	ND	NL
TRH (>C_{16}-C_{34})	500	Southern boundary (MW02) / 2008	0	ND	NL
TRH (>C_{34}-C_{40})	130	Southern boundary (MW02) / 2008	0	ND	NL
Naphthalene	<1	ND	0	ND	NL
Benzo(a)pyrene	0.7	Eastern boundary (MW08) / 2006	0	ND	-
Total PAH	12	Eastern boundary (MW08) / 2006	0	ND	-
Arsenic	20	Southern boundary (MW02) / 2008	5	17 / Southern boundary (MW02)	1 above Freshwater GIL of 13 (in absence of marine)
Cadmium	2.8	South-east corner (MW01) / 2006	2	1 / Central part (MW04)	0 above GIL of 0.7

Analyte	Summary of the 4 Rounds: 2005 - 2012		Final Sampling Round: 2012		
	Maximum over the four rounds (mg/L)	Location / date of maximum	Detections	Maximum / Location of Maximum	n >guideline
Total Chromium	0.11	Central part of site (MW06) / 2008	0	<0.01	0 above GIL of 0.7
Copper	8	South-east corner (MW01) / 2006	11	6 / Northern part (MW12)	7 above GIL of 1.3
Lead	4	South-east corner (MW01) / 2006	1	1 / Central part (MW06)	1 above GIL of 3.4
Mercury	<0.1	ND	0	ND	0 above GIL of 0.1
Nickel	30	Southern boundary (MW02) / 2006	9	18 / Central part (MW07)	2 above GIL of 7
Zinc	54	Central part of site (MW06) / 2006	12	29 / Northern part (MW09)	12 above GIL of 15
VOCs	ND	ND	0	ND	-

n number of samples
- No criteria available/used
ND – Not Detected
NL – Not Limiting, where the criteria value exceeds the soil saturation concentration.
Note: Heavy metal analysis included within final round data was collected from URS (2010) sampling round.
1 – For all investigations prior to 2013, TPH C6-C9 concentrations were assessed as F1 TPH (BTEX concentrations <PQL)
2 – For all investigations prior to 2013, TPH C10-C14 concentrations were assessed as F2 TPH (naphthalene concentrations <PQL)
3 – For all investigations prior to 2013, TPH C15-C28 concentrations were assessed as F3 TPH >C16 – C36
4 – For all investigations prior to 2013, TPH C29-C36 concentrations were assessed as F4 C36 – C40

Phase separated hydrocarbons (PSH) were not encountered during any of the monitoring events. Depth to groundwater appeared stable and physiochemical parameters appeared consistent between rounds. The reported results between rounds were also comparable. The final round of groundwater monitoring, was completed by URS in 2012, and indicated that no petroleum hydrocarbon or PAH were reported above the PQLs in groundwater.

Heavy metal concentrations exceeding the trigger values for aquatic ecosystems were detected in various wells across the site for arsenic, chromium, copper, nickel and zinc. Due to the widespread distribution, URS concluded that these concentrations were indicative of local groundwater quality, and did not pose a risk to commercial industrial use of the site, or surrounding environment. URS determined further investigations were not warranted.

DP (2017) installed a further three groundwater monitoring wells, for the purpose of establishing baseline hydrological data for geotechnical purposes. The bore logs and laboratory reports for two rounds of sampling (2016 and 2017) were provided as a letter report. No details regarding well installation or quality assurance were provided therefore the findings of the groundwater sampling were not relied upon as part of the audit. However, analytical results obtained were reviewed by the Auditor, and were found to be consistent with the findings from the previous URS groundwater investigations.

In the Auditor opinion, the groundwater results are consistent with field observations during the intrusive investigations and expectations following successful removal and validation of petroleum hydrocarbon infrastructure (Section 10). The Auditor is satisfied that no further investigations are needed and that the site criteria for commercial/industrial uses have been met.

10.0 Remediation

10.1 Structural Dilapidation Survey and a Hazardous Building Material Survey

In 2012 URS undertook a structural dilapidation survey (URS 2012c), a hazardous building material survey (HAZMAT) was also undertaken by Hibbs and Associates (2012) under URS supervision. The structural dilapidation survey was undertaken visually, non destructive and unobtrusively from trafficable areas only. The dilapidation survey concluded, based on visual inspection, that the facade of the buildings appeared in a reasonable condition with no adverse structural damage requiring immediate repair.

URS (2013a) state that the hazardous building material survey was a visual inspection of the accessible material to identify locations and applications in which hazardous material may have been used. URS state the HAZMAT survey did not identify any friable asbestos on site. The HAZMAT survey did identify several locations (internal and external) that contained bonded asbestos materials. These bonded asbestos materials were recommended for removal if works were to continue in the vicinity. The HAZMAT survey also identified Synthetic Mineral Fibres fibre (SMF) material inside the buildings which were not identified as a significant risk to human health. No lead based paints were identified.

10.2 Remediation Activities

Civil works were undertaken by Transpacific Industrial Services Pty Ltd (TPI) under supervision of URS between September 2012 and December 2012 and reported by URS (2013b).

Infrastructure removed included three 55kL ASTs and associated pipework, two partial USTs, two interceptor pits and associated pipework. The ASTs removed were noted by URS to be in good condition with no evidence of punctures or excessive corrosion. The two USTs were described as ‘encountered with top opened and all turrets and lugs removed, filled with a sandy material’. Waste transport and disposal certificates for the tanks were provided. In the Auditor’s opinion, remediation works undertaken were appropriate. Validation results and testing are discussed in Section 10.3.

As part of the URS validation activities, 10 m^2 of asbestos containing fibre cement debris from two areas of the site were hand picked and disposed off-site. The asbestos material was located in the north east corner of the site (near EX03/EX04) and electrical component debris from the southern area adjacent to redundant electrical control panel. In addition, loose asbestos sheeting was identified in the laboratory building. The asbestos sheeting is likely to be sourced from the dilapidated buildings. URS state that a licenced contractor carried out the removal works, with dust, debris and damaged materials removed from the laboratory. Prensa Pty Ltd (Prensa) have issued 2 Clearance Certificates associated with the asbestos removal (included as appendix to URS 2013b Validation Report).

10.3 Validation Activities

10.3.1 Evaluation of Validation Soil Results – Excavations

Validation samples were collected from the walls and base of excavations, and the final validation sample results are summarised in Table 10.1 below. Following a review of the results, the Auditor is satisfied that the samples that had failed the criteria have been excavated and adequately validated. Figures showing the extent of excavations are provided in **Attachments 7-11**, **Appendix A.**

Table 10.1 Evaluation of Validation Analytical Results – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
Lead	90	85	66	0 above HIL D of 1,500 mg/kg	0 above Generic ACL (commercial industrial) of 1,800 mg/kg
TRH (C_6-C_{10} - BTEX)	90	0	<10	0 above HSL D 0-1 m sand of 260 mg/kg 0 above ML (commercial industrial - coarse) of 700 mg/kg	0 above ESL (commercial industrial) (coarse/fine) of 215 mg/kg
TRH (>C_{10}-C_{16} - naphthalene)	90	12	760	Not Limiting for HSL D 0 above ML (commercial industrial - coarse) of 1,000 mg/kg	5 above ESL (commercial industrial) (coarse/fine) of 170 mg/kg
TRH (>C_{16}-C_{34})	90	15	690	0 above ML (commercial industrial - coarse) of 3,500 mg/kg	-
TRH (>C_{34}-C_{40})	90	2	410	0 above ML (commercial industrial - coarse) of 10,000 mg/kg	-
Benzene	90	0	<0.2	0 above HSL D 0-1 m, sand of 3 mg/kg	0 above ESL (commercial industrial - coarse) of 75 mg/kg
Toluene	90	0	<0.5	Not Limiting for HSL D	0 above ESL (commercial industrial - coarse) of 135 mg/kg
Ethylbenzene	90	0	<0.5	Not Limiting for HSL D	0 above ESL (commercial industrial - coarse) of 165 mg/kg
Xylenes	90	0	<0.5	0 above HSL D 0-1 m, sand of 230 mg/kg	0 above ESL (commercial industrial - coarse) of 95 mg/kg
Naphthalene	90	0	<0.5	Not Limiting for HSL D	0 above generic EIL (commercial industrial) of 370 mg/kg
Benzo(a)pyrene	90	0	<0.5	-	0 above ESL (commercial industrial) (coarse) of 1.4 mg/kg - not present in area designated for landscaping
Total PAHs	90	6	2.6	0 above HIL D 4,000 mg/kg	-
Total Phenols	90	0	<0.5	0 above HIL D 660 mg/kg (pentachlorophenol)	-

n number of samples
- No criteria available/used
NL Non-limiting
<PQL Less than the practical quantitation limit

The Auditor notes that the validation samples are below the nominated criterial for commercial/ industrial land use with the exception of five samples which were above the ESL for TRH F2 fraction. The ESLs are considered less relevant on commercial industrial areas. As these samples are not located in landscaping areas, the concentrations above the ESL are not considered significant.

The Auditor considers that the final soil sampling density (considering both the URS and DP investigations) beneath the ASTs and USTs conformed with the relevant EPA Technical Note: Investigation of Service Station sites (NSW EPA 2014) and was sufficient to adequately assess the

site. The remediation adequately addressed the elevated petroleum related soil concentrations identified by the URS investigations. This was confirmed by the DP data gap investigations which concluded that no significant concentrations of petroleum related soil impact was identified on site.

10.3.2 Evaluation of Validation Soil Results - Stockpiles Sourced from Excavations

Removal of infrastructure and associated soil impact resulted in seven excavations (EX1-EX7). The excavated soil was placed in 11 stockpiles. A summary of the excavations and stockpiles is provided in Table 10.2 and figures of the extent.

Table 10.2: Excavation Details

Excavation	Size (m^3)	# Validation Samples	Stockpile	# Stockpile Samples	Comments
EX1	65	9	SP01 SP02	8	Removal of shallow hydrocarbon impacted soil at 0.5 m depth in north eastern portion of site
EX02	90	11	SP03 SP04 SP05	12	Removal of 2 partial USTs, remnant pipework and associated soil in lower portion of upper hard stand level
EX03	15	6	SP06	4	Delineation and removal of shallow (0.2-0.3m) hotspot of hydrocarbon impacted soils in north west corner of the site.
EX04	511	42	SP08 SP11 SP12 SP13 SP14		Removal of hydrocarbon impacted soils in central portion of former manufacturing area
EX05	5	6	SP07		Removal of the interceptor pit and associated impacted soils near the AST on upper hard stand area
EX06	10	7	SP09		Removal of the interceptor pit and associated impacted soils located in the former manufacturing area. Defined the eastern extent of EX04.
EX07	5	5	SP10		Removal of shallow hydrocarbon impacted soil (0.1-0.2 m) near SB116 in former manufacturing area.
Scrape at 0.2	1	NA	NA	NA	To verify the presence of shallow impacted soils at MW13, material left insitu

URS state that overall, approximately 700 t of soil material was excavated and stockpiled on site. Additionally, concrete was removed from the surface of the site to access excavations. This concrete was disposed to a recycling facility (details not included). URS indicate that during stockpiling visually contaminated material was segregated and all stockpiles were stored on top of plastic sheeting with hay bales positioned to control run off.

Following validation, the excavations were backfilled with validated excavated material and imported VEMN as discussed in Section 10.3.3.

URS state that stockpiles SP03, SP05, SP07, SP08, SP09, SP10 and SP14 were considered to be suitable for reuse on site and were used to backfill the excavations. The guidelines used to assess the

suitability of the soil by URS are the NSW EPA Service Station Guidelines (NSW EPA 1994) for Sensitive Land use. Given the commercial industrial use of the land the assessment is considered conservative. The auditor considers the reuse to be acceptable.

URS state that stockpiles SP01, SP04, SP06, SP11, SP12 and SP13 were not considered suitable for reuse on site due to TPH concentrations or visual impacts. This material was removed from site (Approximately 511 t) and disposed of as general solid waste at Sita Kemps Creek Facility. Waste Transport Certificates were provided.

URS state that 13 t of bituminous waste from the ASTs along with 320 t of surface bitumen and concrete was disposed of as general solid waste to an EPA licenced facility. URS Also state that approximately 26 kL of hydrocarbon impacted water was removed from, the interceptor pit, USTs, ASTs and within the excavations to an EPA licenced facility.

10.3.3 Evaluation of Soil Results - Imported Material

URS state approximately 540 tonnes of VENM and road base was imported to reinstate and compact the excavations to final grade. The material was sourced from Camsons Quarries Products, Kemps Cree, NSW. URS state the material was visually inspected and six primary samples were analysed. A summary of the analytical results is provided in Table 10.3. URS state that the imported backfill material is acceptable for the commercial industrial use of the site.

Table 10.3: Analytical Results for Imported Fill – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > VENM
Arsenic	6	4	10	
Cadmium	6	0	<PQL	
Chromium	6	6	16	
Cobalt	6	6	22	
Copper	6	6	52	
Lead	6	4	<PQL	
Nickel	6	6	92	
Zinc	6	6	94	
Mercury	6	0	<PQL	
BTEX	6	0	<PQL	
TRH (C_6-C_{10})	6	2	12	
TRH (>C_{10}-C_{40})	6	0	<PQL	
Total PAHs	6	0	<PQL	
OCPs/PCBs	6	0	<PQL	

\- Not Applicable
Bold Concentration exceeds the site criteria

10.4 Auditor's Opinion

The identified petroleum infrastructure, USTs and ASTs have been removed from the site. The potential for unidentified USTs on the site is considered to be low due to the extent of the remedial excavations and investigations undertaken URS and DP, including the GPR survey in 2017.

The soil contamination identified in historical investigations by URS is considered to be adequately remediated and validated. The Auditor concludes that excavations for hydrocarbon impacted soil have been adequately validated and reinstated with appropriate material.

11.0 Contamination Migration Potential

Following remediation, no significant levels of chemical contaminants were detected over the site. Considering the remedial works undertaken to address impacts and the low permeability of the underlying clays, the Auditor considers that there is little or no potential for migration of contamination from the site or vertically to groundwater.

The conservative screening terrestrial ecological criteria were exceeded for zinc, nickel, copper and long chain hydrocarbons within the southern landscape area, when assessed against criteria for areas of ecological significance. The concentrations within natural soils were similar between sampling locations, and it is likely the exceedances represent natural site conditions, and are unlikely to present a significant risk to terrestrial ecology.

12.0 Assessment of Risk

Infrastructure related to the emoleum depot was removed and the site validated prior to the engagement of the Auditor. Given that the site was used as an emoleum depot for the past 20 to 30 years, there is a risk that subsurface contamination could remain. Based on the information presented following the investigation and validation works, the risk is considered to be low.

DP state the 'GPR scan did not indicate the presence of possible buried tanks'. Given this, the remedial works undertaken and the sample density employed during the intrusive investigations, the Auditor considers that the risk of USTs remaining on site is low.

Based on assessment of results against relevant guidelines and consideration of the overall investigation, it is the Auditor's opinion that the risks to human health and the environment are low.

The expected conditions at the site are fill (sand, silty sand) overlying natural (sandy silty clay) and shale with no odour or staining. Where removal of pavement or concrete slabs is required, an unexpected finds protocol should be considered.

13.0 Compliance with Regulatory Guidelines and Directions

The Auditor has used guidelines currently approved by the EPA under section 105 of the NSW *Contaminated Land Management Act 1997.*

The investigation was generally conducted in accordance with SEPP 55 Planning Guidelines and the National Environment Protection Council, (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 1999 (as amended 2013) and reported in accordance with and the OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*. The checklist included in that document has been referred to. The EPA's *Checklist for Site Auditors using the EPA Guidelines for the NSW Site Auditor Scheme 1998* (December 1999) has also been referred to.

As the audit was non-statutory, no notification to NSW EPA was required.

13.1 Planning Conditions

An Environmental Impact Statement (EIS) was prepared for the State Significant Development Proposal for a resource recovery facility (the Proposal) at the site. The EPA was asked to comment on the EIS and noted in a letter dated 5 June 2017 that 'the site was previously an asphalt batching plant owned by Mobil. However, no Remediation Action Plan or Site Audit Statement has been completed for the site'.

The Auditor confirms that a Remediation Action Plan is not required and that a Site Audit Statement regarding site suitability is attached to this Site Audit Report.

14.0 Conclusions and Recommendations

The URS summary report (2013a) which evaluated both the soil and groundwater conditions at the site concluded ‘the site conditions investigated by URS are consistent with the use of the site for commercial/Industrial purposes’.

DP (2017a) considers that based on the validation assessment, DP are of the opinion that ‘the results of the investigation have not revealed contamination that warrants remediation, therefore a Remediation Action Plan is not required for the proposed development. Residual petroleum hydrocarbons in soil at the site is considered to not pose a risk to terrestrial ecology, human health or groundwater (based on current and previous investigation results) when considering current development plans.’

Based on the information presented in the consultants reports and observations made on site, and following the Decision-Making Process for Assessing Urban Redevelopment Sites in DEC (2006) *Guidelines for the NSW Site Auditor Scheme*, the Auditor concludes that the site is suitable for the proposed commercial/industrial uses.

15.0 Other relevant Information

This Audit was conducted on the behalf of Bettergrow Pty Ltd for the purpose of assessing whether the land is suitable for the proposed commercial/industrial uses i.e. a “Site Audit” as defined in Section 4 (definition of a ‘site audit’ (b)(iii)).

This summary report may not be suitable for other uses. URS and DP included limitations in their report. The Audit must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the Auditor had some control or is reasonably able to check.

The Auditor has relied on the documents referenced in Section 1 of the Site Audit Report in preparing the Auditors’ opinion. If the Auditor is unable to rely on any of those documents, the conclusions of the audit could change.

It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

Appendix A: Attachments

Attachment 1: Site Location

Attachment 2: Previous site layout

Attachment 3: URS Sample Location

Attachment 4: Soil Validation Investigation Area 1

Attachment 5: Soil Validation Investigation Area 2

Attachment 6: DP Sample Locations

Attachment 7: URS Remediation excavation locations

Attachment 8: URS Remediation Validation Sample Locations EX1 and EX3

Attachment 9: URS Remediation Validation Sample Locations EX2 and EX5

Attachment 10: URS Remediation Validation Sample Locations EX4

Attachment 11: URS Remediation Validation Sample Locations EX6 and EX7

MOBIL OIL AUSTRALIA

WETHERILL PARK ENVIRONMENTAL SUMMARY REPORT, FORMER WETHERILL PARK EMOLEUM DEPOT

General Area Map

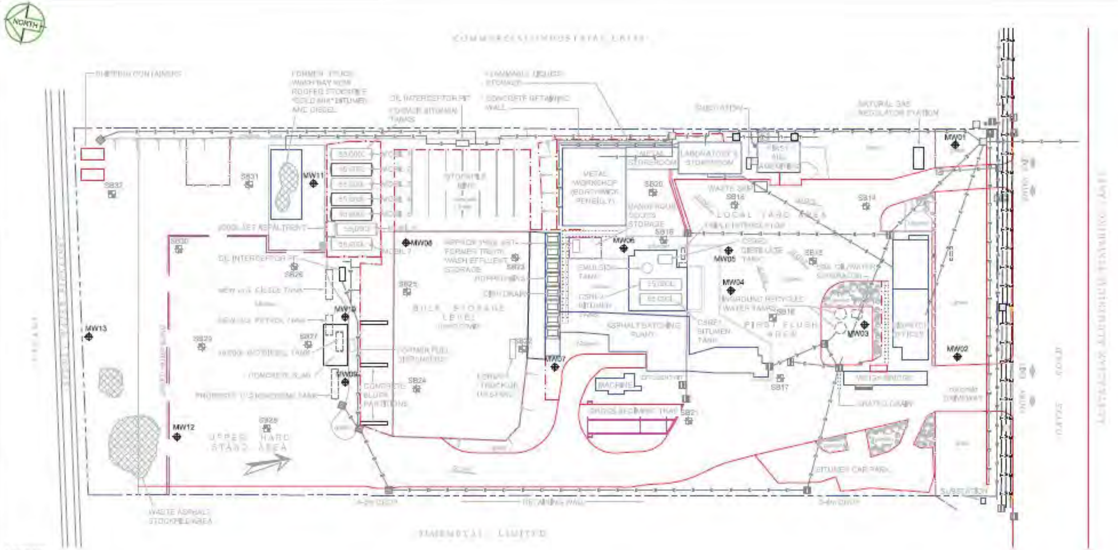
URS

24 DAVIS ROAD, WETHERILL PARK, NSW.

File No: 43484440.001.wor | Drawn: STB | Approved: RS | Date: 13/05/2015

Figure: 2

Rev: A | A3



LEGEND

- INFERRED DIRECTION OF GROUNDWATER FLOW
- SITE BOUNDARY
- FENCE LINE
- RETAINING WALL
- UNDERGROUND STORAGE TANK
- ABOVE GROUND STORAGE TANK (REMAINING)
- ABOVE GROUND STORAGE TANK (REMOVED)
- DIRECTION OF GROUND SURFACE SLOPE
- STAINING AREA
- STOCKPILE AREA
- STORMWATER DRAIN
- WATER TAP OR METER
- HYDRANT/WATER PIT
- GAS PIT
- SEWER PIT
- TELSTRA PIT
- SB31 SOIL BORE (URS AUG 2006)
- MW11 MONITORING WELL (URS AUG 2006)
- GAS LINE
- OVERHEAD ELECTRICITY
- SEWER LINE
- STORMWATER DRAIN
- TELSTRA
- TOWN WATER

CLIENT: **MOBIL AUSTRALIA PTY LTD**

PROJECT: **ANNUAL GME - MARCH 2010**
EMOLEUM (AUSTRALIA) LIMITED, WETHERILL PARK, NSW

0 20 40
1:750 (metres)

DESIGNED: KY | APPROVED: NR
DRAWN: BB | DATE: 08/04/2010
DATE: 08/04/2010 | STATUS: DRAFT

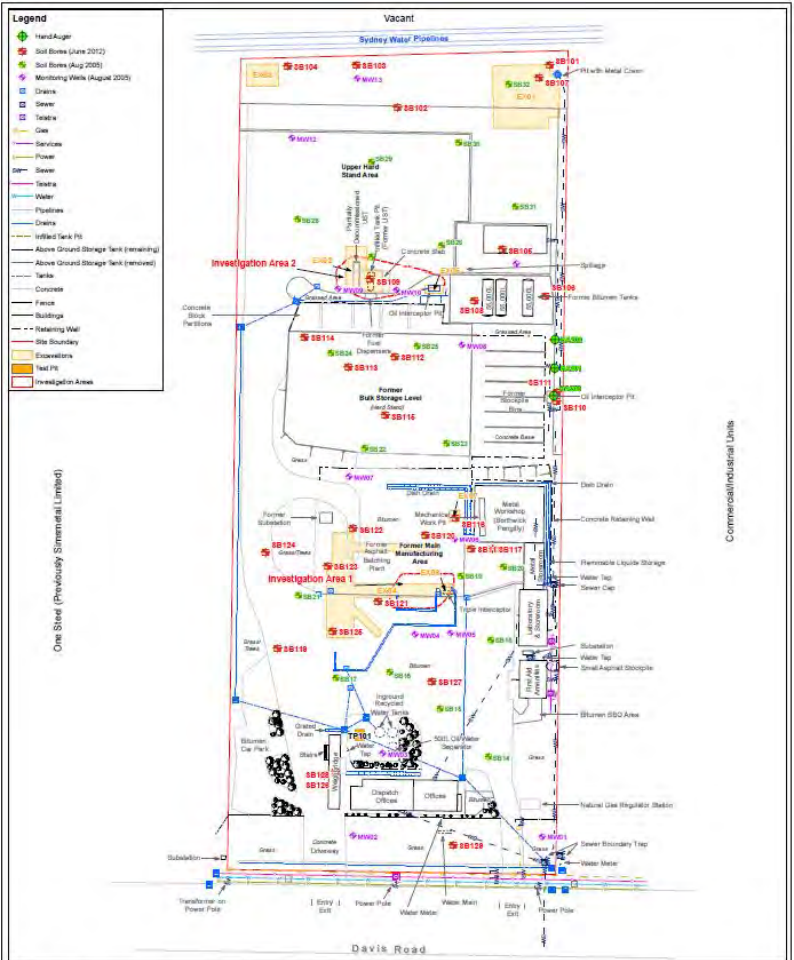
TITLE: **SITE LAYOUT PLAN**

PROJECT: 42424273
CAD FILE: 003.DWG
REVISION: A

URS

A3

FIGURE 3



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WETHERILL PARK ENVIRONMENTAL SUMMARY REPORT, FORMER WETHERILL PARK EMOLEUM DEPOT

INVESTIGATION LOCATIONS

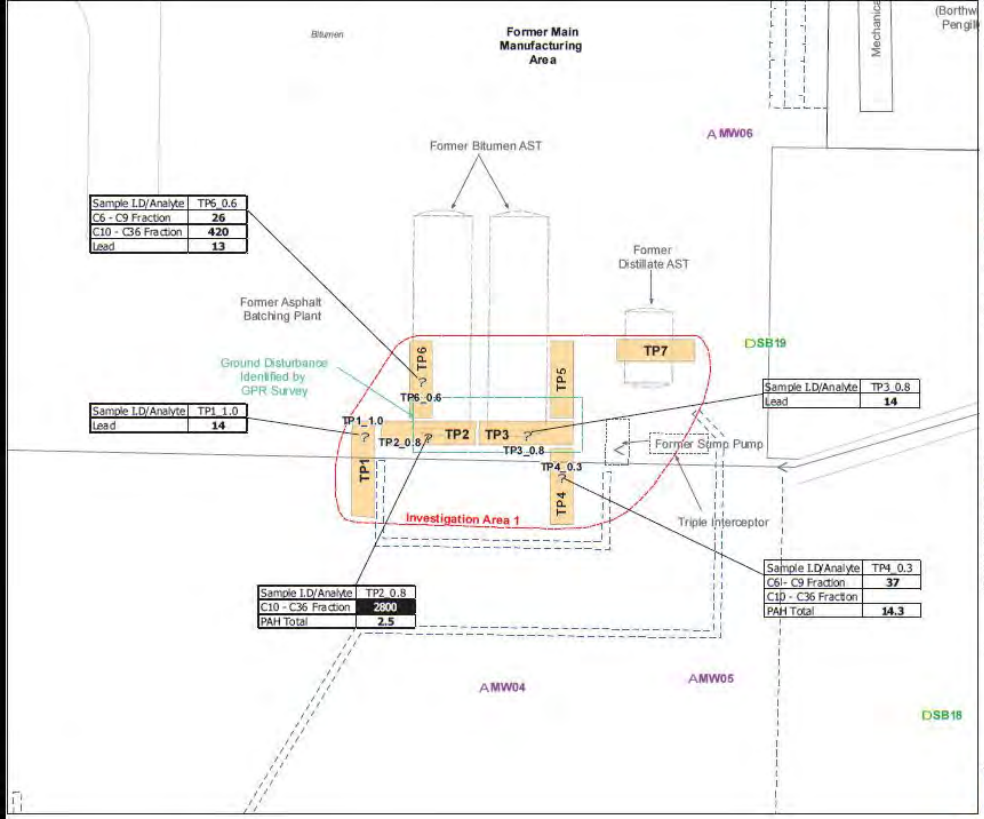
URS

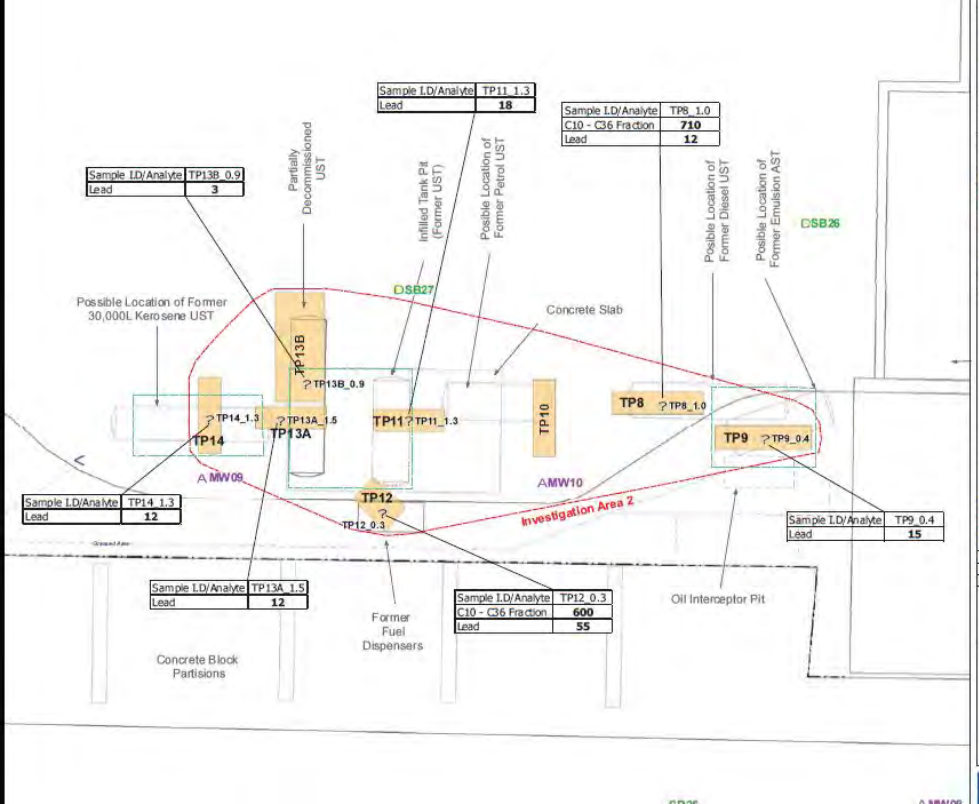
24 DAVIS ROAD, WETHERILL PARK, NSW

File No: 42424443.022.mxd Drawn: STB Approved: RS Date: 19/02/2013

Figure: 3

Rev. A A3


Former Main Manufacturing Area
Bitumen
Former Bitumen AST
Former Distillate AST
Former Asphalt Batching Plant
Ground Disturbance Identified by GPR Survey
Former Sump Pump
Triple Interceptor
Investigation Area 1
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP1_1.0
TP2_0.8
TP3_0.8
TP4_0.3
TP6_0.6
MW04
MW05
MW06
DSB18
DSB19
Sample I.D/Analyte | TP6_0.6
C6 - C9 Fraction | 26
C10 - C36 Fraction | 420
Lead | 13
Sample I.D/Analyte | TP1_1.0
Lead | 14
Sample I.D/Analyte | TP3_0.8
Lead | 14
Sample I.D/Analyte | TP2_0.8
C10 - C36 Fraction | 2800
PAH Total | 2.5
Sample I.D/Analyte | TP4_0.3
C6 - C9 Fraction | 37
C10 - C36 Fraction
PAH Total | 14.3
Legend
Detections
Soil Bores (Aug 2005)
Monitoring Wells (August 2005)
Drains
Sewer
Telstra
Gas
Sewer
Drains
Concrete
Buildings
Retaining Wall
Test Pits
Investigation Area
Ground Disturbance Identified by GPR Survey
Table Legend
Result >LOR
mg/kg = milligrams per kilogram
SAC = Soil Acceptance Criteria
LOR = Limit of Reporting
Note: Only detections over LOR are shown
Datum: GDA94
GAC MGA Zone 56
PATH: T:\JOBS\43434\MXD\SPACE.B
FILE NO: 43434A.MXB
DRAWN: BJB APPROVED: MP DATE: 29/06/2011
MOBIL OIL AUSTRALIA
WETHERILL PARK TEST PITTING
FORMER WETHERILL PARK
EMOLEUM DEPOT,
24 DAVIS ROAD,
WETHERILL PARK, NSW
INVESTIGATION AREA 1
URS
Figure 5A
Rev: A
A3



Legend

- Detections
- Drains
- Soil Bores (Aug 2005)
- Monitoring Wells (August 2005)
- Infilled Tank Pit
- Drains
- Concrete
- Buildings
- Retaining Wall
- Former Tanks
- Test Pits
- Investigation Areas
- Ground Disturbance identified by GPR Survey

Table Legend

Result >LOR
mg/kg = milligrams per Kilogram
SAC = Soil Acceptance Criteria
LOR = Limits of Reporting
Note: Only detections over LOR are shown.

0 1 2 4 Metres

Datum: GDA94
Grid: MGA Zone 56

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FILE NO.: 43434404-00448.mxd
DRAWN: STB APPROVED: MF DATE: 28/06/2012

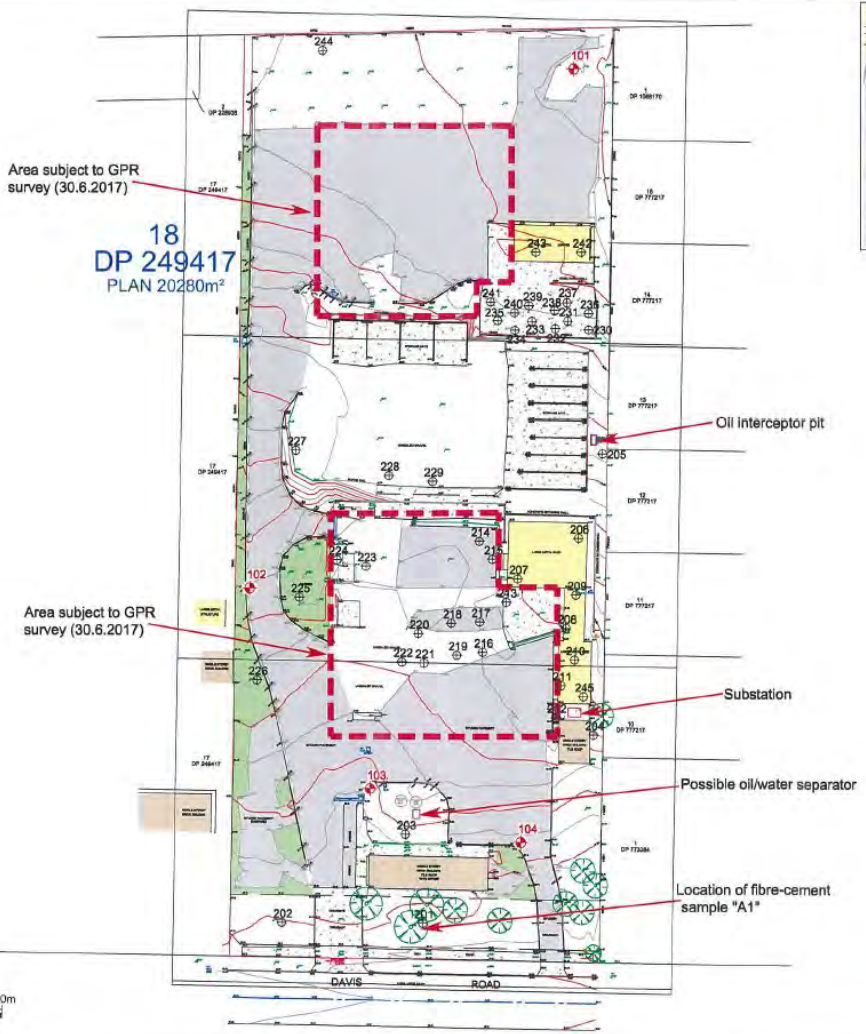
MOBIL OIL AUSTRALIA

WETHERILL PARK TEST PITTING

FORMER WETHERILL PARK
EMOLEUM DEPOT,
24 DAVIS ROAD,
WETHERILL PARK, NSW

INVESTIGATION AREA 2

URS | figure 5B



Locality Plan

NOTE:
1: Base drawing from RPS Pty Ltd (Ref 127695-151014-Detail, dated 14.10.2015)
2: Test locations are approximate only and are shown with reference to existing features.

0 10 20 30 40 50 75 100m
1:1000 @ A3

LEGEND
- Previous borehole location (ground water monitoring well)
- Current borehole location (for soil sampling)

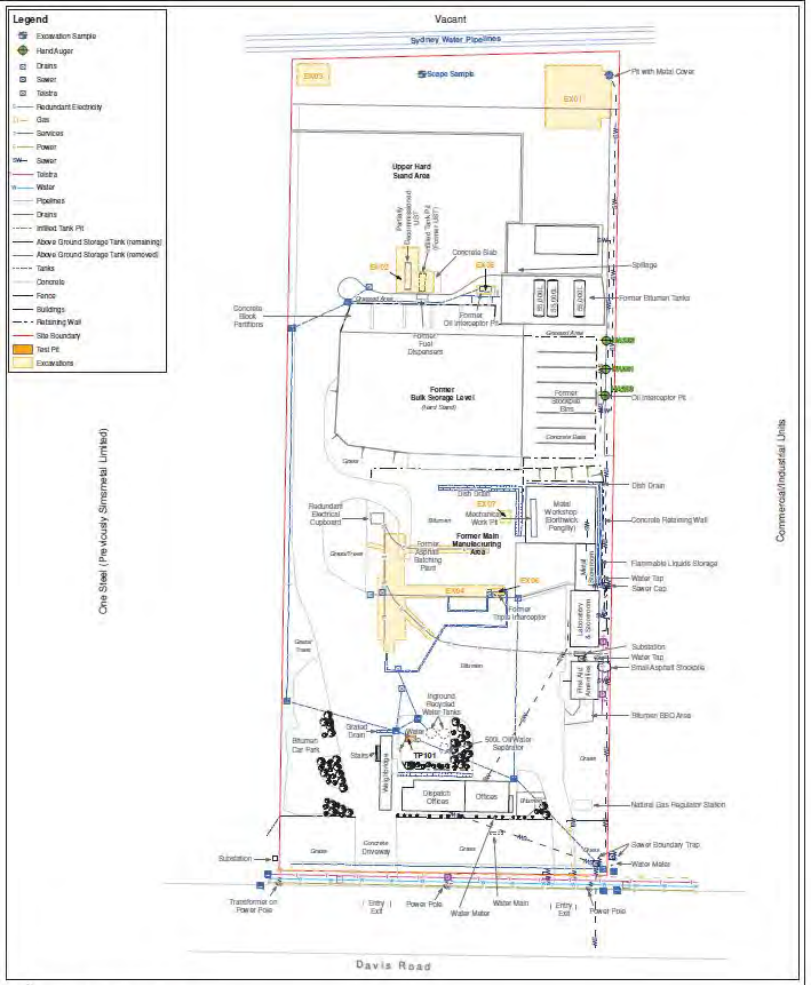
Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Bettergrow Pty Ltd		
OFFICE: Sydney	DRAWN BY: Vojta	
SCALE: 1	DATE: 14.7.2017	

TITLE: **Location of Boreholes**
Proposed Resource Recovery & Recycling Centre
24 Davis Road, WETHERILL PARK

N

PROJECT No:	85126.03
DRAWING No:	1
REVISION:	0



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MOBIL OIL AUSTRALIA

WETHERILL PARK SOIL VALIDATION REPORT, FORMER WETHERILL PARK EMOLEUM DEPOT

EXCAVATION LOCATIONS

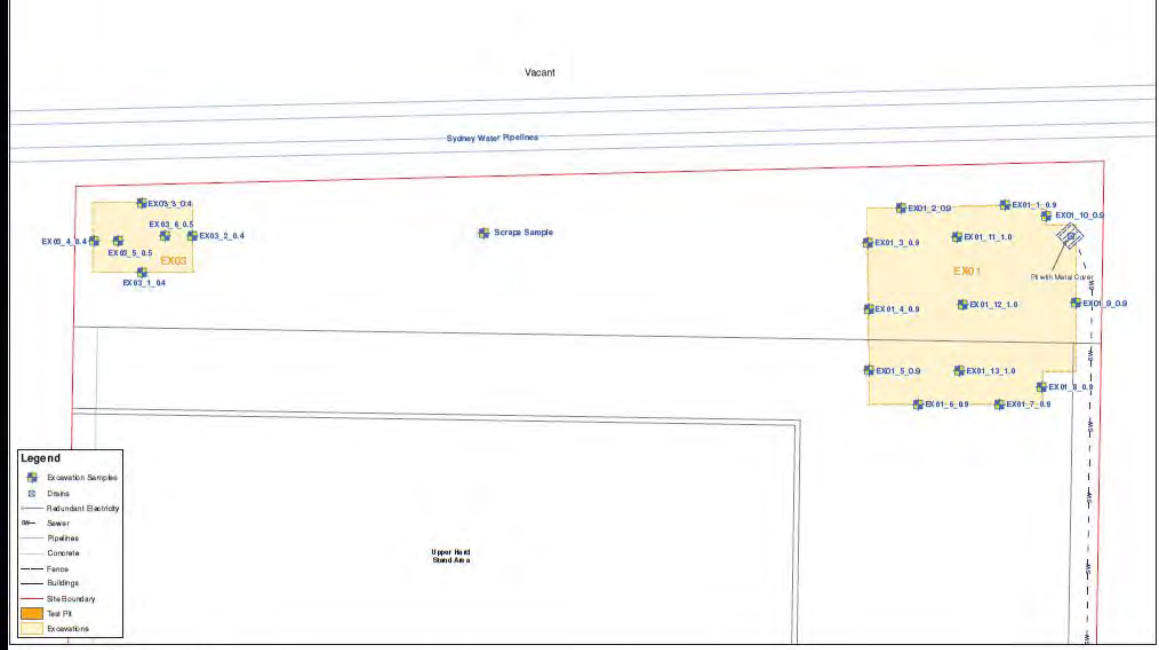
URS

34 DAVIS ROAD, WETHERILL PARK, NSW

File No: 42424443.014.mxd Drawn: STS/SS Approved: RS Date: 19/04/2013

Figure: 4A

Rev: A A3



MOBIL OIL AUSTRALIA

WETHERILL PARK SOIL VALIDATION REPORT, FORMER WETHERILL PARK EMOLEUM DEPOT

EXCAVATIONS 01 & 03
UPPER HARDSTAND AREA

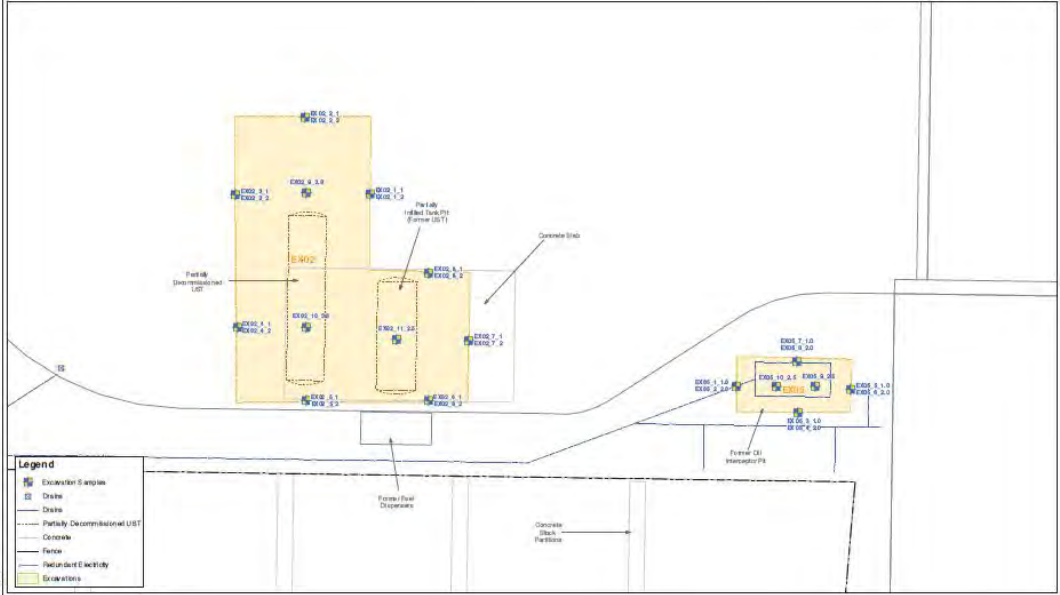
URS

24 DAVIS ROAD, WETHERILL PARK, NSW

Figure 4B

File No: 43434443.01fb.mxd Drawn: STB/SB Approved: SH Date: 19/04/2013

Rev A A3



MOBIL OIL AUSTRALIA

WETHERILL PARK SOIL VALIDATION REPORT, FORMER WETHERILL PARK EMOLEUM DEPOT

EXCAVATIONS 02 & 05
UPPER HARD STAND AREA

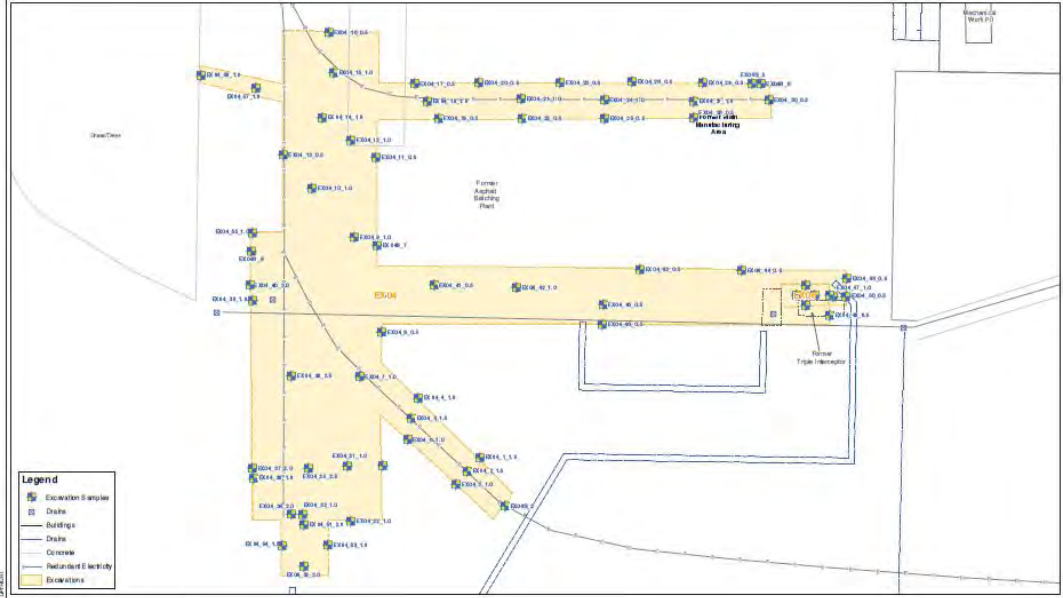
URS

24 DAVIS ROAD, WETHERILL PARK, NSW

File No: 42424443.016_rpt4 Drawn: BTB/SFSS Approved: SH Date: 18/04/2013

Figure: 4C

Rev A A1



MOBIL OIL AUSTRALIA

WETHERILL PARK SOIL VALIDATION REPORT, FORMER WETHERILL PARK EMOLEUM DEPOT

EXCAVATIONS 04
FORMER MANUFACTURING AREA

URS

24 DAVIS ROAD, WETHERILL PARK, NSW

File No: 42424443.017.mxd Drawn: STB Approved: SH Date: 18/04/2013

Figure: 4D

Rev: A Size: A3

MOBIL OIL AUSTRALIA

WETHERILL PARK SOIL VALIDATION REPORT,
FORMER WETHERILL PARK EMOLEUM DEPOT

EXCAVATIONS 06 & 07
FORMER MANUFACTURING AREA

URS

24 DAVIS ROAD, WETHERILL PARK, NSW

File No: 42424443.011_mxd Drawn: STB/BBS Approved: SH Date: 19/04/2013

Figure 4E
Rev A A3

Appendix B: EPA Guidelines

Guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997*

(as of: 13 October 2015)

Section 105 of the *Contaminated Land Management Act 1997* (CLM Act) allows the Environment Protection Authority (EPA) to make or approve guidelines for purposes connected with the objects of the Act. These guidelines must be taken into consideration by the EPA whenever they are relevant and by accredited site auditors when conducting a site audit. They are also used by contaminated land consultants in undertaking investigation, remediation, validation and reporting on contaminated sites. A current list of guidelines made or approved by the EPA under the CLM Act appears below. To obtain hard copies of the guidelines, contact Environment Line on 131 555.

Guidelines made by the EPA

- Guidelines for the Vertical Mixing of Soil on Former Broad-acre Agricultural Land (2003028VerticalMixGuidelines.pdf, 148KB) (January 1995)
- Sampling Design Guidelines (9559sampgdlne.pdf, 2MB) (September 1995)
- Guidelines for Assessing Banana Plantation Sites (bananaplantsite.pdf; 586KB) (October 1997)
- Guidelines for Consultants Reporting on Contaminated Sites (20110650consultantsglines.pdf; 428KB) (reprinted August 2011)
- Guidelines for Assessing Former Orchards and Market Gardens (orchardgdlne.pdf; 172KB) (June 2005)
- Guidelines for the NSW Site Auditor Scheme, 2nd edition (auditorglines06121.pdf; 510KB) (April 2006)
- Guidelines for the Assessment and Management of Groundwater Contamination (groundwaterguidelines07144.pdf; 604KB) (March 2007)
- Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (150164-report-land-contamination-guidelines.pdf; 412KB) (September 2015)

Note: All references in the EPA's contaminated sites guidelines to:

- the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, November 1992) are replaced as of 6 September 2001 by references to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, October 2000)
- the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 1999) are replaced as of 16 May 2013 by references to the National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013)

subject to the same terms.

Guidelines approved by the EPA

ANZECC publications

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, published by ANZECC and the Agriculture and Resource Management Council of Australia and New Zealand, Paper No. 4 (October 2000)

EnHealth publications (formerly National Environmental Health Forum monographs)

- Composite Sampling, Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide
- Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia (2012)

National Environment Protection Council publications

- National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013)

The NEPM consists of a policy framework for the assessment of site contamination, Schedule A (Recommended General Process for the Assessment of Site Contamination) and Schedule B (Guidelines).
Schedule B guidelines include:
Guideline on Investigation Levels for Soil and Groundwater
Guideline on Site Characterisation
Guideline on Laboratory Analysis of Potentially Contaminated Soils
Guideline on Site-specific Health Risk Assessment Methodology
Guideline on Ecological Risk Assessment
Guideline on Methodology to Derive Ecological Investigation Levels in Contaminated Soils
Guideline on Ecological Investigation Levels for Arsenic, Chromium(III), Copper, DDT, Lead, Naphthalene, Nickel and Zinc
Guideline on the Framework for Risk-based Assessment of Groundwater Contamination
Guideline on Derivation of Health-based Investigation Levels
Guideline on Community Engagement and Risk Communication
Guideline on Competencies and Acceptance of Environmental Auditors and Related Professionals
More details on the amended NEPM and the transitional arrangements for its implementation

Other documents

- Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental (February 1996)
- Australian Drinking Water Guidelines, NHMRC and Natural Resource Management Ministerial Council of Australia and New Zealand (2011)

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Senversa Pty Ltd ABN 89 132 231 380

Appendix 7

Dust Assessment

Advanced Environmental Dynamics

Specialist Consultants

GREENSPOT WETHERILL PARK

DUST ASSESSMENT

Report # 959516.2

Prepared for:

Bettergrow Pty Ltd

45 Industrial Road

Vineyard, NSW 2765

1 August 2017

Advanced Environmental Dynamics Pty Ltd (ACN 147 226 060)

The Trustee for AED Trust (ABN: 68 934 621 946)

PO Box 266, Ferny Hills, QLD, 4055

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www.aedconsultants.com.au

Client	**Client's Representative**
Bettergrow Pty Ltd	John Vyse
Client Address	
45 Industrial Road, Vineyard, NSW 2765	

Project Title	**Project / Report Number**
Greenspot Wetherill Park Dust Assessment	959516.2

Authors	**Date**
Dr Darlene Heuff	1 August 2017
	Approved By
	Dr Darlene Heuff

Revision	**Description**	**Date**
0	Draft Report	01/08/2017

Key Words	**Classification**
Dust, Dust Management	Proprietary

Executive Summary

Advanced Environmental Dynamics Pty Ltd was commissioned by Bettergrow Pty Ltd to undertake a dust assessment of the Greenspot Wetherill Park (GWP) resource recycling and recovery centre located at 24 Davis Road, Wetherill Park, NSW.

This assessment has focused on the impacts of dust associated with the material handling of bulk landscaping supplies at GWP in isolation of other off-site dust emission sources and background levels.

Project Background

Up to 200,000 tonnes of various materials will be processed through GWP annually including:

- *60,000 tonnes of hydro-excavation and directional drilling muds/fluids for storage, separation and consolidation within the Drill mud and Hydro-excavation Fluids Processing Area (DHFPA);*
- *40,000 tonnes of various bulk landscaping products;*
- *70,000 tonnes of garden organics (GO) or food organics combined with garden organics (FOGO) to be processed and consolidated within the Organics Receival and Processing Building (ORPB) ; and*
- *30,000 tonnes of other source separated commercial and industrial organics (C&IO) to be processed and consolidated within the Food Depackaging Building (FDB)*

Dust Sources and Management Strategies

The potential for dust-related impacts to off-site receptors associated with the process and handling of the 40,000 tonnes of various bulk landscaping products include:

- *Truck dumping of materials;*
- *Material handling using front end loader (FEL); and*
- *Wind erosion of stockpiles.*

Dust from GWP will be managed through the implementation of a variety of dust management strategies including (Appendix 21, GWP Environmental Impact Statement (RPS, 2017)):

- *Ceasing activities that are producing dust;*
- *Use of fogging unit or sprinkling units;*
- *Sweeping of driveways and haulage paths;*
- *Covering all incoming and outgoing loads of bulk landscaping materials; and*

- *The wetting of bulk landscaping supplies during unloading or loading if required.*

Pollutants of Interest

It is noted that the New South Wales (NSW) Department of Environment and Conservation (DEC) document: 'Approved Methods for the modelling and Assessment of Air Pollutants in New South Wales' includes impact assessment criteria for total suspended particulates (TSP), particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}) as well as dust deposition. Additionally it is noted that particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$) is of interest to the National Environmental Protection Council (NEPC).

In relation to material handling, it is the 24 hour average criteria for the 24-hour average concentration of PM_{10} that is most likely to be exceeded with combustion-type emission sources more likely to contribute to impacts in the particle size range of $PM_{2.5}$ or less. Thus estimating impacts for $PM_{2.5}$ has not been undertaken. Instead, the focus here is on the larger size particulate ranges including TSP and PM_{10} as well as dust deposition.

Dust Emission Scenarios

For the purposes of assessing dust impacts from GWP, two dust emissions scenarios have been considered:

1) *Peak Scenario: Considers the emission of dust associated with an intake and output of 415.5 tonnes/day of bulk material and is based on a peak number of vehicle movements per day.*
2) *Average Scenario: Considers the emission of dust associated with an intake and output of 287.5 tonnes/day of bulk material and is based on an average number of vehicle movements per day.*

A conservative approach has been adopted whereby it has been assumed that the daily throughput for both scenarios occurs 365 days per year in order to capture the maximum range of meteorological conditions. This approach will be more representative of the possible risks of adverse dust impacts on the 24 hour time scale. However, results for the annual averages will be significantly biased upwards with the peak and average scenarios equating to c 3.8 and 2.6 times the annual throughput of 40,000 tonnes of bulk landscaping materials, respectively.

Interpretation of Dust Impacts

Results of the dust dispersion modelling have not highlighted any significant air quality issues with the maximum incremental contribution of emissions of dust to the 24 hour average

concentration of PM_{10} predicted to be less than 45% of the assessment criteria under peak conditions and less than 31% under average conditions (Table A).

The annual average concentration of TSP, PM_{10} as well as the maximum monthly dust deposition are predicted to be well below the relevant impact assessment criterion.

Note that background levels have not been included in the results presented in the table.

Table A: Results from the Dispersion Modelling – GWP in Isolation

Scenario	Vehicle Movement Scenario	Pollutant (units)	Averaging Period	Meteorological Year	Project Only Maximum Outside Site Boundary	Assessment Criteria (total including background)
1	Peak (415.5 tonnes/day)	TSP ($\mu g/m^3$)	Annual(1)	2013	17.4(4)	90
				2014	16.5(4)	90
				2015	17.8(4)	90
		PM_{10} ($\mu g/m^3$)	24 hour	2013	21.3	50
				2014	18.1	50
				2015	22.2	50
			Annual(1)	2013	4.6(4)	30
				2014	4.3(4)	30
				2015	4.6(4)	30
		Dust Deposition (g/m^2/month)	Monthly(1)	2013	0.07(4)	2.0/4.0(3)
				2014	0.07(4)	2.0/4.0(3)
				2015	0.04(4)	2.0/4.0(3)
2	Average (287.5 tonnes/day)	TSP ($\mu g/m^3$)	Annual(2)	2013	12.0(4)	90
				2014	11.4(4)	90
				2015	12.3(4)	90
		PM_{10} ($\mu g/m^3$)	24 hour	2013	14.7	50
				2014	12.5	50
				2015	15.3	50
			Annual(2)	2013	3.1(4)	30
				2014	3.0(4)	30
				2015	3.2(4)	30
		Dust Deposition (g/m^2/month)	Monthly(2)	2013	0.05(4)	2.0/4.0(3)
				2014	0.05(4)	2.0/4.0(3)
				2015	0.03(4)	2.0/4.0(3)

Note (1): Assumes peak volumes 365 days per year

(2): Assumes average volumes 365 days per year

(3): Assessment criterion is: Project only contribution not to exceed 2 g/m^2/month with total (including background) not to exceed 4 g/m^2/month.

(4): Reported results are conservative as they are based on the facility operating at the specified daily rate 365 days per year.

Final Comments

Results of the dust assessment for GWP suggest that the proposed mitigation measures and management strategies proposed for the operation of the facility will be sufficient to meet the regulatory criterion for dust.

Details of the dust management strategies and operational procedures pertaining to dust can be found in the GWP's Environmental Management Plan (Appendix 21, GWP EIS).

Table of Contents

Appendices

Tables

Figures

Abbreviations

AAQ	Ambient air quality
AED	Advanced Environmental Dynamics Pty Ltd
AWS	All weather station
BoM	Bureau of Meteorology
c.	Circa (approximately)
CALMET	California Meteorological Model
CALPUFF	California Plume Dispersion Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEC	Department of Environment and Conservation
DHFPA	Drill mud and Hydro-excavation fluids processing area
EETM	Emissions estimation technique manual
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
FDB	Food depackaging building
FEL	Front End Loader
FO	Food organics
FOGO	Combined food organics and garden organics
GO	Garden organics
GWP	Greenspot Wetherill Park
LZE	Luke Zambellli Environmental
NASA	National Aeronautics and Space Administration
NEPC	National Environmental Protection Council
NEPM	National Environment Protection Measure
NPI	National Pollutant Inventory
NSW	New South Wales
ORPB	Organics receival and processing building
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than 2.5 microns

PM_{10}	Particulate matter with an aerodynamic diameter less than 10 microns
SRTM	Shuttle Radar Topography Mission
TAPM	The Air Pollution Model
TSP	Total suspended particulates

Units

kg	Kilograms
m	Metre
mm	Millimetre
m^2	Square meters
m^3	Cubic meters
µg	Micrograms
%	Percentage
s	Second
t	Tonnes

1. Introduction

Advanced Environmental Dynamics Pty Ltd was commissioned by Bettergrow Pty Ltd (Bettergrow) to undertake a dust assessment of the Greenspot Wetherill Park (GWP) Resource Recovery and Recycling Centre located at 24 Davis Road Wetherill Park, New South Wales (NSW).

This report has been prepared in response to submissions to GWP's Environmental Impact Statement (EIS) and focuses on the material handling and storage of bulk landscaping supplies at GWP.

It is noted that this assessment is not strictly in accordance with the New South Wales (NSW) Department of Environment and Conservation (DEC) document: *Approved Methods for the modelling and Assessment of Air Pollutants in New South Wales.* Details of the areas in which this assessment differs from the NSW DEC document are discussed throughout the relevant sections of this report.

This report contains a summary of the dust assessment methodology and findings. Additional technical details are contained in the supporting appendices.

2. Project Background and Project Information

2.1 Project Description

AED understands that Bettergrow is seeking approval to develop a resource recovery and recycling centre at 24 Davis Road, Wetherill Park NSW (Lot 18, DP249417) (Figure 1).

Figure 1: Site Location (GWP)

Source: Google Earth

Up to 200,000 tonnes of various materials will be processed through the facility annually including:

- 60,000 tonnes of hydro-excavation and directional drilling muds/fluids for storage, separation and consolidation within the Drill mud and Hydro-excavation Fluids Processing Area (DHFPA, Figure 2);
- 40,000 tonnes of various bulk landscaping products;
- 70,000 tonnes of garden organics (GO) or garden organics combined with food organics (FOGO) to be processed and consolidated within the Organics Receival and Processing Building (ORPB, Figure 3) ; and
- 30,000 tonnes of other source separated commercial and industrial organics (C&IO) to be processed and consolidated within the Food Depackaging Building (FDB, Figure 3)

Figure 2: Drill Mud and Hydro Excavation Area (southern portion of site)

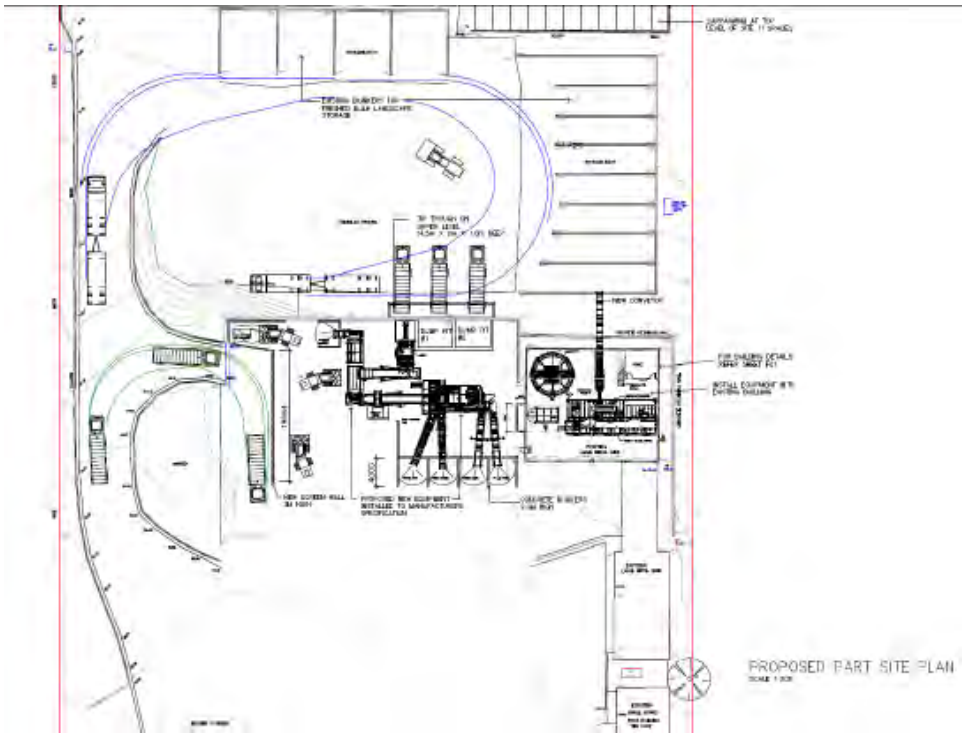
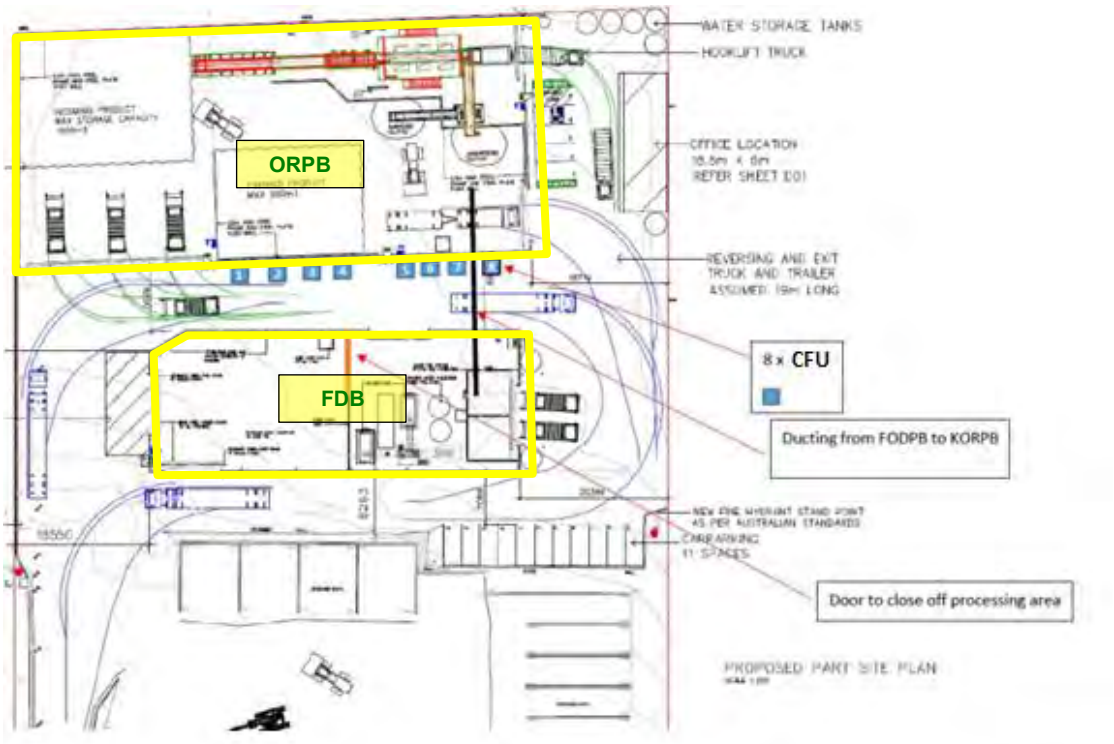


Figure 3: Organics Receival & Processing Building and Food Depackaging Building (northern portion of site)



2.2 Dust Emission Sources

Potential dust emission sources associated with the handling and storage of bulk landscaping material include:

- Truck dumping of bulk landscaping material;
- The movement of material by front end loader (FEL) to the storage bays;
- The unloading of storage bays by the FEL;
- The loading of trucks by the FEL; and
- The erosion of stockpiles by the wind.

2.3 Dust Management Strategies

The potential for dust-related impacts at off-site receptor locations will be managed through the adopted dust reduction measures that form part of the GWP Environmental Management Plan (EMP) (Appendix 21, GWP EIS (RPS, 2017)) and include:

- Ceasing activities that are producing dust to the extent that visible dust is seen to be passing the site boundary;
- Use of fogging unit or sprinkling units located at either end of the bulk landscaping;
- Driveways and haulage paths must be regularly swept;
- All incoming and outgoing loads of bulk landscaping materials must be effectively tarped;
- If required bulk landscaping supplies must be wetted so as to minimise the release of dust at the time of unloading or loading.

2.4 Summary of Key Project Information

A summary of waste and raw material properties as well as finished product properties is provided in Table 5 of the GWP EIS (RPS, 2017) which is reproduced here as Table 1. Information provided in the tables highlight the high moisture content (i.e. greater than 25%) of the bulk materials that will be handled on-site.

Table 1: Project Information: Source GWP EIS (RPS, 2017)

Table 5 Wastes and Raw Materials

Received Wastes and Raw Materials	Waste Classification (EPA, 2014b)	Storage Location	Moisture Content of Waste/Raw Material %
Soils (ENM and VENM)	General Solid Waste (non-putrescible)	Outside Landscape Bays	~25%
Clay/Sands/Stone/Gravels/Aggregates (VENM)	General Solid Waste (non-putrescible)	Outside Landscape Bays	~25% or greater
Drilling mud and/or muddy waters from hydro excavation, drilling and pot holing operations	Liquid Waste	Drill Mud Storage Tanks/Pit	~65% - 95%
Garden Mixes/Top Dressings/Mulches	General Solid Waste (non-putrescible)	Outside Landscape Bays	~30% or greater
Garden Organics	General Solid Waste (non-putrescible)	Food and Garden Organics Building	~40%
Food and Garden Organics	General Solid Waste (putrescible)	Food and Garden Organics Building	~45%
Solid Food Waste	General Solid Waste (putrescible)	Food De-Packaging Building	~60%
Liquid Food Waste	Liquid Waste	2 x 27,000 litre Storage Tanks	~95% - 100%
Sawdust	General Solid Waste (non-putrescible)	Outside Landscape Bays (tarped)	~25% - 40%
Spent filter sand media	General Solid Waste (non-putrescible)	Outside Landscape Bays (tarped)	~25%

Table 6 Finished Products

Received Wastes and Raw Materials	Processing or End Use	Finished Products	Moisture Content of Product %
Soils (ENM and VENM)	Sold as raw product	Finished Products include Mine Mix, Naturaliser, BioNRich, Earth4Turf	~25%
Clay/Sands/Stone/Gravels/Aggregates (VENM)	Sale to end user	Clay/Sands/Stone/Gravels/Aggregates	~25% or greater
Drilling mud and/or muddy waters from hydro excavation, drilling and pot holing operations	Screening and Processing through CD Enviro System	Engineering material as per the EPA exemption	~25% or greater
		Liquid fraction either to sewer, to composting facility, or to another licenced facility for further processing/re-use	~95%
Garden Mixes/Top Dressings/Mulches	Sale to end user	Garden Mixes/Top Dressings/Mulches	~30% or greater
Garden Organics	Decontamination & shredding	Material transferred to EPA licenced composting sites for the production of a range of growing media suitable for domestic and agricultural use	~35%
Food and Garden Organics			~40%
Solid Food Waste	De-packaging and decontamination	Material transferred to EPA licenced composting sites for the production of a range of growing media suitable for domestic and agricultural use	~45%
Liquid Food Waste		Liquid fraction applied to processed FOGO, composting, or sent to another licenced facility for further re-use	~95%
Sawdust	Sale to end user	Sawdust	~25% - 40%
Spent filter sand media	Sold as raw product	Component of Mine Mix, Naturaliser, BioNRich, Earth4Turf	~25%

Additional information pertaining to the silt content of a number of the bulk landscaping materials has also been provided and is summarised in Table 2. (Note that the US EPA AP42 Appendix C (US EPA AP42) defines silt as less than 75 microns in diameter).

The materials are noted to have silt values ranging from 0% to 17.9%. Larger silt values will be associated with an increased potential to emit dust particularly during adverse meteorological conditions. Careful monitoring of the moisture levels of all bulk materials as well as wind conditions will minimise the potential for off-site dust nuisance.

Table 2: Silt Content of Bulk Landscaping Materials

Material	Silt	Source (Document)
10 mm aggregate	1.0%	Oberon Q 10 mm Aggregate Lot 211 (2).pdf
14 mm aggregate	0.0%	Oberon Q 14 mm Aggregate Lot 218.pdf
20 mm concrete Aggregate	1.0%	20 mm Concrete Aggregate Lot 144.pdf
Washed sand	2.0%	Washed sand - Copier@sesl.com.au_2010710_151111.pdf
River sand + Loam	7.2%	River sand + Loam - Copier@sesl.com.au_2010710_151111.pdf
Screened Sandy Loam	6.2%	Screened Sandy Loam - Copier@sesl.com.au_2010710_151111.pdf
Top dressing Soil	5.1%	Top dressing Soil - Copier@sesl.com.au_2010710_152342.pdf
Site Soil	17.9%	Site Soil - Copier@sesl.com.au_2010710_152342.pdf
Drainage Gravel	2.4%	Drainage Gravel - Copier@sesl.com.au_2010710_152342.pdf

Provided in Table 3 is a summary of the daily vehicle movements for both an average and a peak throughput. A breakdown of vehicle movements associated with the peak scenario as a function of the hour of the day is provided in Table 4 highlighting that the majority of vehicle movement associated with the bulk handling activities will be limited to the hours of 05:00 through to 15:00 with only two vehicle movements between the hours of 23:00 and 24:00.

Table 3: Summary of Daily Vehicle Movements associated with Bulk Landscaping Materials

Vehicle Type	Average		Peak	
	in	out	in	out
Truck and Dog (32 t)	3.5	3.5	4.5	4.5
19m B' Doubles (17t)	1.5	1.5	2	2
6 or 8 wheeler with Hook lift bin (12.5 t)	10	10	15	15
Semi Tippers (25 t)	1	1	2	2

Table 4: Peak Volume Vehicle Movements including a Breakdown of Movements per Hour

Vehicle Type	Peak		Total Daily Movements	Monday to Friday a.m.											
	in	out		1	2	3	4	5	6	7	8	9	10	11	12
Truck and Dog (32 t)	4.5	4.5	9	-	-	-	-	-	2	1	-	-	2	-	-
19m B' Doubles (17t)	2	2	4	-	-	-	-	2	-	-	-	-	-	-	-
6 or 8 wheeler with Hook lift bin (12.5 t)	15	15	30	-	-	-	-	-	4	8	8	4	-	-	3
Semi Tippers (25 t)	2	2	4	-	-	-	-	-	-	2	-	-	-	-	-
Vehicle Type	**Peak**		**Total Daily Movements**	**Monday to Friday p.m.**											
	in	**out**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Truck and Dog (32 t)	4.5	4.5	9	3	1	-	-	-	-	-	-	-	-	-	-
19m B' Doubles (17t)	2	2	4	-	-	-	-	-	-	-	-	-	-	2	-
6 or 8 wheeler with Hook lift bin (12.5 t)	15	15	30	3	-	-	-	-	-	-	-	-	-	-	-
Semi Tippers (25 t)	2	2	4	2	-	-	-	-	-	-	-	-	-	-	-

3. Environmental Values

3.1 Ambient Air Quality Objectives

Assessment criteria related to dust as prescribed in NSW DEC (2005) include dust deposition, total suspended particulates (TSP) and particulate matter with an aerodynamic radius less than 10 micrometres (PM_{10}) (Table 5).

As particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$) is of interest to the National Environmental Protection Council (NEPC) the associated advisory levels as noted in the National Environment Protection Measure (NEPM) Ambient Air Quality (AAQ) are included in the table for completeness.

Table 5: Impact Assessment Criteria (NSW, 2005)

Pollutant	Averaging Period	Project Goal	Source
TSP	Annual	90 µg/m^3	NHMRC (1996)
PM_{10}	24 hour	50 µg/m^3	NEPC (1998)
	Annual	30 µg/m^3	EPA (1998)
$PM_{2.5}$	24 hour	25 µg/m^3	NEPM - advisory
	Annual	8 µg/m^3	NEPM - advisory
Dust deposition	Monthly(1)	2 mg/m^2/day	NERDDC (1988)
	Monthly(2)	4 mg/m^2/day	NERDDC (1988)

Note (1): Maximum increase in deposited dust levels
(2): Maximum total deposited dust level

In relation to the handling of bulk landscaping material at GWP, it is the impact assessment criterion of 50 µg/m^3 for the 24-hour average concentration of PM_{10} that is most likely to be exceeded. Since combustion-type emission sources more likely to contribute to impacts in the particle size range of $PM_{2.5}$ or less, results for $PM_{2.5}$ associated with material handling at GWP have not been developed. Instead, the focus of this assessment is on the larger size particulate ranges and in particular PM_{10}.

3.2 Existing Air Quality Associated with PM_{10}

The nearest dust monitoring location to GWP is the NSW Office of Environment and Heritage's (OEH) Prospect monitoring station located in William Lawson Park to the north of GWP (Figure 4). The Prospect monitoring station was commissioned in 2007 and replaced the Blacktown Station. With respect to particulate matter only PM_{10} is measured at this

location (NSW OEH, 2017) i.e. neither TSP nor $PM_{2.5}$ is measured at Prospect monitoring station.

Although the air quality within the industrial area surrounding GWP may differ from that at the Prospect monitoring station, in the absence of site-specific monitoring data, data from this location has been used to investigate background levels of PM_{10} at GWP.

Figure 4: Location of the Prospect Monitoring Station relative to GWP

Presented in Table 6 is a statistical summary of the 24-hour average concentration of PM_{10} at the Prospect monitoring station (NSW OEH, 2017) for 2015. The maximum 24-hour average concentration of PM_{10} of 68.7 µg/m^3 recorded during 2015 at this location exceeds the impact assessment criterion of 50 µg/m^3.

Table 6: Ambient Air Quality – Statistical Summary for the 24-Hour Average Concentration of PM_{10}, 2015 (NSW OEH, 2017)

Table 111. Statistical summary for PM_{10}: 24-hour average concentrations (2015)

Region/Performance monitoring station	Data availability rate (%)	Maximum (µg/m^3)	Percentile (µg/m^3)						
			99th	98th	95th	90th	75th	50th	25th
Sydney									
Bringelly	99.2	**57.0**	36.9	32.6	27.8	24.3	19.6	15.1	10.9
Camden	98.9	**62.4**	32.4	30.6	24.7	22.3	17.1	12.6	9.5
Campbelltown West	95.9	**69.7**	38.9	34.5	27.9	24.4	19.2	13.8	10.7
Chullora	98.1	**64.6**	46.0	32.2	29.4	26.3	21.7	16.3	12.7
Liverpool	95.1	**68.6**	36.7	34.4	31.1	28.4	23.1	17.2	12.8
Oakdale	98.9	**61.7**	29.7	27.3	22.4	20.0	14.5	10.0	7.2
Prospect	95.1	**68.7**	39.8	34.1	29.9	26.2	21.1	16.8	12.8
Richmond	96.7	49.3	32.2	27.3	25.6	21.8	16.1	12.0	8.2
Rozelle	96.4	**60.3**	37.1	32.6	29.5	25.5	20.4	15.4	11.9

Bold font indicates values that exceed the AAQ NEPM standard.
AAQ NEPM standard: 50.0 µg/m^3 (24-hour average)

Presented in Table 7 is a summary of the maximum 24-hour average concentration of PM_{10} at the Prospect monitoring location for the nine year period 2007 through 2015 (NSW OEH, 2017). It is noted that the NEPM permits five exceedences of the ambient air standard per year to allow for naturally occurring phenomena such as bush fires, dust storms etc. Values in the table which exceed that NEPM standard of 50 µg/m^3 for PM_{10} are indicated in bold font. Note that the maximum 24-hour average concentration of PM_{10} recorded in 2009 at this location (as well as the majority of the State's monitoring locations) was likely associated with the severe and extensive dust storm that crossed NSW (and southeast Queensland) in late September, 2009. The maximum 24 hour average concentration of PM_{10} recorded at this location also exceeded the NEPM standard during 2013 (4 exceedences) and 2015 (1 exceedence).

Table 7: Statistical Summary for the 24-Hour Concentration of PM_{10} (2007 – 2015) (NSW OEH, 2017)

Table 120. Statistical summary for PM_{10}: 24-hour average concentrations. Station: Prospect

Year	Data availability rate (%)	Number of exceedences (days)	Maximum (µg/m^3)	Percentile (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2007	82.7	0	46.3	43.3	41.6	33.4	28.1	21.9	16.8	12.4
2008	88.5	0	41.8	39.6	35.0	32.6	27.5	21.0	16.4	12.8
2009	96.4	**11**	**1680.3**	**135.3**	**60.7**	38.9	32.3	24.1	18.2	13.5
2010	97.5	0	40.1	31.7	30.1	26.7	22.8	18.7	14.9	11.2
2011	93.2	0	41.5	36.2	31.7	27.4	24.3	19.3	15.1	10.9
2012	94.3	0	38.7	34.8	33.8	29.3	26.5	20.5	16.3	13.0
2013	94.5	4	**81.8**	**51.2**	43.4	33.8	30.0	23.3	17.6	13.3
2014	93.4	0	44.3	35.4	34.3	30.2	25.6	21.1	16.8	12.7
2015	95.1	1	**68.7**	39.8	34.1	29.9	26.2	21.1	16.8	12.8

Bold font indicates values that exceed the AAQ NEPM standard.
AAQ NEPM standard: 50.0 µg/m^3 (24-hour average)

Presented in Table 8 is a summary of the annual average concentration of PM_{10} as measured at the Prospect monitoring station for the period 2007 through 2015 (NSW OEH, 2017). An exceedence of the AAQ NEPM standard of 25 µg/m^3 for the annual average concentration of PM_{10} was recorded at this location (and a number of other locations) during 2009. Note however, that there were no exceedences of the impact assessment criterion of 30 µg/m^3 for the annual average concentration of PM_{10} (Table 5, NSW 2005). The mean annual average concentration recorded at the location of the Prospect monitoring station over the nine year period was 18.3 µg/m^3 or c. 61% of the impact assessment criterion.

Table 8: Statistical Summary for the Annual Average Concentration of PM_{10} (2007 – 2015) (NSW OEH, 2017)

Table 113. Annual average concentrations for PM_{10} (µg/m^3)

Region/Performance monitoring station	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sydney										
Bringelly	20.2	18.4	15.7	24.7	15.5	15.9	15.7	17.0	16.6	15.8
Camden							20.1	15.4	15.6	13.9
Macarthur/ Campbelltown West*	17.3	15.8	14.5	21.3	14.0	13.2	12.6*	15.5*	17.0*	15.6*
Chullora	21.9	19.5	19.5	**26.1**	17.7	19.8	18.1	18.3	18.1	17.5
Liverpool	21.6	18.9	17.6	**25.8**	17.0	18.1	19.8	21.0	19.1	18.5
Oakdale	14.0	12.8	12.3	20.1	10.7	10.7	11.7	13.6	13.1	11.4
Prospect	-	18.1	17.8	**25.9**	15.4	15.8	17.2	19.2	17.6	17.6
Richmond	17.4	14.9	13.0	21.5	13.1	13.2	15.1	17.3	15.4	12.8
Rozelle	20.5	18.1	17.3	24.8	16.1	16.6	16.9	18.3	17.9	16.7

Bold font indicates values that exceed the AAQ NEPM standard.
AAQ NEPM standard: 25.0 µg/m^3 (annual average)

3.2.1 Estimates of the Background-Level of PM_{10}

In theory, background-levels of pollutants are the concentrations that would occur in the absence of anthropogenic emission sources. In practice, the practicalities and limitations associated with the establishment of an ambient air monitoring stations means that they are rarely sited at locations which are not influence to some degree by anthropogenic emission sources.

Estimating background-levels is further complicated by the fact that in reality background-levels will be spatially and temporally varying as the emission rate of pollutants from natural sources are often functions of a number of factors including for example, frequency of rain, wind speed, atmospheric stability etc.

Additionally it is noted that in general, an air quality assessment requires an estimate of the existing (or current) air quality environment as opposed to background (i.e. naturally occurring) levels of pollutants. Here we define existing air quality to include all current (and potentially approved) emission sources whether or not they are explicitly modelled as part of the assessment.

In NSW, the treatment of how to incorporate estimates for existing levels of pollutants depends on the assessment type (i.e. Level 1 – screening, or Level 2 – refined) (NSW EPA, 2005). For a Level 1 assessment, the maximum recorded concentration obtained at a 'representative' monitoring location is added to the maximum predicted concentration based on GWP emission sources. Based on the information contained in Table 7, a Level 1 background estimate for the Prospect monitoring location based on a maximum recorded 24-hour average concentration of PM_{10} may exceed the assessment criteria of 50 µg/m^3.

For a Level 2 assessment (NSW EPA, 2005), a time series of measured dust levels (representing the background-level) is combined with a time series of modelled dust levels (for GWP) from which a resultant maximum concentration is determined. This latter approach is considered to be a more accurate representation of the temporal variability of naturally occurring dust levels. However, representative time series of measurements are typically limited and alternate approaches to the representation of the current air quality environment may require consideration.

For example, it is noted that the Victorian EPA recommend the use of the 70th percentile as an estimate for the background-level. However as noted above, the application of a single value (in this case the 70th percentile) does not account for the temporal and spatial variability of dust levels within the study region. Based on the summary of monitoring results from the Prospect monitoring station, the average 75th percentile 24-hour average concentration of PM_{10} over the nine year period 2007 through 2015, is c. 21.2 µg/m^3. The Victorian EPA approach is not as restrictive as the NSW Level 1 approach of the use of the maximum recorded concentration at the appropriate averaging period though equally spatially and temporally limited in its representation.

For this assessment, the focus of the presentation of results is on GWP-only impacts (i.e. in isolation of natural and other local emission sources). However, the interpretation of results in consideration of the aforementioned discussion in relation the various approaches that may be adopted to represent estimates of current dust levels will be discussed.

4. Dust Assessment Methodology

4.1 Dust Emissions Scenario

As noted in Section 2.2, the key dust emission sources associated with the handling of bulk landscaping materials include:

- Loading and unloading of trucks;
- Handling of material using an FEL; and
- The erosion of stockpiles by the wind.

Two dust emissions scenarios have been considered based on average and peak vehicle movements (Table 3):

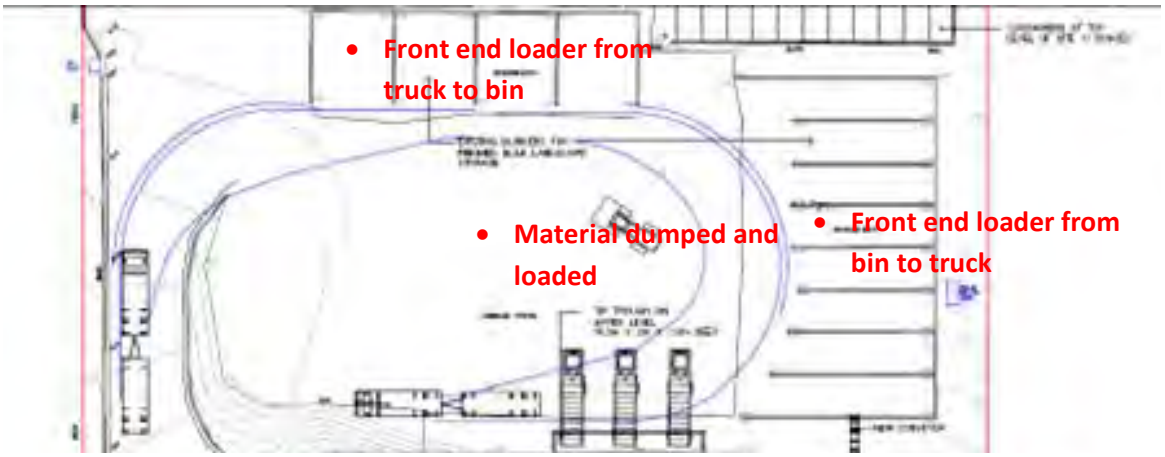
1) Peak Scenario: Considers the emission of dust associated with an intake and output of 415.5 tonnes/day of bulk material handling and is based on a peak number of vehicle movements.
2) Average Scenario: Considers the emission of dust associated with an intake and output of 287.5 tonnes/day of bulk material handling and is based on an average number of vehicle movements.

A conservative approach has been adopted whereby it has been assumed that the daily throughput for both scenarios occurs 365 days per year in order to capture the maximum range of meteorological conditions. This approach will be more representative of possible risks of adverse dust impacts on the 24 hour time scale. However, results for the annual averages will be significantly biased upwards with the peak and average scenarios applied 365 days per year equating to c 3.8 and 2.6 times the annual throughput of 40,000 tonnes of bulk landscaping materials, respectively.

Additionally, the following material handling sequence has been assumed:

- All vehicles arrive and leave full.
- The truck dumps its load at the location indicated in Figure 5.
- The FEL moves the material from the stockpile to the western-most bin.
- The FEL then removes material from the bin along the eastern boundary of the site and loads the truck at the central location.

Figure 5: Dust Emissions Scenario



4.2 Dust Emissions Inventory

Estimates for dust emission rates have been sourced from the National Pollutant Inventory Emissions Estimation Technique Manual for Mining version 3.1 (NPI EETM) dated January 2012 (NPI EETM, 2012). The NPI EETM (2012) includes a number of options for emission factors including default values (to be used in the absence of site specific information) as well as emission factor formulas. A summary of the options for 'uncontrolled' dust emission factors based on available site data is provided in Table 9.

Table 9: Dust Emission Factor Options (NPI EETM, 2012)

Dust Source	Emission Factors (kg/tonne)					
	Default		Overburden(1)		Coal(1)	
	TSP	PM10	TSP	PM10	TSP	PM10
Truck dumping	0.012	0.0043	0.012	0.0043	0.012	0.0043
Front end loader	0.029	0.014	0.00003	0.00002	0.0122	0.0025

Note (1): Based on 25% moisture (Table 1).

In consideration of the high moisture content of the bulk landscaping materials (Table 1), the adopted dust emission rates that were used in this assessment (Table 10) are based on the default values for truck dumping and the formula for material handling by front-end loaders (coal). The adopted emission factors for material handling by FEL are less conservative than the default values but significantly higher than those based on the formula for overburden.

Table 10: Adopted Dust Emission Rates

Dust Source	Dust Control		Emission Rates (kg/day)			
	water	bunding	Peak		Average	
			TSP	PM10	TSP	PM10
Truck dumping material	50%	-	2.49	0.89	1.73	0.62
FEL truck to storage bay	50%	-	2.53	0.51	1.75	0.35
FEL storage bay to truck	50%	-	2.53	0.51	1.75	0.35
Stockpile erosion by wind	50%	30%	0.93	0.46	0.32	0.16

Note (1): Based on default emission factors from NPI EETM for Mining v3.1

4.3 Summary of the Dust Dispersion Modelling Methodology

This dust assessment has been undertaken in consideration of:

- (NSW DEC, 2005)*: Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC).

Additionally it is noted:

- Dust dispersion modelling has been undertaken using a combination of the US EPA approved CALMET/CALPUFF modelling system (Scirer, 2000a) with numerically simulated upper air data based on TAPM. Regional, three-dimensional wind fields that are used as input into the dispersion model were prepared using a combination of The Air Pollution Model (TAPM) developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Hurley, 2008), and CALMET, the meteorological pre-cursor for CALPUFF (Scirer, 2000b).
- A total of three years of ½ hourly meteorology was developed corresponding to 2013, 2014 and 2015.
- Half-hourly meteorological data from the Bureau of Meteorology (BoM) Horsely Park all weather station (AWS) has been incorporated into the numerically simulated wind fields that were generated using CALMET.
- Dust emission sources associated with the material handling of bulk landscaping materials have been represented in the dispersion model using volume sources. Source characteristics are summarised in Appendix C with emission rates summarised in Table 10. Additional details are provided in Appendix C.
- As the contribution to the overall dust emissions inventory associated with wind erosion of material whilst located within the storage bins is small compared with dust

generated as a result of material handling, wind erosion has not been explicitly modelled.

- A conservative approach has been adopted whereby it has been assumed that peak or average tonnages of bulk landscaping supplies has passed through the facility 365 days per year, however in practice, there will be significant daily variability. This approach has been adopted in order to capture the widest range of meteorological conditions that may lead to worst case impacts. A reduced estimate for the annual average dust emission rate could have been developed however, as the more conservative approach has not highlighted any issues, a refinement of the methodology to include an annual average estimate of emissions of dust from the facility has not been undertaken. Note that the assumption of 365 days per year rate will significantly bias (upwards) the results for the annual average concentration of TSP and PM_{10} as well as the monthly average dust deposition. Note that the peak scenario corresponds to an annual throughput of c. 150,000 tonnes as opposed to the nominated 40,000 tonnes of bulk landscaping materials.
- As the shortest averaging period associated with the ambient air objectives is 24 hours, the estimated mass of dust generated from material handling is assumed to be evenly spread over the hours associated with vehicle movements as specified in Table 4. In practice, emissions of dust will vary on an hourly (or sub hourly) basis depending on demand. Assuming that the daily total dust emissions are uniformly distributed over the hours indicated in Table 4 has been adopted in order to capture a wide range of meteorological conditions and is not expected to have a significant impact on the results presented.

Additional information pertaining to the technical set up of the models is provided in Appendix A and Appendix C. Presented in Appendix B is a summary of the site-specific meteorology developed for the study region.

5. Results from the Dispersion Modelling

5.1 Maximum Dust Impacts outside the Site Boundary

Presented in Table 11 are the results of the dispersion modelling outside the site boundary for the peak and average scenarios (Section 4.1).

Results are presented for GWP in isolation. Since the results do not include an estimate of background levels they are not directly comparable with the impact assessment criteria presented in Table 5. As discussed in Section 3.2.1, estimating background levels is complicated. Recall that a Screening Level 1 approach involves the adding of the maximum recorded concentration to the results of the dispersion modelling. Independent of the magnitude of the predicted impact from GWP, a Level 1 approach will lead to an exceedence of the impact assessment criteria for the 24 hour average concentration of PM_{10} as maximum levels of PM_{10} recorded at the Prospect monitoring station (for example) exceeded 50 $\mu g/m^3$ during 2013 and 2015 which correspond to two of the three meteorological years modelled.

This limitation noted, results of the dispersion modelling highlights that GWP dust emission sources have the largest impact on the 24 hour average concentration of PM_{10} (c.f. the annual average concentration of PM_{10}, the annual average concentration of TSP or dust deposition). The maximum contribution is predicted to range from approximately 25% to 45% of the impact assessment criteria during worst-case meteorological conditions.

Results presented for the maximum monthly dust deposition, the annual average concentration of TSP and the annual concentration of PM_{10} are considered to be highly conservative as they are based on the assumption that the facility operates at the per day rate of 415.5 tonnes (Peak Scenario) or 287.5 tonnes (Average Scenario) of bulk materials, 365 days per year. For the Peak Scenario this would equate to an annual throughput of c. 3.8 times the facilities 40,000 tonnes of bulk landscaping material, whilst the Average Scenario is associated with an annual total volume which is c. 2.6 times the nominated throughput. With these overestimation factors in mind, the results for the annual average concentration of PM_{10} and TSP and the maximum monthly dust deposition do not highlight any significant dust issues.

The dust mitigation measures included in Appendix 21 of the GWP EIS (RPS, 2017) are considered sufficient.

Table 11: Results from the Dust Dispersion Model – GWP in Isolation

Scenario	Vehicle Movement Scenario	Pollutant (units)	Averaging Period	Meteorological Year	Project Only Maximum Outside Site Boundary	Assessment Criteria (total including background)
1	Peak (415.5 tonnes/day)	TSP ($\mu g/m^3$)	Annual[1]	2013	17.4[4]	90
				2014	16.5[4]	90
				2015	17.8[4]	90
		PM_{10} ($\mu g/m^3$)	24 hour	2013	21.3	50
				2014	18.1	50
				2015	22.2	50
			Annual[1]	2013	4.6[4]	30
				2014	4.3[4]	30
				2015	4.6[4]	30
		Dust Deposition (g/m^2/month)	Monthly[1]	2013	0.07[4]	2.0/4.0[3]
				2014	0.07[4]	2.0/4.0[3]
				2015	0.04[4]	2.0/4.0[3]
2	Average (287.5 tonnes/day)	TSP ($\mu g/m^3$)	Annual[2]	2013	12.0[4]	90
				2014	11.4[4]	90
				2015	12.3[4]	90
		PM_{10} ($\mu g/m^3$)	24 hour	2013	14.7	50
				2014	12.5	50
				2015	15.3	50
			Annual[2]	2013	3.1[4]	30
				2014	3.0[4]	30
				2015	3.2[4]	30
		Dust Deposition (g/m^2/month)	Monthly[2]	2013	0.05[4]	2.0/4.0[3]
				2014	0.05[4]	2.0/4.0[3]
				2015	0.03[4]	2.0/4.0[3]

Note (1): Assumes peak volumes 365 days per year

(2): Assumes average volumes 365 days per year

(3): Assessment criterion is: Project only contribution not to exceed 2 g/m^2/month with total (including background) not to exceed 4 g/m^2/month.

(4): Reported results are conservative as they are based on the facility operating at the specified daily rate 365 days per year.

5.2 Contour Plots

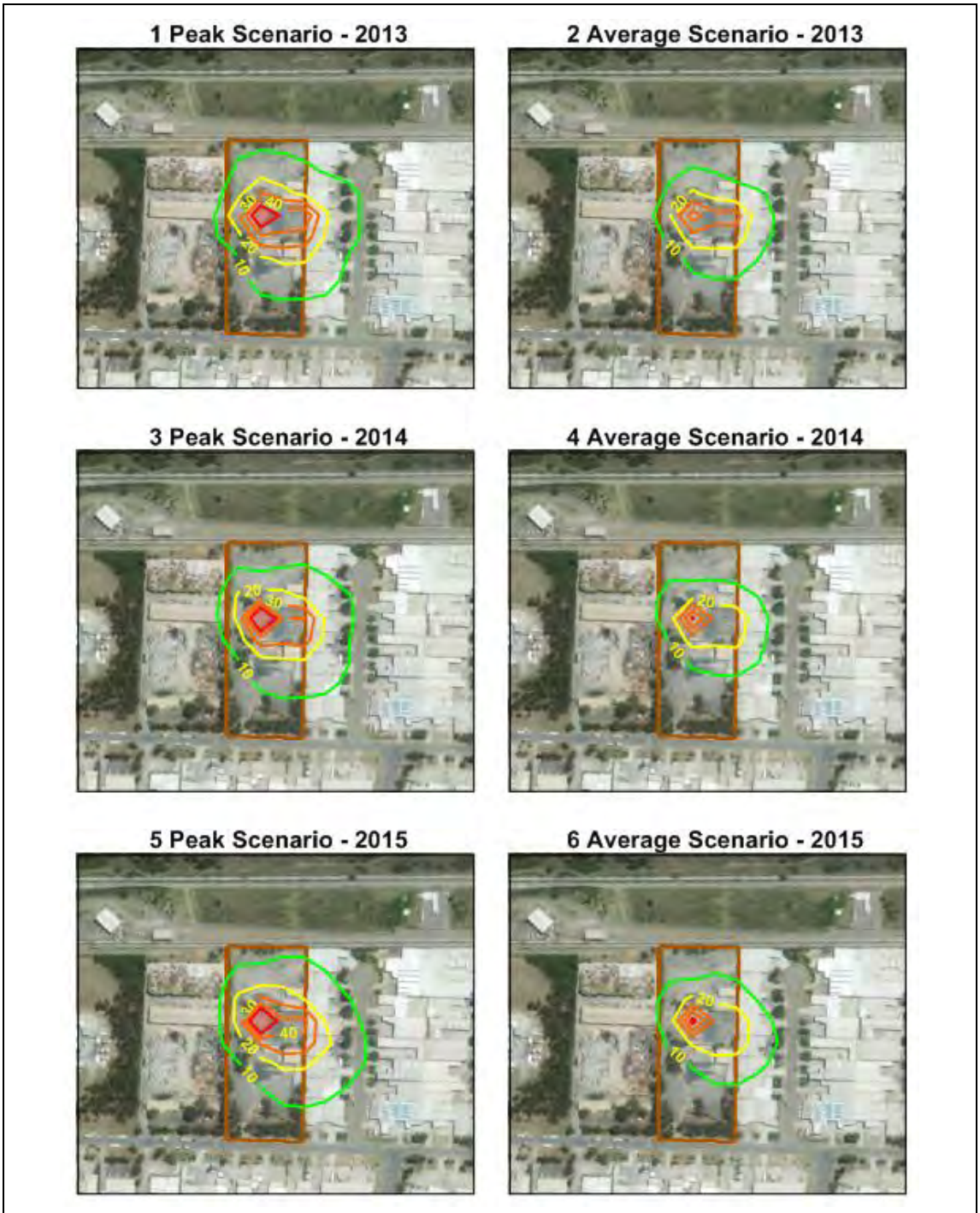
When interpreting results presented as contour plots, it is important to note that the figure does not represent a snapshot at any given time. Instead, it presents the maximum concentration at each location in the study region which for each receptor may occur at different times of the year and under different atmospheric conditions.

Presented in Figure 6 and Figure 7 are contour plots of the maximum 24-hour average and the annual concentration of PM_{10} predicted using the CALPUFF dispersion model for meteorological years 2013 through 2015 for the two scenarios modelled.

Note that the results are presented for GWP in isolation and do not include an estimate of background levels. Thus the results presented are not directly comparable with the impact assessment criteria presented in Table 5.

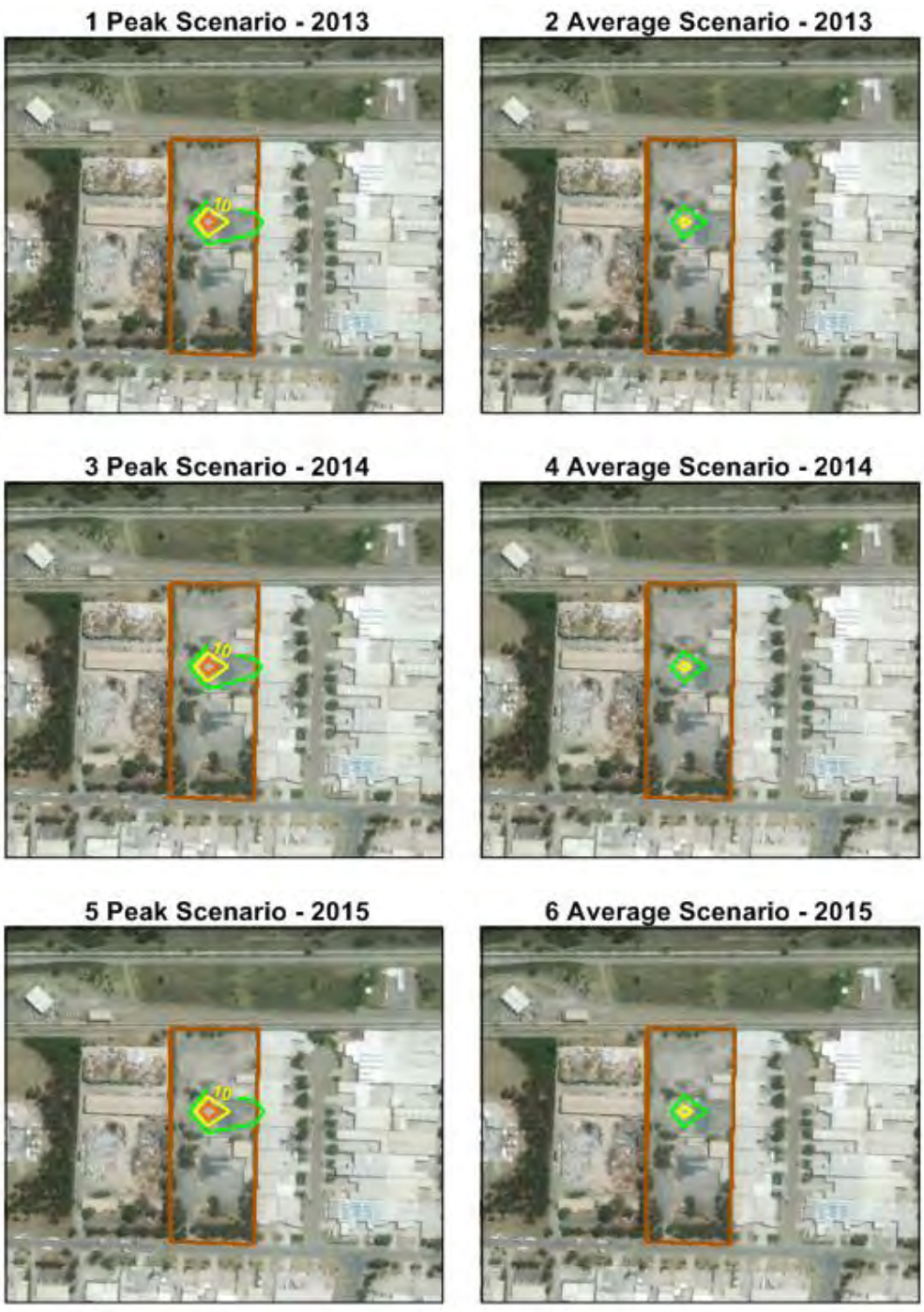
In general, no significant issues are indicated by the results of the dispersion modelling at any off-site location for the scenarios considered.

Figure 6: GWP in Isolation: The Maximum 24 Hour Average Concentration of PM_{10}



Scenario: Peak and Average		**Sources included:** Truck dumping and FEL	
Pollutant:	PM_{10}	Averaging Period:	24-hour
Background-level:	Not included	Rank:	maximum
Project Goal:	50 µg/m^3	Contour level(s):	10, 20, 30, 40 and 50 µg/m^3

Figure 7: GWP in Isolation: The Annual Average Concentration of PM_{10}



Scenario: Peak and Average		**Sources included:** Truck dumping and FEL	
Pollutant:	PM_{10}	Averaging Period:	annual
Background-level:	Not included	Rank:	N/A
Project Goal:	30 µg/m^3	Contour level(s):	10, 15, 20 and 30 µg/m^3

5.3 Assumptions and Implications

This dust assessment has naturally included a range of assumptions that will have varying degrees of impact on the results obtained. Some of the key assumptions and implications are summarised in Table 12.

Table 12: Modelling Assumptions and Implications

Item	Category	Assumption	Implication
1	Dust emission factors	Based on NPI EETM for mining V3.1	• Truck dumping is based on recommended default values – representativeness of the adopted values is questionable. • Emission factors for material handling using a FEL Based on material handling of coal. These emission factors are less than the proposed default values but significantly larger than those for FEL on overburden - representativeness of the adopted values is questionable. • Adopted emission factors are potentially high compared to those for high moisture/low silt materials. • Control of dust through the use of water sprays and good housekeeping practices will be required to ensure dust does not cause adverse off-site impacts
2	Emissions Scenarios	Peak daily volume of 415.5 tonnes	• Conservative compared to average values. Will have a significant impact on the results presented for the monthly and annual averages.
3	Emissions Scenarios	Peak and Average volumes applied 365 days per year	• Will have a significant impact on the results presented for the monthly and annual averages with higher results predicted.
4	Emissions Scenarios	Daily emission rate of TSP and PM_{10} applied uniformly over indicated hours	• Since the shortest averaging period considered is the 24-hour average, uniforming loading of the environment during the nominated hours will capture a wider range of meteorological conditions though this assumption is not considered to have a significant impact on the results presented.
5	Background levels	Not included	• Allows for a focus on GWP contribution. • Not strictly in accordance with the NSW DEC (2005). • Results are not directly comparable with impact assessment criteria. • Estimates for background levels for the 24 hour average concentration of PM_{10} range from 21.2 $\mu g/m^3$ to over 50 $\mu g/m^3$ based on data from the NSW OEH's Prospect monitoring station • An estimate for background levels for the annual average concentration of PM_{10} of c.18.3 $\mu g/m^3$ based on data from the NSW OEH's Prospect monitoring station. • TSP and $PM_{2.5}$ are not measured at the Prospect monitoring station.

Item	Category	Assumption	Implication
6	Pollutants	Results for $PM_{2.5}$ were not developed	• Due to the nature of the particle size distribution of particulate matter that is typically associated with bulk material handling, results for $PM_{2.5}$ have not been developed. • A rough estimate of the scale of predicted impacts could be developed from the results presented for PM_{10} based on a general assumption that c. 10%-20% of PM_{10} is in the form of $PM_{2.5}$
7	Dust emission sources	Wind erosion of stockpiles	• Considered to have minimal impact as the storage bins are three-sided and will be equipped with water sprays. • As long as the top of the stockpiles do not exceed the height of the bund walls, there should be minimal potential for wind-blown dust. The temporary covering of stockpiles should be implemented if water sprays are found to be insufficient to control all visible dust from the material in the storage bays under adverse meteorological conditions.

6. Summary

AED has conducted an assessment of the impact of emissions of dust associated with Greenspot Wetherill Park located at 24 Davis Road, Wetherill Park, NSW.

The key dust emission sources are associated with the material handling of bulk landscape materials.

Results of the dust dispersion modelling for the two scenarios considered have not highlighted any air quality issues beyond the site boundary.

The risk of adverse impacts of dust from the facility will be minimised through the strict adherence to the dust management strategies outlined in Appendix 21 of the GWP EIS (RPS, 2017).

In summary, results of the dust assessment suggest that the mitigation measures and management strategies proposed for the operation of the facility will be sufficient to comply with regulatory requirements for dust.

7. Document Limitations

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8. References

- CALPUFF (2011): CALPUFF modelling system version 6 user instructions, April 2011, Available at ASG at TRC website http://www.src.com/calpuff/calpuff1.html
- EPA (1998): *Action for Air: The NSW Government's 25-Year Air Quality Management Plan*¸ NSW Environment Protection Authority Sydney.
- Hurley P.J. (2008): *TAPM V4. Part 1: Technical Description*, CSIRO Marine and Atmospheric Research Paper No. 25. 59 pp.
- NEPC (1998): *Ambient Air – National Environment Protection Measure for Ambient Air Quality,* National Environment Protection Council, Canberra.
- NERDDC (1988): *Air Pollution from Surface Coal Mining: Measurement Modelling and Community Perception,* Project No 921, National Energy Research Development and Demonstration Council.
- NHMRC (1996): *Ambient Air Quality Goals Recommended by the National Health and Medical Research Council*, National Health and Medical Research Council, Canberra.
- NSW Department of Environment and Conservation (DEC) (2005): *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*.
- NSW Office of Environment and Heritage (2017): *New South Wales Annual Compliance Report 2015. National Environment Protection (Ambient Air Quality) Measure.* May 2017.
- RPS (2017*): Greenspot Wetherill Park Resource Recovery and Recycling Facility Environmental Impact Statement*. SSD 7401 Volume 1 and 2. Prepared for Bettergrow Pty Ltd. Dated 11 April 2017.
- Scire, J. S., D.G. Strimaitis, R.J. Yamartina (2000a): *A User's Guide for the CALMET Meteorological Model (Version 5)*. January 2000.
- SRTM (2000): NASA's Shuttle Radar Topography Mission (SRTM), Downloaded from USGS website http://dds.cr.usgs.gov/srtm/version2_1/SRTM3/Australia/
- US EPA AP42: Appendix C which can be accessed at the following website:

  https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors

Appendix A Development of Numerically Simulated Meteorological Fields

Dispersion modelling typically requires a meteorological dataset representative of the local airshed on an hourly timescale. Parameters required include wind speed, wind direction, temperature, atmospheric stability and mixing height. In general, meteorological observations recorded by weather stations include hourly wind speed, wind direction, temperature, rainfall and humidity. However additional parameters like atmospheric stability class and mixing height are difficult to measure and are often generated through the use of meteorological models.

A.1 TAPM

The meteorological model 'The Air Pollution Model' (TAPM) developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) was used to predict initial three-dimensional meteorology for the local airshed. TAPM is a prognostic model used to predict three dimensional meteorological observations, with no local inputs required. The model predicts meteorological dataset consisting of parameters like wind speed, wind direction, temperature, water vapour, cloud, rain, mixing height, atmospheric stability classes etc. that are required for dispersion modelling.

Additionally TAPM includes the option to assimilate local observations (of wind speed and wind direction) in order to nudge the predicted solution towards the observed records. For this assessment, only the upper air data of TAPM is used in CALMET i.e. data assimilation functionality of TAPM was not used.

Technical details of the model equations, parameterisations and numerical methods are described in the technical paper by Hurley (2008).

The details of the TAPM configuration are summarised in Table 1.

Table 1: TAPM Configuration

Parameter	Units	Value
TAPM version	-	v4.0.5
Years modelled	-	2013, 2014 & 2015
Grid centre	Lat, Lon (Degrees)	-33.83 150.90
Number of nested grids	-	4
Grid dimensions (nx, ny)	-	25,25
Number of vertical grid levels (nz)	-	25
Grid 1 spacing (dx, dy)	Km	30,30

Parameter	Units	Value
Grid 2 spacing (dx, dy)	Km	10,10
Grid 3 spacing (dx, dy)	Km	3,3
Grid 3 spacing (dx, dy)	Km	1,1
Local hour	-	GMT + 10
Local Met Assimilation	-	No
Surface vegetation database	-	Default TAPM V4 database at 3-minute grid spacing (Australian vegetation and soil type data provided by CSIRO Wildlife and Ecology.
Terrain database	-	Default TAPM V4 database at 9-second grid spacing (Australian terrain height data from Geoscience Australia)

A.2 CALMET

CALMET (version 6.334) was used to simulate meteorological conditions for the local airshed. CALMET is a diagnostic three dimensional meteorological pre-processor for the CALPUFF modelling system (developed by Earth Tech, Inc.).

Prognostic output from TAPM was used as input into the CALMET model. Using high resolution geophysical datasets, CALMET then adjusts the initial guess field for the kinematic effects of terrain, slope flows, blocking effects and 3-dimensional divergence minimisation as well as differential heating and surface roughness associated with different land uses across the modelling domain.

A single resolution CALMET grid was developed to derive meteorological fields at 100 m resolution. The domain size and grid resolution are specified in Table 4. The extent of the domains is shown in Figure 1.

Table 2: CALMET Domain Specifications

CALMET Grid Resolution	Domain Size	Number of Nodes	Grid Spacing (m)
100 m	9.8 km x 7.6 km	99 x 77	100 x 100

The development of the CALMET grid requires input datasets along with the control file where the CALMET run parameters are specified. These input datasets include:

- Geophysical data
- Upper air meteorological data
- Surface meteorological data

The CALMET inputs are discussed in detail in the following sections.

Figure 1: Areal Extent of CALMET Domain (Site Indicated by Yellow Rectangle)

A.2.1 The 100 Meter Resolution CALMET Grid

Geophysical dataset

The terrain for the 100 m resolution CALMET grid was extracted from 3-arc second (90m) spaced elevation data obtained via NASA's Shuttle Radar Topography Mission (SRTM) in 2000.

Terrain data at 100 m resolution overlayed over the base map is shown in Figure 2.

The land use or land cover data for the modelling domain was derived manually using aerial imagery. The Geotechnical parameters for the land use classification were adopted from a combination of closest CALMET and AERMET land use categories.

User defined land use classification and geotechnical parameters used in CALMET are presented in Table 3 and Figure 3.

Figure 2: Terrain data for CALMET Geophysical Dataset

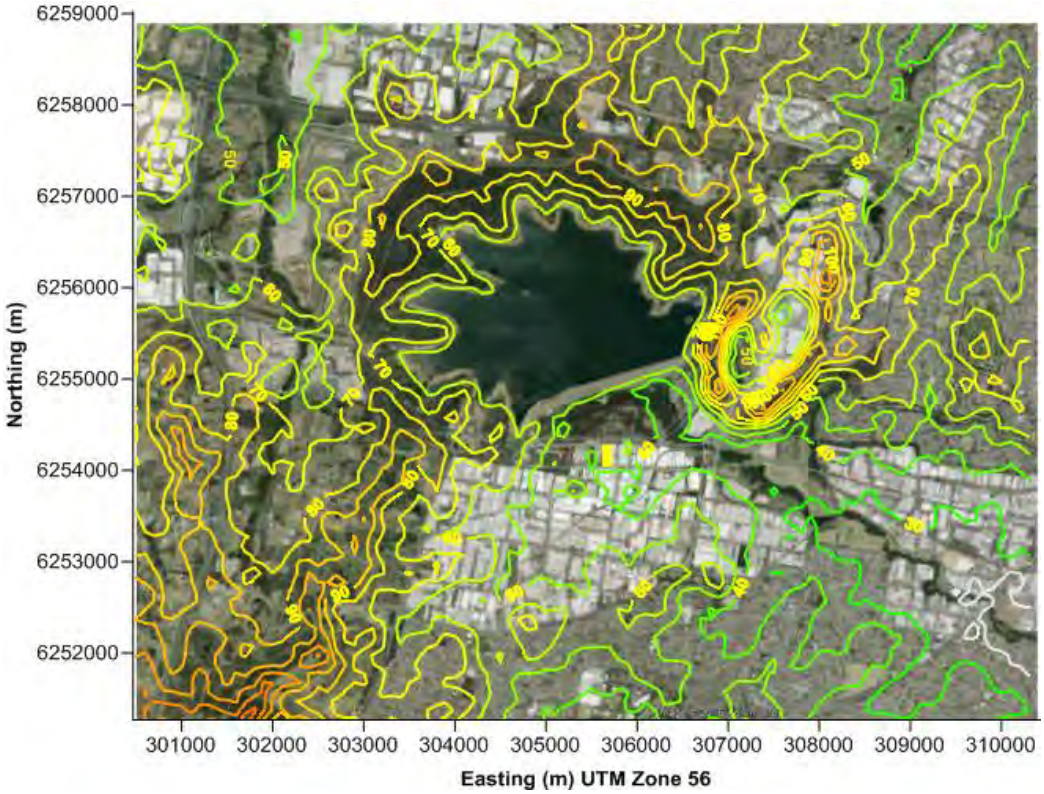


Figure 3: User Defined Land Use Categories for CALMET Modelling domain

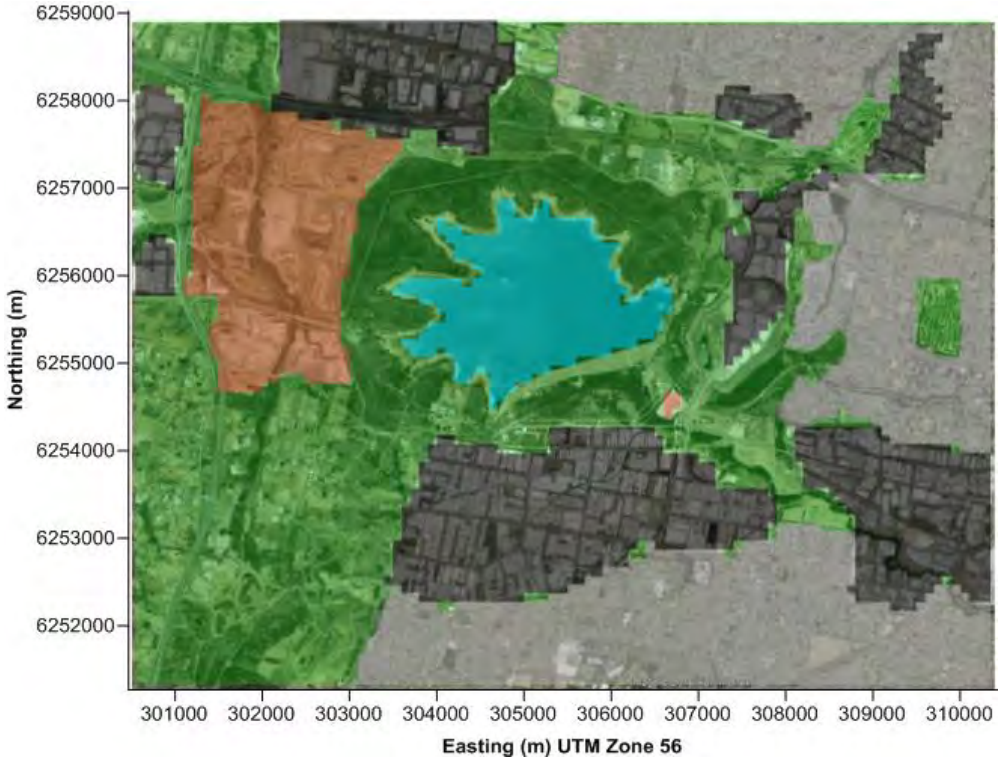


Table 3: Geotechnical Parameters for User Defined CALMET Land Use Classification

CALMET User defined Category	Description	Aermet Category	Surface roughness (a)	Bowen ratio (a)	Albedo (a)	Soil heat flux parameter (b)	Anthropogenic heat flux (b)	Leaf Area Index (b)
1	Urban areas	Light Industrial	0.54	0.8	0.16	0.25 (Calmet – Urban)	0	0.2 (Calmet – Urban)
2	Urban areas	Low intensity residential	0.54	0.8	0.16	0.25 (Calmet – Urban)	0	0.2 (Calmet – Urban)
3	Grassland / Herbaceous	Grassland / Herbaceous	0.1	0.8	0.18	0.15 (Calmet – Rangeland)	0	0.5 (Calmet – Rangeland)
4	Small water bodies	----------	0.001 (Calmet – Bays & Estuaries)	0 (Calmet –Bays & Estuaries)	0.01 (Calmet –Bays & Estuaries))	1 (Calmet –Bays & Estuaries)	0 (Calmet –Bays & Estuaries)	0 (Calmet –Bays & Estuaries)
5	Quarries/Mine	Quarries/strip mine/gravel	0.3	1.5	0.2	0.15 (Calmet –Barren)	0	0.05 (Calmet –Barren)

(a) EPA (2008) , *AERSURFACE User's Guide*, developed by the Air Quality Modelling Group, USEPA office of Air Quality Planning and Standards.
(b) CALPUFF version 6, USER guide.

Upper air dataset

Upper air data were extracted from TAPM for the innermost grid at three locations corresponding to that illustrated in Figure 4. Coordinates of the upper air stations are presented in Table 4.

Table 4: Coordinates of Upper Air Stations Included in CALMET

Station Name	Source	Easting(m) UTM 56	Northing (m) UTM 56
UP1	TAPM	308,675	6,252,340
UP2	TAPM	308,675	6,257,340
UP3	TAPM	301,675	6,257,340

Figure 4: Location of Upper Air Stations

Surface Observations Dataset

Hourly surface observations at one location were extracted from the innermost TAPM grid (1 km).

Additionally, ½ hourly data from the Bureau of Meteorology's Horsely Park All Weather Station was incorporated into CALMET.

Figure 5 illustrates the location of the surface stations. Coordinates and source of these surface stations are presented in Table 5.

Figure 5: Location of Surface Stations

Table 5: Coordinates of Surface Observation Stations Included in CALMET

Station ID	Station Name	Source	Height (m)	Easting (m) UTM 56	Northing (m) UTM 56
20001	S1	TAPM	10	308,675	6,252,340
20002	Horsley Park	BoM	10	301,708	6,252,287

CALMET Configuration

Details of the CALMET configuration are presented in Table 6.

Table 6: CALMET Configuration

Parameter	Units	Value
CALMET version	-	V6.334
Years modelled	-	2012, 2013 & 2014
No. X grid cells (NX)	-	99
No. Y grid cells (NY)	-	77
Grid spacing (DGRIDKM)	Km	0.1
X coordinate (XORIGKM)	Km	300.5
Y coordinate (YORIGKM)	Km	6251.273
No. of vertical layers (NZ)	-	10
Number of surface stations	-	2
Number of upper air stations	-	3
Maximum radius of influence over land in the surface layer (RMAX1)	Km	3
Maximum radius of influence over land aloft (RMAX2)	Km	6
Maximum radius of influence over water (RMAX3)	Km	1
Radius of influence of terrain features (TERRAD)	Km	1
Land use database	-	Manually generated land use based on aerial imagery
Terrain database	-	3-arc second (90m) spaced elevation data obtained via NASA's Shuttle Radar Topography Mission (SRTM) in 2000
Minimum overland mixing height (ZIMIN)	m	50
Maximum overland mixing height (ZIMAX)	m	3000
UTC time zone (ABTZ)	Hours	UTC+1000

Appendix B Existing Meteorological Environment

B.1 Wind Roses

Numerically simulated wind fields (CALMET) for the three-year period (2013 through 2015) were developed for the study area. The wind rose for the three-year period is presented in Figure 6. Predominant winds are light air (0.5 m/s to 1.5 m/s) to moderate breeze (5.5 m/s to 8 m/s) from the southwest.

There is some seasonality suggested by the middle row of wind roses. During summer months light to gentle breezes are predicted from the east through to south while the predominance of the southeast wind is indicated throughout the remainder of the year.

Variability of the winds as a function of the time of day is indicated by the wind roses in the bottom row of the figure(s).

The wind roses for the Horsely Park (BoM) monitoring station are similar to those for the project site with predominantly southeast winds highlighted.

Figure 6: Wind Roses – All, Annual, Seasonal, Hour of Day (CALMET: 2013-2015)

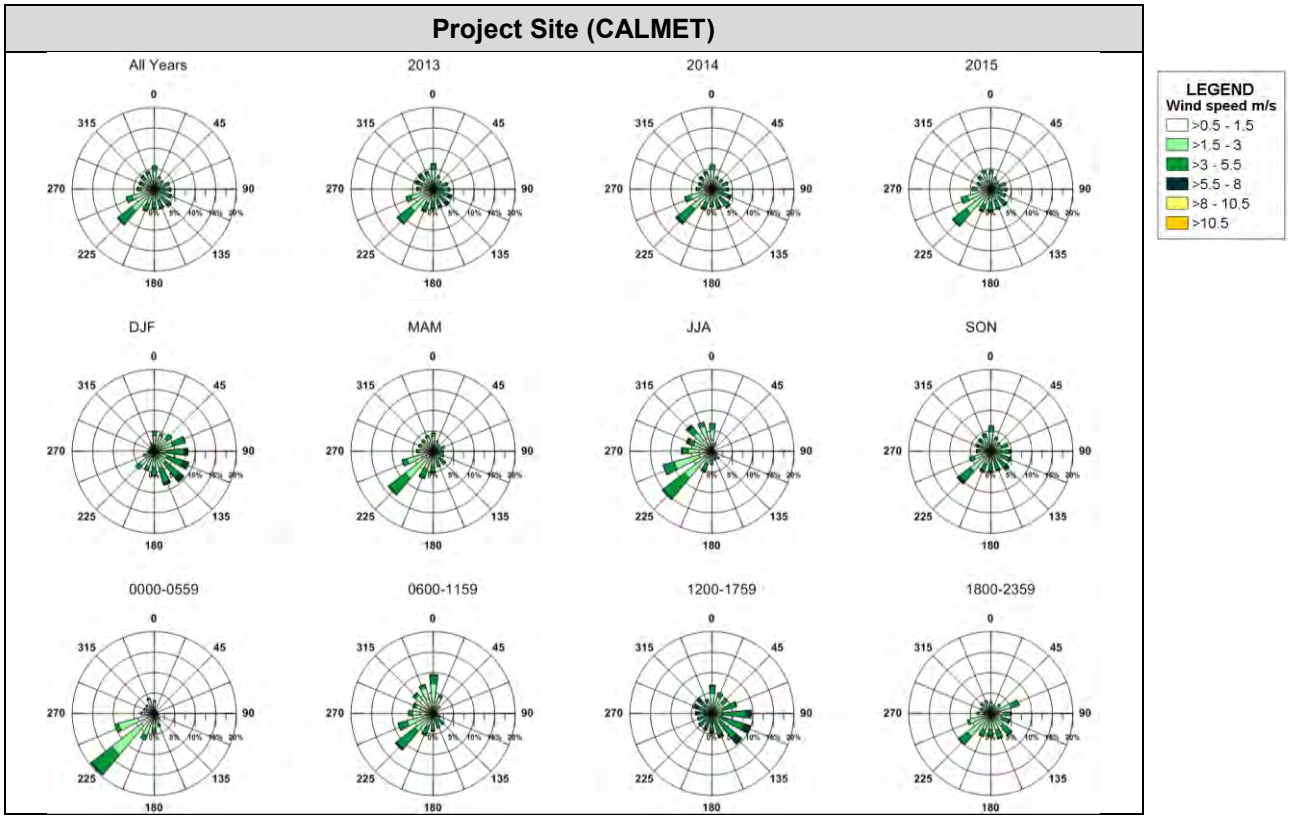
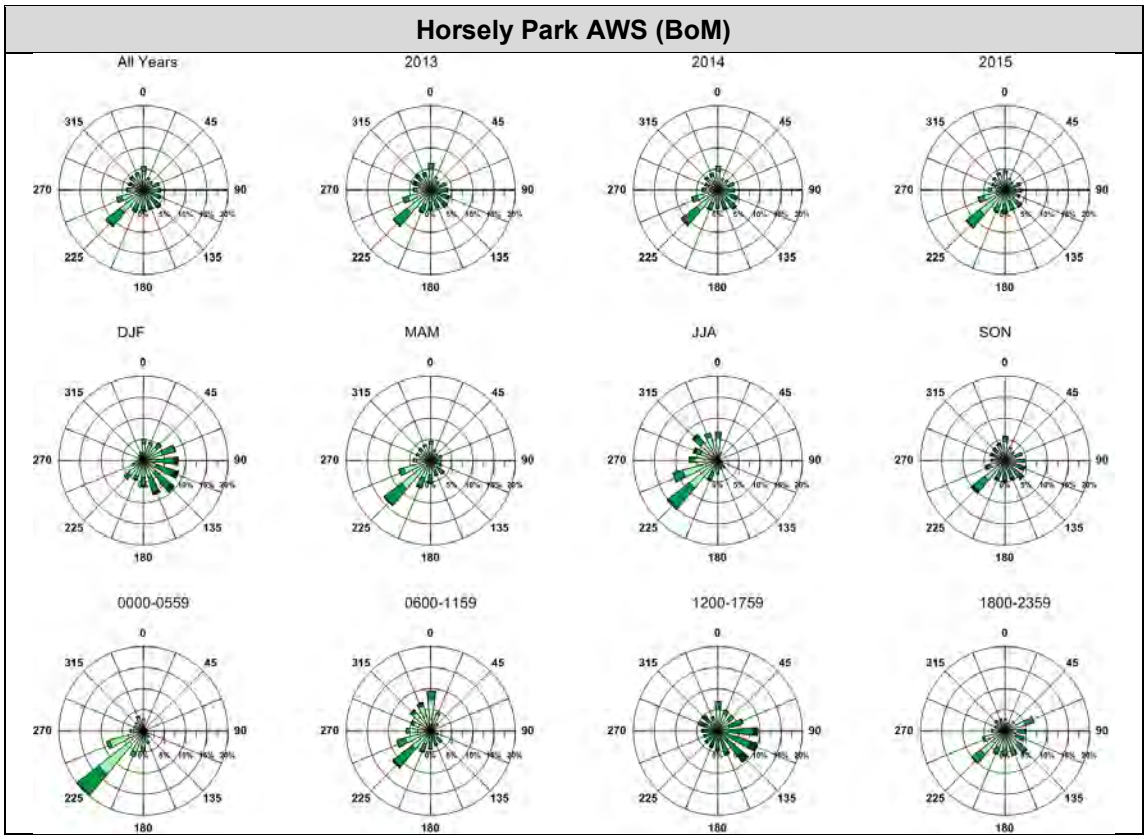


Figure 7: Wind Roses – All, Annual, Seasonal, Hour of Day (BoM: 2013-2015)



B.2 Stability Class

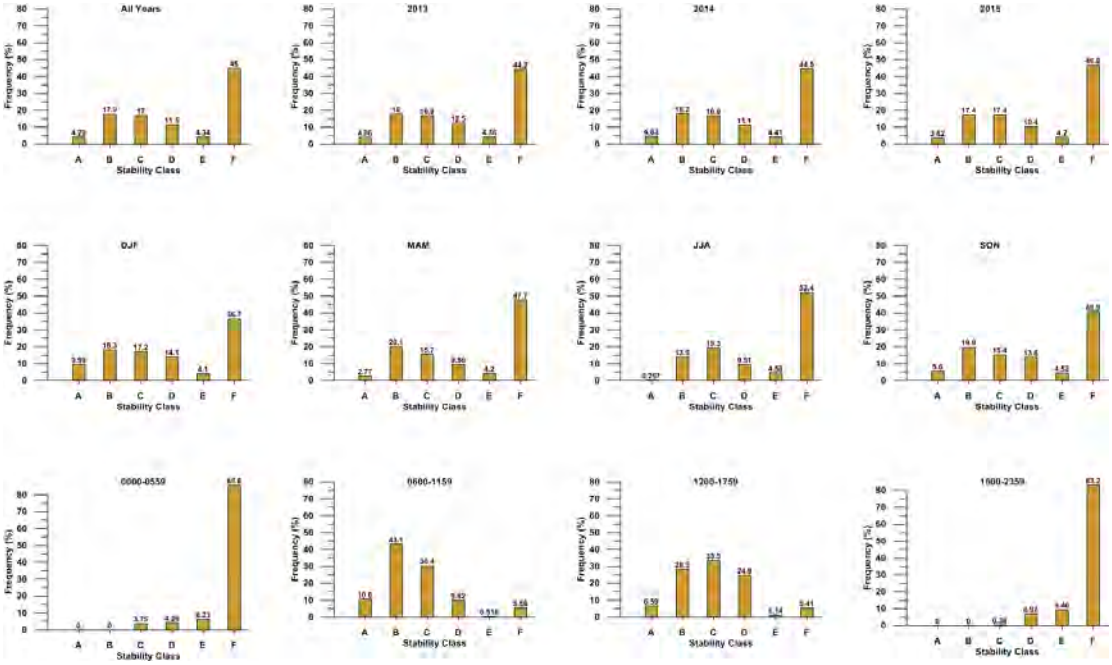
Stability of the atmosphere is determined by a combination of horizontal turbulence caused by the wind and vertical turbulence caused by the solar heating of the ground surface. Stability cannot be measured directly and instead it must be inferred from available data, either measured or numerically simulated.

The Pasquill-Gifford scale defines stability on a scale from A to G, with stability class A being the least stable, occurring during strong daytime sun and stability class G being the most stable condition, occurring during low wind speeds at night. For any given wind speed the stability category may be characterised by two or three categories depending on the time of day and the amount of cloud present. In meteorological models such as CALMET, the stability classes F and G are combined.

A summary of the numerically simulated hourly stability class data for three years (2013 through to 2015) is presented in Figure 8. Stability class F is predicted to occur most frequently indicating that the dominant conditions are moderately to very stable, with very little diffusion. The frequency of strongly convective (unstable) conditions at the study area, represented by stability class A, is relatively low at five per cent of hours during the three years simulated.

Seasonal and hourly variability is highlighted by the breakdown of stability class frequency in the middle and lower rows of the figure respectively. Not surprisingly, stable conditions are most frequent during the night time and early morning hours.

Figure 8: Frequency of Stability Class - CALMET 2013 - 2015



Appendix C Dispersion Modelling Methodology

This appendix presents an overview of the dispersion modelling methodology.

C.1 Dispersion Model

Odour dispersion modelling was undertaken using the US EPA approved CALPUFF model for three years of meteorological conditions at 0.1 km resolution wind fields developed using CALMET. General run control parameters and technical options that were selected are presented in Table 7. Defaults were used for all other options.

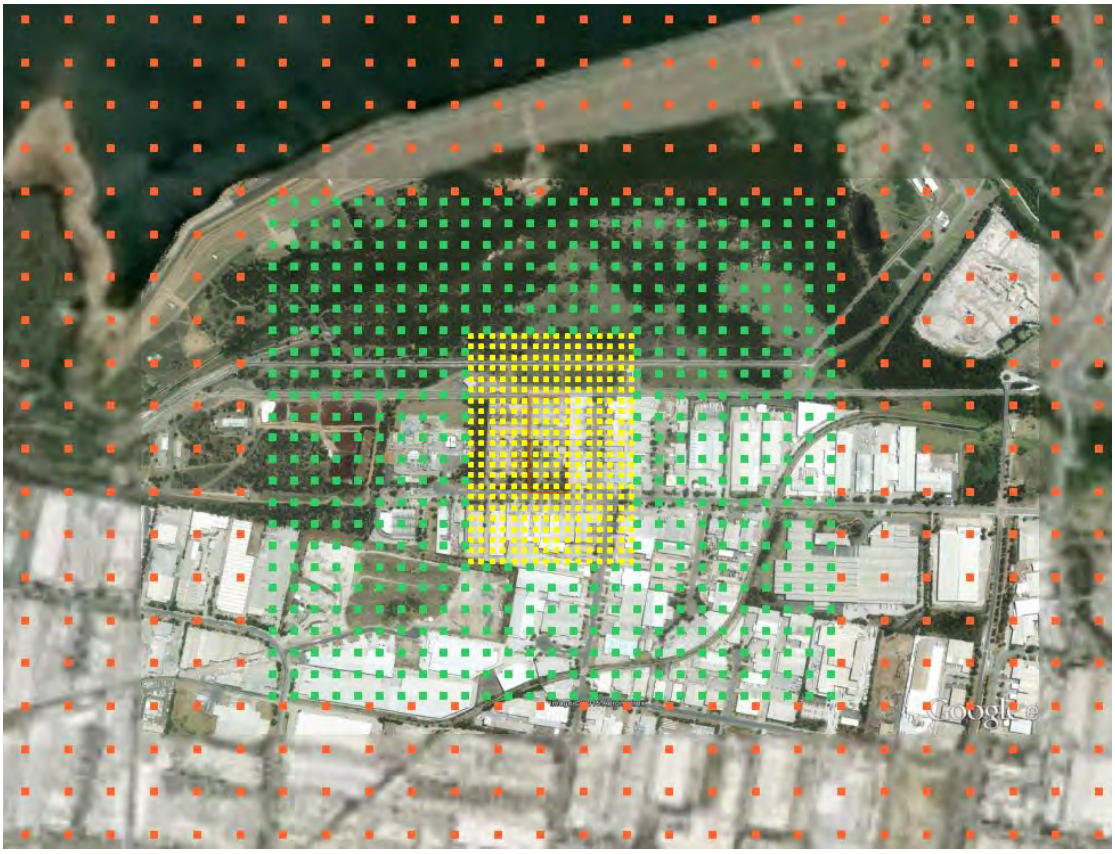
Table 7: CALPUFF Configuration

Parameter	Units	Value
CALPUFF version	-	V6.42
Years modelled	-	2013, 2014 & 2015
No. X grid cells (NX)	-	99
No. Y grid cells (NY)	-	77
Grid spacing (DGRIDKM)	Km	0.1
X coordinate (XORIGKM)	Km	300.500
Y coordinate (YORIGKM)	Km	6251.273
No. of vertical layers (NZ)	-	10
UTC time zone (XBTZ)	Hours	UTC+1000
Model Time step	sec	1800
Transitional Plume Rise	-	True
Stack Tip Downwash	-	True
Method used to compute dispersion coefficient (MDISP)	-	2 (internally calculated sigma v, sigma w using micrometeorology)
Computational grid size and resolution	-	Identical to CALMET grid
Discrete receptors modelled	-	1307
Discrete receptors height above ground	m	1.5
Wet deposition	-	False
Dry deposition	-	False
Building wake affects	-	Included (BPIP)

C.2 Discrete Project Receptors

A total of 1307 receptor locations were included in the CALPUFF model at a spacing of 25 m (yellow), 50 m (green) and 200 m (orange).

Figure 9: The Location of Variable Spaced Receptors Surrounding the Project Site



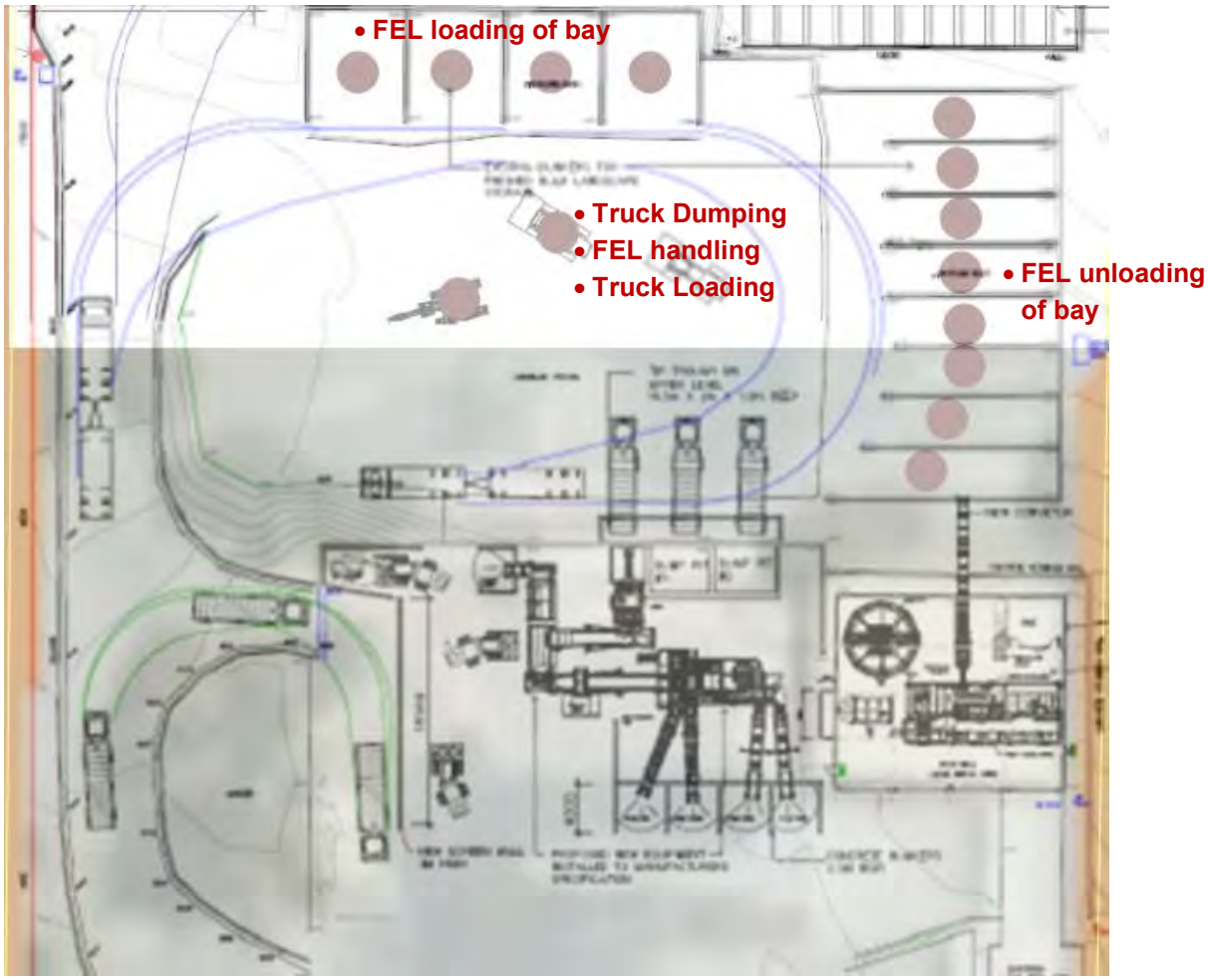
C.3 Dust Emission Source Characteristics

The location of the dust emission sources associated with the handling and storage of bulk material is shown in Figure 10 with source characteristics summarised in Table 8.

Table 8: Dust Emission Source Characteristics for Worst-Case Scenario

Source	Description	Release Height (m)	Sigma Y	Sigma Z	Easting (km)	Northing (km)	Dust Emission Rate
Truck	Truck Dumping	1.5	3	0.75	305.668	6254.183	Hourly varying
FEL	FEL – Truck dump location	1.5	3	0.75	305.668	6254.183	Hourly varying
FEL	FEL – Truck Loading	1.5	3	0.75	305.668	6254.183	Hourly varying
FEL	FEL – loading bay	1.5	2	0.75	305.652	6254.196	Hourly varying
FEL	FEL – unloading bay	1.5	2	0.75	305.701	6254.180	Hourly varying

Figure 10: Location of Dust Emission Sources for Worst-Case Scenario



Appendix 8

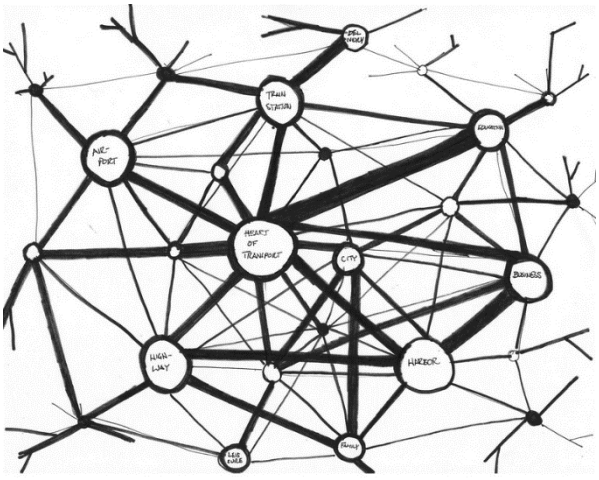
Revised Traffic Impact Assessment

THOMPSON STANBURY ASSOCIATES

ABN: 79 943 737 368

PARKING TRAFFIC & TRANSPORT IMPACT ASSESSMENT

PROPOSED RESOURCE RECOVERY & RECYCLING CENTRE
24 DAVIS ROAD
WETHERILL PARK



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APPENDICES

SUMMARY RESPONSE TO SECREATARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARS)

The following provides a summary of the relevant sections of the report which directly addresses the SEARs requirements relating to *Traffic and Transport* as outlined in NSW Planning and Environment letter to Bettergrow Pty. Ltd., dated 16/12/2015.

SEARs TRAFFIC AND TRANSPORT REQUIREMENTS (SSD 7401)	
Requirements	**Pertinent sections of report for reference**
Details of all traffic types and volumes likely to be generated during the construction and operation, including a description of the haul routes	**Section 3** - details the different vehicle types and traffic volumes. **Section 6** – provides a description of the vehicular routes during the operation of the facility **Appendix 1** - provides a description of the vehicular routes during the construction of the facility
An assessment of the predicted impacts of this traffic on road safety and the capacity of the road network, including consideration of cumulative traffic impacts at key intersections using SIDRA or similar traffic model.	**Section 6** – addresses the projected impacts of the development on the surrounding road network.
Detailed plans of the proposed layout of the internal road network and parking on site in accordance with relevant Australian Standards.	**Section 4** – addresses internal site design with respect to access, parking and internal circulation and its compliance with relevant Australian Standards.
Plans of any proposed road upgrades, infrastructure works or new roads required for development.	No changes are proposed to the adjoining and surrounding road network, as our Traffic Impact Assessment report has assessed the surrounding road hierarchy to be readily capable of accommodating all vehicle types associated with the development in a safe and efficient manner. Notwithstanding the above, it is noted that our observations have indicated that the current road network in the immediate vicinity of the site is already servicing heavy vehicle types associated with adjoining developments similar to the proposed resource recovery facility.

SUMMARY RESPONSE TO ROADS AND MARITIME SERVICES (RMS) REQUIREMENTS

The following provides a summary of the relevant sections of the report which directly addresses the additional comments specified by the RMS contained within their email dated 19/12/2016, upon review of our draft report.

SEARs TRAFFIC AND TRANSPORT REQUIREMENTS (SSD 7401)	
Requirements	**Pertinent sections of report for reference**
It is noted that the traffic impact assessment has not modelled the impact of heavy vehicles (generated from the development) on the road network. Only traffic impacts of staff and visitors have been assessed. The cumulative impacts of passenger vehicles and heavy vehicles is to be assessed/modelled for the proposed development (both peak hour and daily). The report should be modified reflecting this requirement.	**Section 3 (and Table 2)-** presents both passenger and heavy vehicle generation associated with the development, which have been used as the basis for modelling contained in later sections of our report (this has not changed from our draft report). **Section 6** – addressed the cumulative impacts of passenger and heavy vehicles based on the results of the SIDRA modelling.
In accordance with Roads and Maritime's response on the request for SEARs (attached), the following additional intersection is to be examined / modelled as part of the application: - Victoria Street / Elizabeth Street	**Section 6** – contains additional modelling incorporating this signalised intersection.
The Traffic Impact Statement should include the SIDRA output data for all intersections assessed.	**Appendices 1 and 2** – provides the full SIDRA modelling output results as requested.

1. INTRODUCTION

Thompson Stanbury Associates has been engaged by Bettergrow to prepare a traffic impact assessment to accompany a development application lodged with NSW's Department of Planning & Environment for the establishment of a Resource Recovery & Waste Recycling Facility at 24 Davis Road, Wetherill Park.

The purpose of this report is to assess and document likely traffic impacts resulting from the proposal and to recommend, where appropriate, treatments to alleviate such impacts. This assessment is provided in response to the Department of Planning & Environment's Secretary Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Assessment for the subject development dated 16 December 2015. Further, this report addresses the recent Roads and Maritime Services' (RMS) comments presented within their letter dated 19 December 2016. In this regard, assessment is made of the following:

- The suitability or otherwise of the proposed site access arrangements and internal circulation servicing the development with respect to the projected operational requirements of the proposed use;

- The suitability or otherwise of the proposed parking and internal circulation / manoeuvring with respect to the projected operational requirements of the proposed use;

- The existing road network conditions within the vicinity of the site including traffic volumes and general traffic safety;

- The traffic likely to be generated by the subject development with particular regard to the movement of heavy vehicles; and

- The ability of the surrounding road network to accommodate additional traffic movements projected by the proposal.

Reference has been made to the following documents throughout this report:

- The Roads & Maritime Services' *Guide to Traffic Generating Developments*;

- The Australian Standard for *Parking Facilities Part 1: Off-Street Car Parking* (AS2890.1-2004), *Part 2: Off-Street Commercial Vehicle Facilities* (AS2890.2-2002) and *Part 6: Off-Street Parking for People with Disabilities* (AS2890.6-2009); and

- Fairfield City Council's *Fairfield Citywide Development Control Plan 2013* (DCP2013).

The report has been prepared in accordance with State Environmental Planning Policy (Infrastructure) 2007.

The report should be read in conjunction with site plans prepared by Style Developments.

2. SITE DETAILS

2.1 Site Location

The subject site is located on the northern side of Davis Road, approximately 55m west of its intersection with Arnott Place, Wetherill Park. This location is illustrated within a neighbourhood context by **Figure 1** shown overleaf, being an extract of UBDs *Australian City Streets* – Version 4.

2.2 Site Description

The subject site provides a real property description of Lot 18 DP 249417 and a street address of 24 Davis Road, Wetherill Park. The subject allotment forms a rectangular shaped parcel of land providing a single frontage to Davis Road of approximately 90m and a depth (extending north from the southern property boundary) of approximately 225m. Total site area is 20,292m^2.

2.3 Existing Use

The subject land currently accommodates a series of outbuildings previously associated with an oil refinery operated by Mobil. This industrial processing development has been decommissioned and rehabilitated since operations by Mobil ceased in 2004, but the remaining buildings and infrastructure will be retained for use by the proposed recycling centre.

The existing vehicular driveway connecting the on-site facilities with the adjoining public road is proposed to be widened to readily accommodate heavy commercial vehicles (being the largest to frequent the site) in accordance with the requirements stated in The Australian Standard for *Parking Facilities Part 2: Off-Street Commercial Vehicle Facilities (2002)*.

2.4 Surrounding Uses

The site is located is surrounded by large scale industrial developments contained within the Wetherill Park industrial estate.

FIGURE 1 – SITE LOCATION WITHIN A NEIGHBOURHOOD CONTEXT

3. PROPOSED DEVELOPMENT

3.1 Built Form

The subject DA seeks consent for the retention of the existing site structures (e.g. workshop, office/amenities, existing off-street parking area, etc.) and the construction of the following supplementary structures that will collectively facilitate the proposed waste recycling/resource recovery purpose of the site:

- Two new weighbridges (one entry and one exit), located immediately adjacent to the main office area within the southern-western portion of the site;

- Two large industrial buildings to be used for receiving, storing and processing of organic materials. These building are to be located within the northern portion of the site and are designed to provide industrial floor areas of 2,240m^2 and 969m^2, receptively;

- A secondary office & amenities building, situated within the north-eastern corner of the site, that is to provide an office floor space of 80m^2; and

- A CD enviro drill mud plant for managing hydro-excavated drill muds.

Vehicular access to the subject premises is proposed to be accommodated via a 12.5m wide combined ingress/egress access driveway connecting with Davis Road along the southern property boundary, located approximately 20m east of the western property boundary. Further, a passenger vehicle only access driveway is proposed at the south-eastern corner of the site servicing Davis Road. The proposed driveways facilitates access into the proposed on-site developments including provision for separate off-street passenger vehicle parking areas for staff, yielding a total of 36 spaces.

3.2 Site Operations

The subject site is proposed to function as a resource recovery and waste recycling facility that will be responsible for receiving and processing up to 200,000 tonnes per annum of the following wastes:

- 60,000 tonnes of hydro-excavation and drill mud/fluids;

- 40,000 tonnes bulk landscaping supplies; and

- 100,000 tonnes of garden organics, commingled food, garden organics and food waste.

As part of the proposal, the subject site is anticipated to perform the following activities with respect to the quantities of waste mentioned above:

- Receipt of consolidated hydro-excavation and drill muds/fluid and removal from site for use as structural fill or feedstock;

- Receipt of bulk landscaping supplies for distribution within surrounding areas; and
- Receipt of wood offcuts, timber and garden organics as well as food/food waste for consolidation and redistribution.

The waste is to be transported, mechanically deposited, sorted and collected on site by various types of commercial vehicles ranging from Small Rigid Vehicles (SRVs) to 19m long B-doubles.

The annual operational management of up to 200,000 tonnes of waste per year is equivalent to a total daily quantity of approximately 770 tonnes per day. Such a level of activity could be expected to generate (based on information provided by the applicant) a maximum of 304 truck movements per day to and from the site at peak trading, comprising 24 truck and dog combination vehicles, 23 six to eight tonne hooklift bin trucks, 90 Council's garbage collection trucks, 8 B-doubles (19m long), 30 six to eight tonne wheeler rigid tippers, 12 semi-tippers (25-tonne), 92 wheeler sucker trucks, 18 semi sucker trucks, 4 semi liquid tankers and 3 flattop trucks.

The business is proposed to be operational over 24 hours a day from Monday to Friday and also on Saturday from 6:00am – 2:30pm. Generally, office hours will occur between 6:00am – 5:00pm, Monday to Friday only. However, the proposed facility is also proposed to cater for afterhours deliveries of materials resulting from the need for contractors to carry out works within metropolitan areas at night, where construction and maintenance work times are largely defined by various authorities.

Further to the above, on Sundays, the site will undergo maintenance activities in conjunction with minimal deliveries and outgaining consignments, under minimal staff supervision.

In addition to the above, the business is anticipated to have the following maximum number of staff with respect to each division of the future on-site operations:

- 1 staff to monitor/control the weighbridge;
- 4 staff allocated to the drill mud operation of the business;
- 14 staff allocated to the organic waste processing division;
- 1 Bulk Landscaping Supplies division;
- 2 maintenance staff; and
- 3 office staff

The projected daily work schedule of the abovementioned employees are illustrated in **Table 1** overleaf, being an extract of the information provided by the applicant (Bettergrow).

TABLE 1 PROJECTED STAFF ROSTER							
TIME	DIVISION OF OPERATION						
	W/bridge	Mud	Bulk L/scape	Organics, GO, FO & FOGO	Supervision Management Security	Office	Total
12:00am - 5.00am		2			1		3
5.00am - 6.00am	1	4	1	14	2		22
6.00am- 7.00am	1	4	1	14	2	1	23
7.00am - 8.00am	1	4	1	14	2	2	24
8.00am - 9.00am	1	4	1	14	2	3	25
9.00am - 10.00am	1	4	1	14	2	3	25
10.00am - 11.00am	1	4	1	14	2	3	25
11.00am -12.00pm	1	4	1	14	2	3	25
12.00pm - 1.00pm	1	4	1	14	2	3	25
1.00pm - 2.00pm	1	4	1	14	2	3	25
2.00pm - 3.00pm	1	4	1	14	2	2	24
3.00pm - 4.00pm	1	3	1	14	2	2	23
4.00pm - 5.00pm	1	3	1	14	2	1	22
5.00pm - 6.00pm		2	1	12	2		17
6.00pm - 7.00pm		2		12	1		15
7.00pm - 8.00pm		2		2	1		5
8.00pm - 9.00pm		2		2	1		5
9.00pm - 10.00pm		2		2	1		5
10.00pm - 11.00pm		2		2	1		5
11.00pm - 12.00pm		2		2	1		5

Table 1 indicates that the maximum number of staff expected to be on site at any one time is 25, which is anticipated to occur between 8:00am – 2:00pm.

Based on the proposed operations and staff employment levels of the recycling facility, an estimation of the weekly hour by hour traffic generation (comprising both staff and heavy vehicle traffic movements) is provided by the applicant and summarised in **Table 2** overleaf.

Table 2 indicates the following:

- During peak weekly operations, the recycling facility is anticipated to generate between 30 – 40 vehicle movements (comprising both passenger and heavy vehicles) per hour to and from the site during the time period between 1:00pm – 3:00pm;

- During peak commuter hourly periods (between 7:00am – 9:00am and 4:00pm – 6:00pm), the recycling facility is envisaged to generate a traffic demand of between 15 - 30 vehicle movements (comprising both passenger and heavy vehicles) per hour to and from the site;

- The maximum passenger vehicle generation associated with staff is 18 ingress trips to the site;

- The maximum passenger vehicle generation associated with visitors is two trips to and from the site; and

- The maximum heavy vehicle generation during peak operation of the facility is 38 trips to and from the site.

TABLE 2 - SUMMARY OF ANTICIPATED AVERAGE AND PEAK DAILY VEHICLE MOVEMENTS IN AND OUT OF GREENSPOT WETHERILL PARK IN FULL OPERATION

	Hydro Exc & Drill Mud					Estimated arrival and departure times for site vehicles based on Peak daily movements only. Numbers shown are a total of both in and out movements by vehcile category and operation																							
	Average		Peak		Total Peak	Monday to Friday a.m.												Monday to Friday p.m.											
Vehicle Type	in	out	in	out	Movements	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
Semi Tippers 25 tonne	3	3	4	4	8							1	1			2	2		1	1									
4, 6 or 8 wheeler sucker trucks	38	38	46	46	92	4	4	4	4	4	4	2		2	4		4	8	4	6	8	10	11	4	1	1	1	1	1
Semi Sucker trucks	7	7	9	9	18								1	2	2	2	2			2	2	3	2						
Semi liquid tankers	0	0	0	0	0																								
	Bulk Landscape Materials																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
Truck and Dog 32 t pay load	5	2	6	3	9						2	1			2			3	1										
19m B' Doubles	3	0	4	0	4					2																		2	
6 or 8 wheeler rigid tippers	10	10	15	15	30						4	8	8	4			3	3											
Semi Tippers 25 tonne	1	1	2	2	4							2						2											
	GO and comingled Food and Garden Organics																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
6 or 8 wheeler with Hook lift bin	1	1	1.5	1.5	3											2	1												
Truck and Dog 32 t pay load	3	6	5	8	13						4	3			1			2	1			2							
Side arm Council kerbside collection	32	32	42	42	84						4	15	15	10				15	15	10									
19m B' Doubles	0	3	0	4	4					2																		2	
	Food Organics																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
6 or 8 wheeler Hook lift bin or murrels	8	8	10	10	20				2	3							4	4	4	2	1								
Truck and Dog 32 t pay load	1	1	1	1	2							1	1																
Side arm Council kerbside collection	2	2	3	3	6							1	2	1				1	1										
Tortliners / Flat top	0.5	0.5	1.5	1.5	3						1	1							0.5	0.5									
Semi liquid tankers	1.5	1.5	2	2	4					2						2													
	Miscallaneous																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
Staff Cars	20	20	22	22	44	2				18	1	1							8	5	5	2	2						
Visitor Cars	2	2	4	4	8									2			2	2		2									
Fuel Deliveries	1	1	1	1	2							2																	
Total movements by Hour						6	4	4	6	31	20	38	28	21	9	8	18	40	35.5	28.5	16	17	15	4	1	1	1	5	1

4. SITE ACCESS & INTERNAL CONSIDERATIONS

4.1 Access Arrangements

The subject site is proposed to be serviced by a combined ingress/egress access driveway, providing a 12.5m width at the southern property boundary and facilitating connectivity between the off-street parking and internal circulation areas with the adjoining frontage road (Davis Road). Further, a 5.6m wide combined ingress/egress driveway servicing passenger vehicle access only is proposed to connect with Davis Road at the south-eastern corner of the site.

4.1.1 Passenger Vehicles

The suitability of the proposed access driveway with respect to accommodating passenger vehicles is assessed based on guidelines provided within the Australian Standard for Off-Street Car parking (AS2890.1-2004). This publication provide driveway design recommendations based on a number of site characteristics such as the number and classification of vehicles to be accommodated on-site and the functional role of the frontage road. **Table 3** below highlights the minimum driveway widths required to accommodate passenger in accordance with.

TABLE 3
DRIVEWAY DESIGN SPECIFICATIONS

AS2890.1-2004 (Passenger Vehicles)		**Minimum Width of Driveway**
Class of Parking Facility	Class 1 (The majority of car parking spaces on site are to be allocated for staff/employees of the proposed development.)	Combined entry and exit width of between 3.0m – 5.5m (Category 1 type driveway)
Frontage Road Type	Local (The frontage road (Davis Road) adjoining the proposed driveways at the eastern site boundary is deemed to perform a local road function under the care and control of Fairfield City Council.)	
Number of Parking Spaces (Proposed)	36	

Based on **Table 3**, it is evident that the proposed access arrangements suitably accords with the design criteria specified within AS2890.1-2004 and is therefore considered to be satisfactory in terms of servicing passenger vehicles.

4.1.2 Heavy Vehicles

In order to demonstrate the suitability of the proposed access driveway design in being capable of accommodating heavy vehicles up to the size of 19.0m long b-doubles (being the largest vehicles to frequent the site), this Practice has prepared a number of swept path plans, which have been overlaid on the site plan prepared by the architect.

These plans have been formulated utilising Autoturn software and based on standard b-double truck turning specifications provided within AustRoads. These swept paths indicate that such vehicles are able to enter and exit the site without any unreasonable encroachment on the opposing Davis Road eastbound travel lane, formalised road verge and/or internal development kerbing.

In addition to the above, it is noted that the entry and exit weighbridges are located approximately 19.0m inside the property boundary. It has been previously mentioned that the largest vehicles to frequent the site is a 19.0m long B-double and **Table 3** has indicated that up to two of these vehicles can be expected to be on site at any one time. The proposed length of the entry weighbridge (22.0m) and the waiting space behind it is such that it is capable of wholly accommodating up to two 19.0m long B-doubles on–site without extension/encroachment onto the adjoining frontage road. As such, the weighbridge location is assessed to be appropriate with respect to minimising the potential for queuing onto the public road due to the operational requirements of the development. In consideration of this and the above, the proposed driveway design is therefore deemed to be capable of satisfactorily accommodating the largest vehicles required to service the site.

4.1.3 Site Access Safety Assessment

The safety and efficiency of access / egress movements are also proposed to be assisted by the provision of a relatively level grade within at least the first 6m of the property boundary and the provision of a triangular area measuring 2.5m into the site and 2m along the boundary that is clear of obstructions to visibility adjoining the side of the driveway accommodating exiting traffic.

The consistent horizontal and vertical alignment of Davis Road in the immediate vicinity of the subject site will provide motorists with good sight distance between the public roadway and the site access driveway.

In consideration of this and the abovementioned discussion, the proposed site access arrangements are considered to be satisfactory.

4.2 Parking Provision

The subject development is proposing to provide a total of 36 off-street passenger vehicle parking spaces, distributed throughout the site within standard 90 degree angled parking rows serviced by an adjoining parking aisle.

Fairfield City Council does not provide specific parking rates for a resource recovery facility within Fairfield Citywide Development Control Plan 2013, however it requires the parking demand to be assessed based on a car parking study of a comparable facility. In this regard, the parking impact assessment should be based on the operational characteristics of the proposed site operations provided by the applicant (Bettergrow), which is understood to be based on a similar existing development within the Sydney Metropolitan area, owned and operated by Bettergrow.

Parking demand associated with the proposed use is most likely to be limited to that generated by staff and any potential visitors. It has previously been presented that the

proposed site operations will generate a demand for up to 25 employees and two visitors on-site at any one time. Accordingly, assuming a worst case scenario that all staff and visitors drive themselves to and from the site, a peak passenger vehicle parking demand of 27 is anticipated. The proposed parking provision of 36 spaces is therefore expected to readily accommodate operational demands and accordingly, is considered to be satisfactory.

4.3 Vehicle Circulation

4.3.1 Passenger Vehicles

Upon entry to the subject site, passenger vehicles will move in a forward direction to access the at-grade passenger vehicle parking areas located within the front and rear of the site. The passenger vehicle parking areas are proposed to comprise 90 degree angled parking rows, being serviced by adjoining parking aisles.

The internal circulation of the parking areas have been designed to accord with the relevant requirements of AS2890.1-2004 and AS2890.6-2009, providing the following minimum dimensions:

- Standard vehicle parking space width = 2.5m;
- Disabled (if required) vehicle parking space width = 2.5m (plus an adjoining 2.5m wide shared area);
- Additional space width adjoining obstruction = 0.3m;
- Standard and disabled (if required) vehicle parking space length = 5.4m; and
- Parking aisle width = 5.8m.

The above compliance with the relevant AS2890.1-2004 and AS2890.6-2009 specifications is anticipated to result in safe and efficient internal manoeuvring and parking space accessibility. As such, this Practice is satisfied that the internal circulation and manoeuvring arrangements of the subject development are suitable incorporating the recommendations provided within this section given the likely operational characteristics of the site.

4.3.2 Heavy Vehicles

The facility is proposed to accommodate vehicles up to and including 19.0m long B-doubles. These vehicles will access the site in a simple forward direction and undertake all loading / unloading activities and manoeuvring within the on-site circulation areas, as well as within the four internal loading bays within the proposed FGO building, located at the north-western corner of the site. Three of these internal loading bays adjoining the southern building wall are capable of accommodating up to three trucks similar in size to a Medium Rigid Vehicle (MRV), whilst the loading bay along the eastern building wall is designed to service up to one tuck and dog combination vehicle.

Upon completion of the loading / unloading activities, these vehicles exit the site via the site access driveway to Davis Road in a simple forward manoeuvre.

In order to demonstrate the ability of the internal circulation arrangements to accommodate the required manoeuvring throughout the site, a turning path analysis has been undertaken, whereby a number of swept path plans have been prepared incorporating turning specifications of MRVs, truck and dog combination vehicles and 19.0m long B-doubles provided within Austroads. This analysis has indicated that all heavy vehicles proposed to service the facility are capable of manoeuvring within the site in a safe and efficient manner without any unreasonable encroachment on internal passenger vehicle parking areas or structures. Accordingly, the internal heavy vehicle manoeuvring arrangements are considered to be satisfactory.

5. EXISTING TRAFFIC CONDITIONS

5.1 Road Network

The following provides a description of the surrounding road network that services connectivity between the proposed and adjoining developments within the Wetherill Park Industrial Precinct:

Davis Road performs a local industrial access function under the care and control of Fairfield City Council. In this regard, it facilitates an east/west connection between Prospect Highway/Widemere Road in the east and Elizabeth Street in the west, with which it intersects under traffic signal and unsigned priority control respectively. At its western extremity, Davis Road terminates in a cul-de-sac.

Davis Road provides a 12.0m wide pavement, providing one through lane of traffic in each direction in conjunction with parallel parking lane along both formalised kerb and gutter alignments.

Elizabeth Street performs a collector function under the care and control of Fairfield City Council. It provides a north/south route connecting Davis Road in the north to The Horsley Drive (a State Road) to the south, with midway connections to Victoria Street (a regional road). Elizabeth Street provides an 18.0m wide carriageway comprising two 3.0m wide travel lanes and two 6.0m wide parking lanes. At its southern extremity, Elizabeth Street intersects with The Horsley Drive under traffic signal control. Traffic flow is governed by a sign posted speed limit of 60km/hr.

5.2 Traffic Volumes

In order to obtain an indication of the existing operation of the primary access intersection servicing Davis Road, reference is made to morning and evening peak hour traffic surveys undertaken by staff of this Practice at the intersection of Elizabeth Street and Davis Road. Further, traffic surveys during peak hour periods were undertaken at the following intersections in the vicinity of the site associated with separate projects:

- Junction of Elizabeth Street and Frank Street; and

- Intersection of Victoria Street and Elizabeth Street.

Surveys of the above intersections were undertaken recently between 7.00am – 8.00am and 4.00pm – 5.00pm. Our observations have identified that traffic demands within the surrounding road network, outside of these peak times and during weekends were significantly lower.

Figure 2 overleaf provides a graphical representation of the surveyed peak hour traffic movement profile obtained from the above manual traffic surveys whilst full details are available upon request.

FIGURE 2
EXISTING WEEKDAY PEAK HOUR TRAFFIC VOLUMES
7.00AM - 8.00AM & 4.00PM - 5.00PM

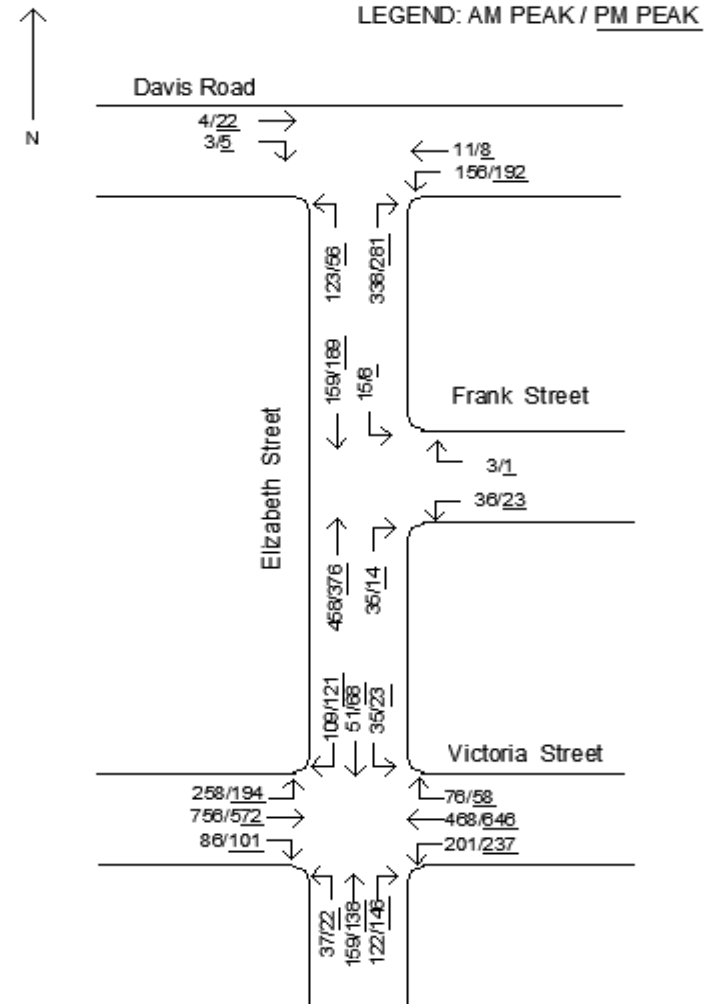


Figure 2 indicates the following:

- Bidirectional traffic demands within Davis Road are approximately between 150 – 250 vehicles during peak times;
- Bidirectional traffic demands within Frank Street are approximately between 50 – 100 vehicles during peak times;
- Elizabeth Street at its junction with Frank Street accommodates bidirectional traffic demands in the order of between 600 – 700 vehicles during peak times;
- Elizabeth Street at its junction with Victoria Street accommodates bidirectional traffic demands in the order of between 500 – 600 vehicles during peak times;
- Bidirectional traffic demands within Victoria Street are approximately between 1,800 – 1,900 vehicles during peak times;

5.3 Existing Intersection Operation

5.3.1 Davis Road & Elizabeth Street

In order to estimate the existing peak efficiency of the critical road network, a SIDRA computer network analysis has been undertaken at the junction of Elizabeth Street/Davis Road and the intersection of Victoria Street/Elizabeth Street. SIDRA is a computerised traffic arrangement program which, when volume and geometrical configurations of a network of intersections are imputed, provides an objective assessment of the operation efficiency under varying types of control (i.e. signs, signal and roundabouts). Key indicators of SIDRA include level of service where results are placed on a continuum from A to F, with A providing the greatest intersection efficiency and therefore being the most desirable by the Roads and Maritime Services.

SIDRA uses detailed analytical traffic models coupled with an iterative approximation method to provide estimates of the abovementioned key indicators of capacity and performance statistics. Other key indicators provided by SIDRA are average vehicle delay, the number of stops per hour and the degree of saturation. Degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach. Degree of saturation is a useful and professionally accepted measure of intersection performance.

SIDRA provides analysis of the operating conditions that can be compared to the performance criteria set out in **Table 4** overleaf (being the RMS NSW method of calculation of Level of Service).

TABLE 4
LEVELS OF SERVICE CRITERIA FOR INTERSECTION

Level of Service	Average Delay per Vehicle (secs/veh)	Expected Delay
SIGNALISED INTERSECTIONS AND ROUNDABOUTS		
A	Less than 14	Little or no delay
B	15 to 28	Minimal delay and spare capacity
C	29 to 42	Satisfactory delays with spare capacity
D	43 to 56	Satisfactory but near capacity
E	57 to 70	At capacity, incidents will cause excessive delays
F	> 70	Extreme delay, unsatisfactory
GIVE WAY & STOP SIGNS		
A	Less than 14	Good
B	15 to 28	Acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Near capacity
E	57 to 70	At capacity and requires other control mode
F	> 70	Unsatisfactory and requires other control mode

The existing conditions have been modelled utilising the peak hour traffic volumes presented within **Figure 2**. **Table 5** provides a summary of the SIDRA output data whilst more detailed summaries are provided upon request.

TABLE 5 SIDRA NETWORK MODELLING ANALYSIS EXISTING CONDITIONS		
Junction of Elizabeth Street and Davis Road	**AM**	**PM**
Elizabeth Street South		
Delay	6.1	6.4
Degree of Saturation	0.32	0.28
Level of Service	A	A
Davis Road East		
Delay	5.7	5.7
Degree of Saturation	0.10	0.12
Level of Service	A	A
Davis Road West		
Delay	6.2	6.3
Degree of Saturation	0.01	0.02
Level of Service	A	A
Total Intersection		
Delay	6.2	6.4
Degree of Saturation	0.01	0.28
Level of Service	A	A
Junction of Victoria Street and Elizabeth Street	**AM**	**PM**
Elizabeth Street South		
Delay	46.3	48.8
Degree of Saturation	0.66	0.65
Level of Service	D	D
Victoria Street East		
Delay	29.9	33.4
Degree of Saturation	0.51	0.67
Level of Service	C	C
Elizabeth Street North		
Delay	56.2	56.6
Degree of Saturation	0.47	0.52
Level of Service	D	E
Victoria Street West		
Delay	33.0	31.9
Degree of Saturation	0.70	0.55
Level of Service	C	C
Total Intersection		
Delay	35.7	37.0
Degree of Saturation	0.61	0.67
Level of Service	C	C

Table 5 indicates the following:

- The junction of Davis Road and Elizabeth Street currently provides motorists with a level of service 'A', representing good operation with spare capacity during both commuter peaks; and

- The intersection of Victoria Street and Elizabeth Street is assessed to currently provide motorists with a level of service 'C', representing satisfactory conditions with some delays.

5.4 Public Transport

5.4.1 Bus

Transit Systems operates a single bus service (Route 812) in the immediate vicinity of subject site, with the closest bus stop being 200m walking distance to the south-east of the subject site, along the western side of Elizabeth Street.

Route 812 operates from Fairfield to Blacktown with generally 30 minute frequencies.

6. PROJECTED TRAFFIC CONDITIONS

6.1 Traffic Generation

The traffic generation of the proposal is essentially a function of the employment levels in conjunction with the level of waste disposal and collection vehicle traffic generated by the operation. **Table 2** of Section 3.2 of this report has previously presented that the projected traffic generation associated with staff and visitors (comprising both passenger and heavy vehicles) during AM and PM peak hour commuter periods is estimated to be between 15 – 30 vehicle movements to and from the site. Incorporating the worst case scenario, the upper bound traffic generation of 30 vehicle movements comprising 15 inbound trips and 15 outbound trips anticipated to be generated during peak hour will be used for the purposes of this assessment.

6.2 Trip Assignment

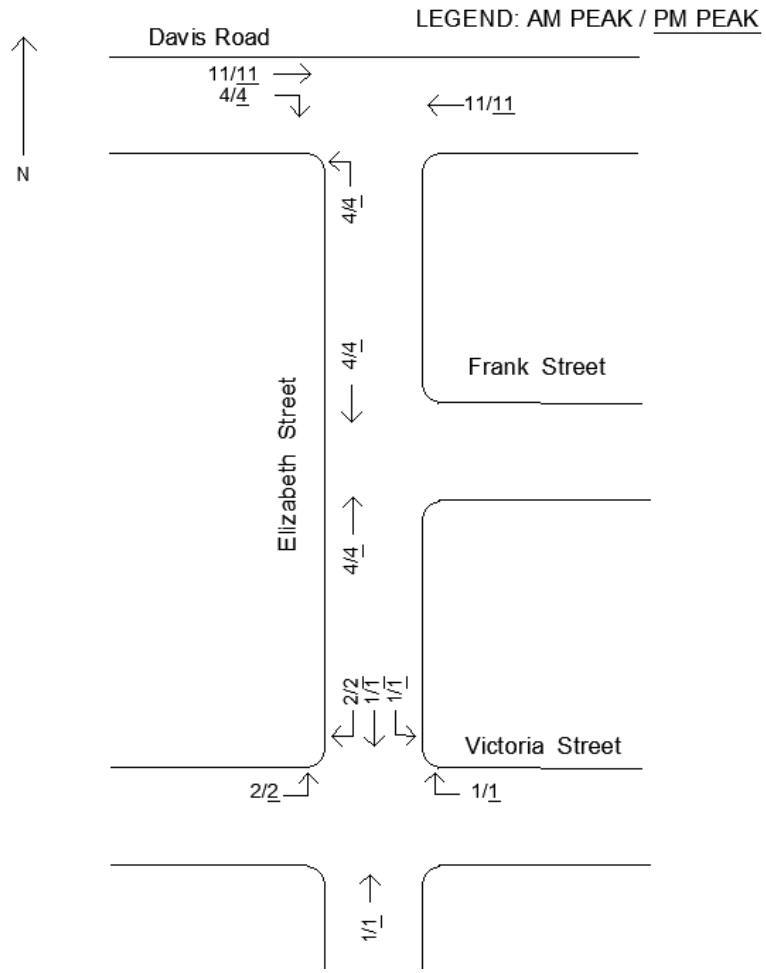
It is reasonable to assign traffic generated by the subject use in accordance with existing traffic distributions and the location of the site with respect to the surrounding road network. Based our observations, it is noted that the large majority of traffic associated with existing developments within Davis Road originate from the east via Prospect Highway/Widemere Road, with a small number of trips originating from the south via Elizabeth Street. In this regard, it is expected that 70% of traffic generated by the development is projected to arrive from the east via Davis Road, whilst the remaining 30% are projected to originate from the south via Elizabeth Street. The same assignment has been applied to vehicles exiting the site.

The following peak hour trip assignment has therefore been formulated:

- 4 vehicles approach the site from the south via Elizabeth Street, left turn into Davis Road and thence a right turn into the site;
- 11 vehicles approach the site from the east via Davis Road and thence a right turn into the site;
- 4 vehicles exit the site via a left turn into Davis Road and thence a right turn into Elizabeth Street to the south; and
- 11 vehicles exit the site via a left turn into the Davis Road travelling towards the east.

Figure 3 overleaf provides a graphical representation of the development generated trip assignment throughout the local road network.

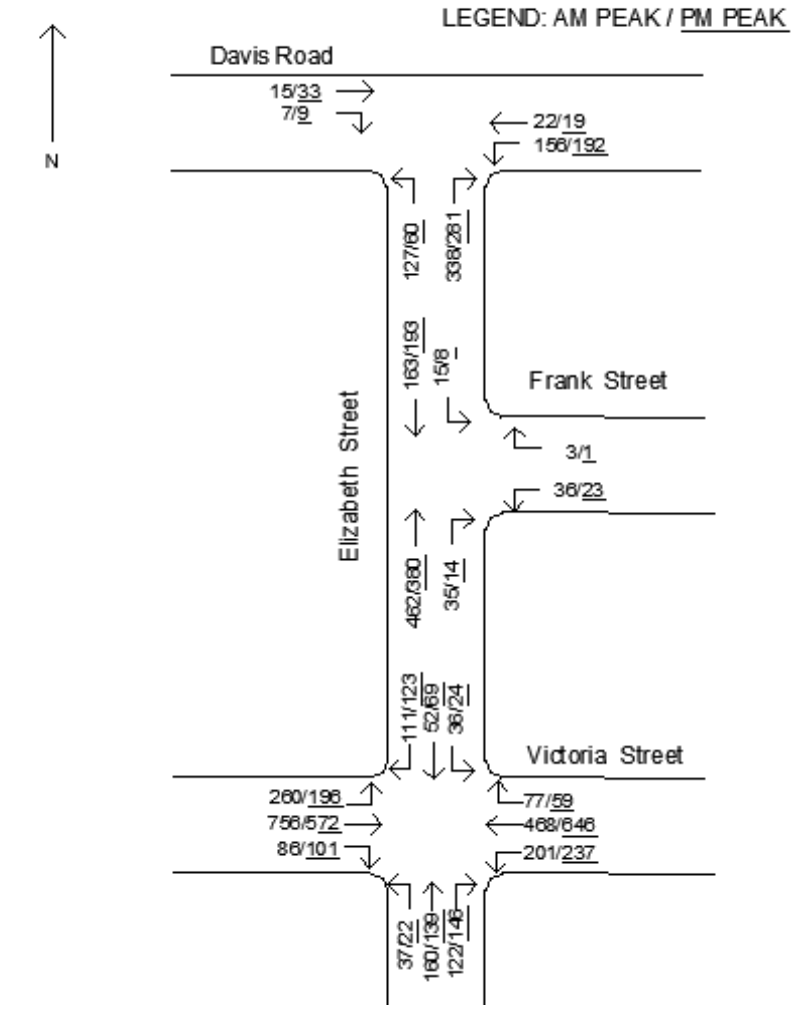
FIGURE 3
SUBJECT DEVELOPMENT TRIP ASSIGNMENT
7.00AM - 8.00AM & 4.00PM - 5.00PM



6.3 Projected Traffic Volumes

Based on the discussion provided previously on likely traffic generation and trip assignment, the projected peak hour traffic volumes have been formulated by adding the trip assignment presented within **Figure 3** to the to the volumes existing surveyed peak conditions provided within **Figure 2**. **Figure 4** overleaf provides an estimation of the future traffic volumes associated with and adjoining the subject site.

FIGURE 4
PROJECTED WEEKDAY PEAK HOUR TRAFFIC VOLUMES INCORPORATING SUBJECT DEVELOPMENT
7.00AM - 8.00AM & 4.00PM - 5.00PM



6.4 Projected Road Network Performance

6.4.1 Junction of Elizabeth Street/Davis Road and Intersection of Victoria Street/Elizabeth Street

Utilising the projected traffic generation characteristics of the proposed development and the abovementioned assumed trip assignment, a number of significant junctions have been modelled in order to estimate that likely impact on traffic safety and efficiency. A summary of the most pertinent results are indicated within **Table 6** overleaf whilst full output details are provided upon request.

TABLE 6 SIDRA OUTPUT – WEEKDAY PEAK HOUR PERFORMANCE JUNCTION OF DAVIS ROAD AND ELIZABETH STREET				
Junction of Elizabeth Street and Davis Road	**Existing Conditions**		**Projected Conditions**	
	AM	**PM**	**AM**	**PM**
Elizabeth Street South				
Delay	6.1	6.4	6.3	6.4
Degree of Saturation	0.32	0.28	0.33	0.28
Level of Service	A	A	A	A
Davis Road East				
Delay	5.7	5.7	5.7	5.7
Degree of Saturation	0.10	0.12	0.11	0.13
Level of Service	A	A	A	A
Davis Road West				
Delay	6.2	6.3	6.3	6.4
Degree of Saturation	0.01	0.02	0.01	0.03
Level of Service	A	A	A	A
Total Intersection				
Delay	6.2	6.4	6.3	6.4
Degree of Saturation	0.01	0.28	0.33	0.03
Level of Service	A	A	A	A
Junction of Victoria Street and Elizabeth Street	**AM**	**PM**	**AM**	**PM**
Elizabeth Street South				
Delay	46.3	48.8	46.4	48.8
Degree of Saturation	0.66	0.65	0.67	0.65
Level of Service	D	D	D	D
Victoria Street East				
Delay	29.9	33.4	29.9	33.4
Degree of Saturation	0.51	0.67	0.51	0.67
Level of Service	C	C	C	C
Elizabeth Street North				
Delay	56.2	56.6	56.2	56.7
Degree of Saturation	0.47	0.52	0.48	0.53
Level of Service	D	E	D	E
Victoria Street West				
Delay	33.0	31.9	33.0	31.9
Degree of Saturation	0.70	0.55	0.70	0.56
Level of Service	C	C	C	C
Total Intersection				
Delay	35.7	37.0	35.8	37.0
Degree of Saturation	0.61	0.67	0.70	0.67
Level of Service	C	C	C	C

Table 6 indicates that the traffic projected to be generated by the subject proposal is expected to result in some minor increase to the average vehicular delay, number of stops and degree of saturation at modelled intersections. However, the existing intersection level of service is projected to remain unaltered at all modelled intersections.

6.4.2 Site Access

The low traffic demands within Davis Road provide regular and extended gaps within directional traffic flows thereby providing good conditions with which to undertake turning movements to and from the site access driveways. Impedance associated with

such movements are therefore projected to be minimum thereby resulting in efficient site access conditions.

Section 4.1 of this report presented that the site has been designed so as to provide the maximum possible sight distance between the access driveway and the adjoining public road traffic movements. In consideration of this and the above discussion, the projected additional traffic movements generated by the proposed use are envisaged to be provided safe and efficient conditions within which to access and exit the site.

6.4.3 Operational Impacts

It is noted that **Table 2** has previously indicated that whilst the projected AM peak traffic generation of the proposed development coincides with the morning peak hour surveyed by staff of this Practice, the PM peak traffic demand of the proposed development (comprising 40 passenger and heavy vehicle movements to and from the site) is anticipated to occur outside of the afternoon peak period surveyed.

In any case, it has been previously noted that our observations of the traffic conditions within the surrounding roads during non-commuter peak periods and on weekends were quieter, with less traffic demands on the surrounding roads. As such, the additional traffic envisaged to be generated by the recycling facility during these times is not expected to have any adverse impacts on existing road network servicing the site. In this regard, a SIDRA analysis of these conditions incorporating the cumulative impacts of the recycling facility during these times are not expected to yield different results concerning the Level of Service, presented in **Table 6**.

7. CONCLUSION

This traffic impact assessment details our assessment of the traffic generation, access and safety considerations associated with a proposal for the establishment of a Resource Recovery & Waste Recycling Facility at 24 Davis Road, Wetherill Park. Having regard to the contents of this report the following conclusions are made:

- The on-site parking provisions are adequate to accommodate for projected demand given the likely number of employees and visitors on-site at any one time provided by the applicant;

- The proposed site access arrangements provide for the safe and efficient conditions with which to access and vacate the site;

- The internal circulation arrangements are projected to provide for safe and efficient internal movements and are capable of accommodating the peak operation demands of the use, wholly within the site;

- The surrounding road network in particular the junction of Elizabeth Street/Davis Road and the intersection of Victoria Street/Elizabeth Street operates with a good level of service during peak and non-peak periods (including weekends);

- The proposed use is projected to generate up to 30 peak hour trips (comprising both passenger and heavy vehicles) to and from the site corresponding to peak commuter periods and a maximum of 40 vehicle trips to and from the site during other times; and

- The surrounding road network is capable of accommodating the vehicular traffic generated by the proposal at all times.

Having regard to the conclusions abovementioned, this Practice is satisfied that the proposed development is worthy of support in relation to the traffic issues discussed.

APPENDIX 1

CONSTRUCTION VEHICLE TRANSPORT ROUTES

It is unclear at this stage what the exact routes construction vehicles are to undertake, as this information is usually contained within a Construction Traffic Management Plan prepared at the Construction Certificate stage following the commissioning of a builder thereby allowing a greater appreciation of the likely construction methodology and therefore the required traffic management measures to be implemented. Under these circumstances, only a preliminary indication of the potential transport routes to be utilised by construction vehicles to and from the site can be provided.

Due to the location of the site to the surrounding road network, it is likely that construction vehicles are to utilise similar routes to that of heavy vehicles frequenting the site, when the recycling facility is fully operational. In this regard, construction vehicle access movements to / from the site is likely to be right in / left out via Davis Road, originating and departing from / to the Davis Road in the east and Elizabeth Street in the west, as the western end of Davis Road terminates in a cul-de-sac. Davis Road/Elizabeth Street provides good connectivity to surrounding regional and arterial routes servicing the Sydney metropolitan area thereby indicating that construction vehicles are able to access and depart the site creating very little disturbance to surrounding local road traffic flow.

TRAFFIC IMPACT DURING CONSTRUCTION

The recent traffic investigations of the adjoining road network and the analysis contained within previous sections of this report have indicated that motorists are provided with a reasonable level of service within the immediately adjoining public road network. The traffic generation associated with construction activities are anticipated to be considerably less than the development at full operation. As such, the limited traffic can be accommodated without any unreasonable impacts on adjoining road network. Notwithstanding this, it has accordingly been recommended that construction vehicle movements to and from the site be minimised and eliminated where possible during road network peak periods (7.00am – 9.30am and 2.30pm – 6.00pm).

Appendix 9

Carbon Filter Unit Specifications

ACTIVATED CARBON TECHNOLOGIES PTY LTD
ABN 67 103 713 622
PO Box 1120, Research 3095, Victoria, AUSTRALIA
Phone: 03 9437 2600 **Fax:** 03 9437 2611
www.activatedcarbon.com.au

Acticarb EA1000K

Description:
Microporous Impregnated & Pelletised Activated Carbon

Application:
For the treatment of air streams containing volatile organic compounds & acidic gases.

Advantages:
- High adsorption capacity with a high rate of removal
- High hardness and therefore reduced production of fines
- High density therefore high mass adsorption capacity
- Alkali impregnant for maximum removal efficiency of acidic gases

Characteristic	Specification	Typical Analysis
Apparent Density (g/mL)	0.50-0.55	0.52
Moisture as packed (% max.)	15	13
H_2S Adsorption Capacity (g H_2S/cc Carbon)	0.14	0.16
Iodine Number	>950	1050
Surface Area (BET M^2 /g)	>1000	1025
Hardness Index (% min.)	95	99.5
Particle Size (mm diameter)	4	4.0
Particle Length (>6mm)	> 95%	> 98%

Packaging:
Ex-stock in 25kg paper bags & 500kg bulk bags.
Other packaging available on request.

Created 2015.07.30 Version 4

ISO 9001 BUREAU VERITAS Certification

Brisbane Office
PO Box 6339, Upper Mt Gravatt QLD 4122, AUSTRALIA
Phone: 07 3209 6759
Email: brisbane@activatedcarbon.com.au

Perth Factory
PO Box 4087, Canning Vale East 6155, WA, AUSTRALIA
Phone: 08 9455 6864 **Fax:** 08 9455 6865
Email: admin@activatedcarbon.com.au

ACTIVATED CARBON TECHNOLOGIES PTY LTD
ABN 67 103 713 622
PO Box 1120, Research 3095, Victoria, AUSTRALIA
Phone: 03 9437 2600 **Fax:** 03 9437 2611
www.activatedcarbon.com.au

Acticarb GS900

Description:

High Activity Micro & Meso-porous Granular Activated Carbon

Application:

For the treatment of gas streams containing high concentrations of volatile organic micro-pollutants where short contact time is available and high degree removal is required.

Advantages:

- High adsorption capacity with a high rate of removal allowing short contact times
- High hardness and therefore reduced production of fines
- High density therefore high mass adsorption capacity

Typical Analysis:

Apparent Density (g/mL)	0.35-0.45
Moisture as packed (% max.)	3
Ash Content (% max.)	15
Iodine Number	>900
Total Pore Volume (mL.g)	>0.46
Hardness Index (% min.)	85

Particle Size Range:

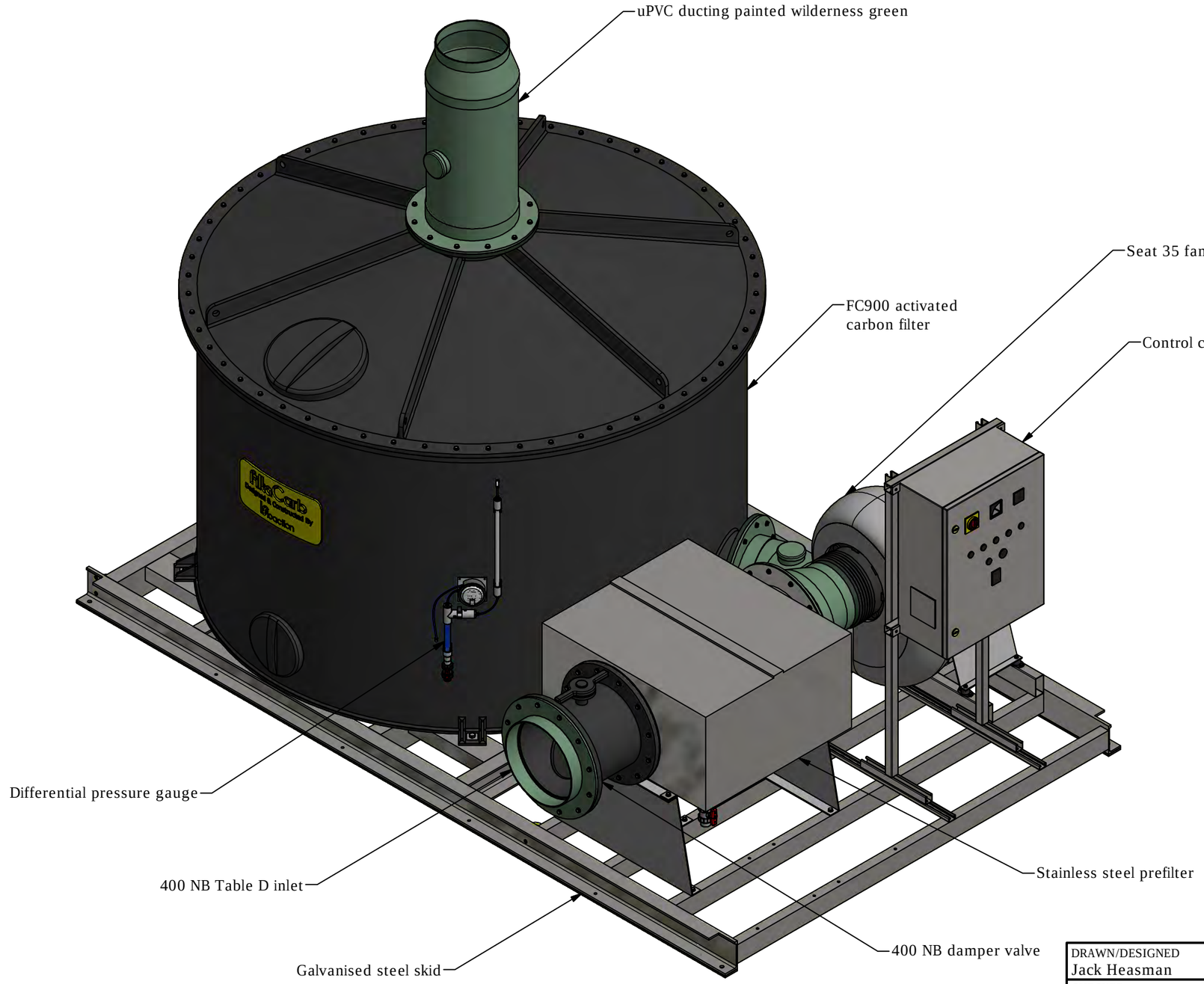
Particle Size	Effective Size	Uniformity Coefficient
4 x 8 Mesh	2.0 – 3.0mm	< 1.4
6 x 12 Mesh	1.6 – 2.0mm	< 1.4
8 x 30 Mesh	0.8 – 1.0mm	< 1.8
12 x 40 Mesh	0.5 – 0.7mm	< 1.8

Other sizings are available on request

Packaging:

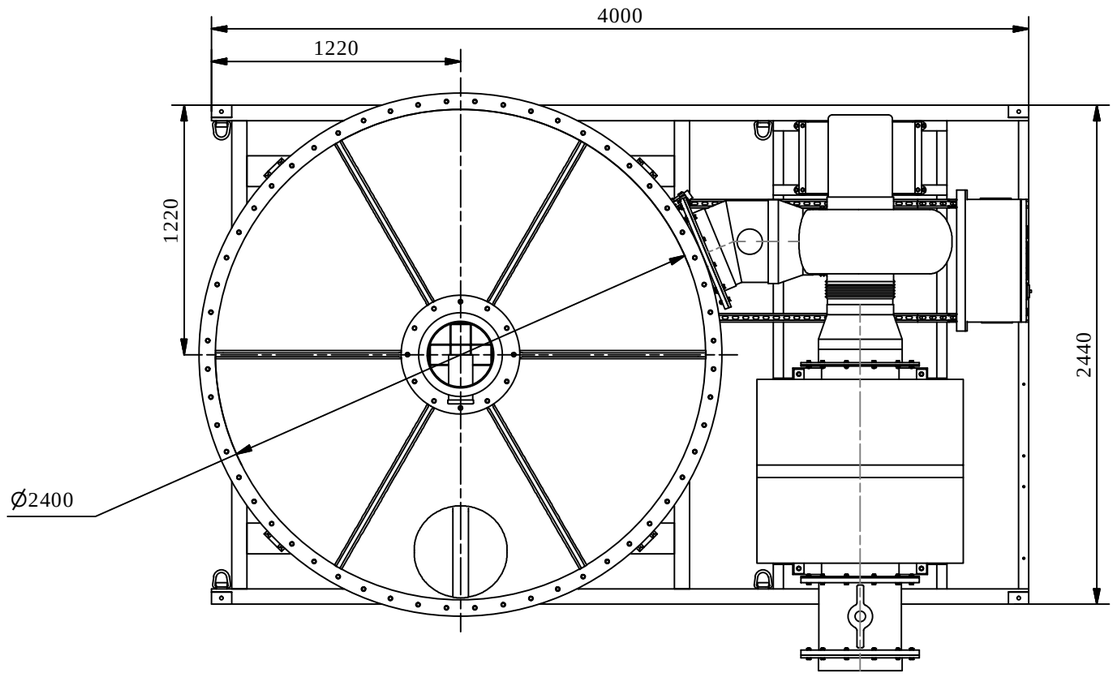
Ex-stock in 20kg paper bags and 400kg & 500kg bulk bags. Other packaging available on request.

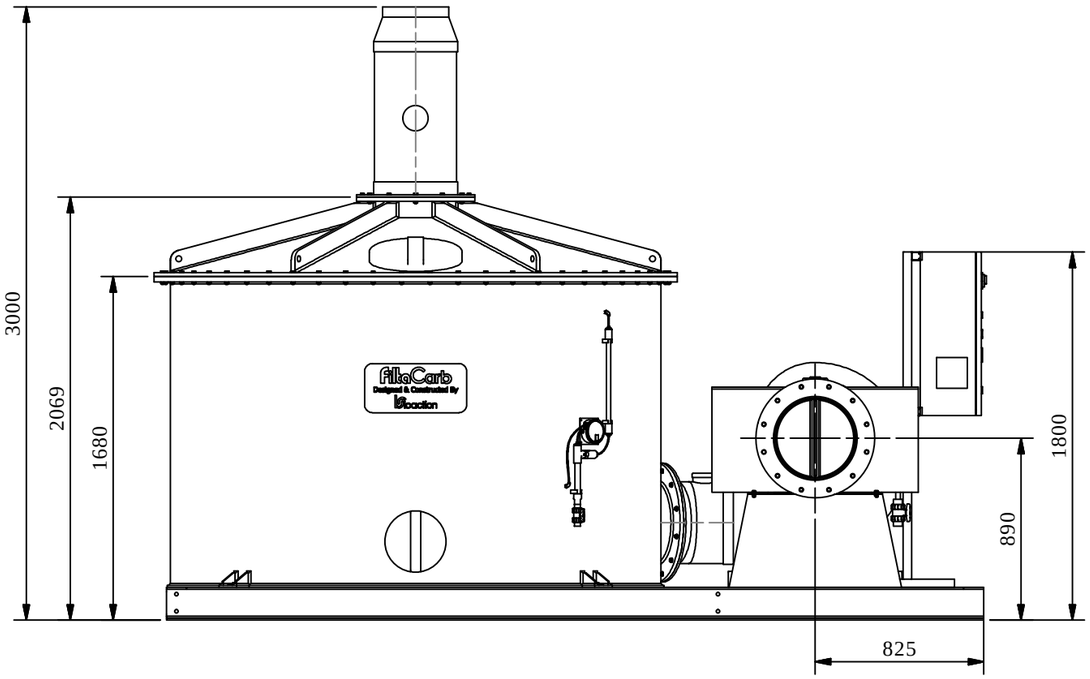
REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
A	First issue	25/09/2015	J.Heasman

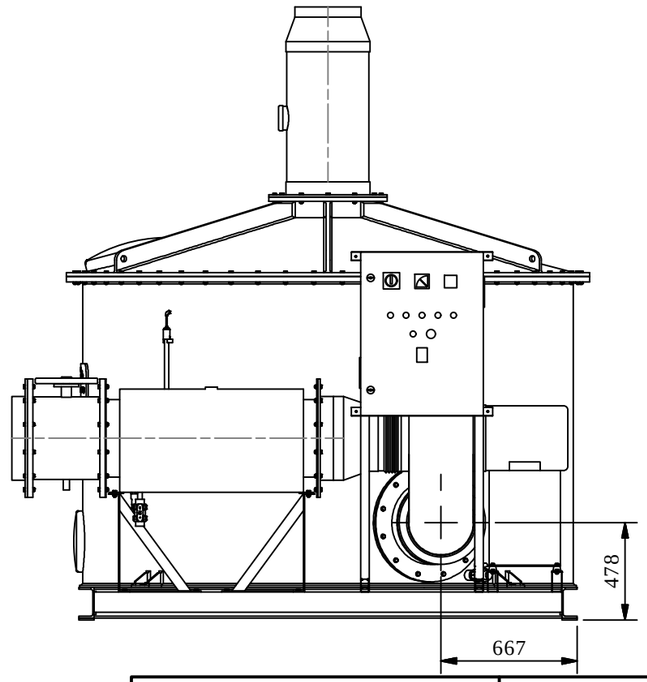


Concept

DRAWN/DESIGNED Jack Heasman	DATE 25/09/2015	OdourPro — Odour Control Systems & Services, Tel: (02) 4957 2886, Web: www.odours.com.au
CHECKED	DATE	
COMPANY		TITLE: FiltaCarb - FC900 - Positive General Assembly
APPROVED FOR CONSTRUCTION		SIZE A3 / DWG No. FC900 - POS - 1 - A / REV A
CLIENT: SIGNED ..... DATE ..../...../.....	Additional Details: All dimensions in mm unless otherwise stated	SCALE NTS / SHEET 1 OF 3
BIOACTION ENGINEER: SIGNED ..... DATE ..../...../.....		







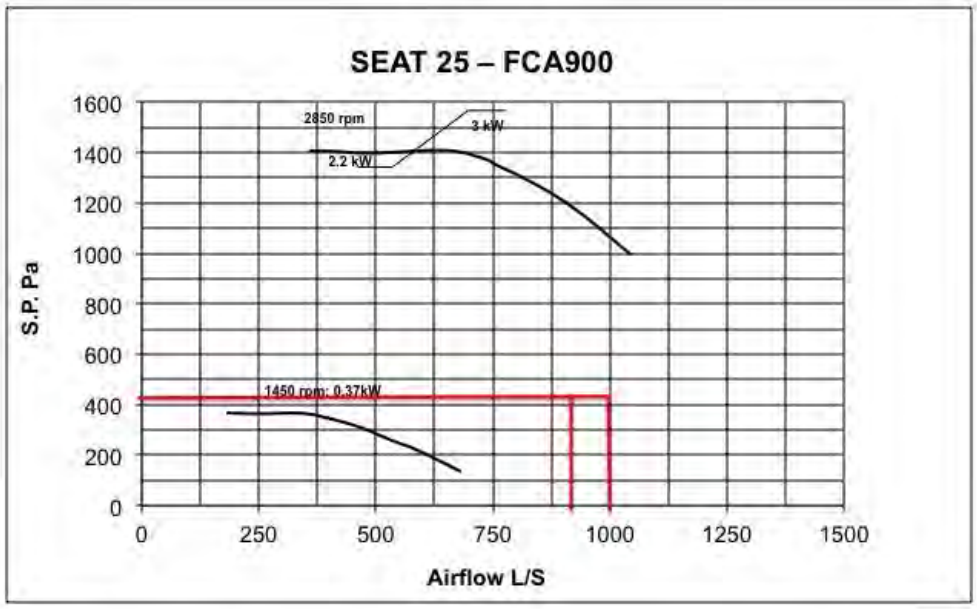
Concept

DRAWN/DESIGNED Jack Heasman	DATE 25/09/2015	OdourPro	Odour Control Systems & Services Tel: (02) 4957 2886 Web: www.odours.com.au
CHECKED	DATE		
COMPANY		TITLE: FiltaCarb - FC900 - Positive General Arrangement	
APPROVED FOR CONSTRUCTION		SIZE: A3	DWG No.: FC900 - POS - 2 - A
CLIENT: SIGNED ..... DATE ..../..../.....	Additional Details: All dimensions in mm unless otherwise stated	REV: A	
BIOACTION ENGINEER: SIGNED ..... DATE ..../..../.....		SCALE: 1:30	SHEET 2 OF 3

FiltaCarb FCA900 GAC Filter Specifications

Function	Description	Measurement
FILTER TYPE	FiltaCarb FCA900 GAC Filter	
REQUIREMENTS	Maximum Flow	900 LPS
		3240 m^3/h
FUNCTIONAL DESCRIPTION	The system is a single-stage treatment system using carbon adsorption technology. Hazardous gases are extracted from the source using an extraction/blower fan that then vents the untreated gases through the filter media. The untreated gases accumulate in the lower plenum of the filter before being evenly diffused through the media of the filter bed where contaminates are physically adsorbed. A specific activated carbon media is used to treat the target gases to achieve >99% removal of source gases.	
ABSORPTIVE MEDIA	EcoSorb® CX is an activated carbon that is specifically manufactured from a sustainable raw material for the removal of gaseous pollutants. The product has a high activation level resulting in the development of excellent adsorption characteristics. EcoSorb® CX is ideally suited to the removal of low molecular weight compounds present in low to medium concentrations.	
	SPECIFICATIONS	
	Media Volume	3.34 m^3
	Media Mass	1835.4 kg
	Empty Bed Residence Time (EBRT)	3.71 sec
	Pressure Drop	410.53 Pa
	CTC adsorption (min.)	60%
	Total ash content (max.)	4%
	Moisture content (max. as packed)	5%
	Hardness (min.)	97%
	Particle size tolerance (max.)	5%
	TYPICAL PROPERTIES	
	Surface Area	1050m^2/g
	Butane adsorption (base)	23%
	Apparent Density (tapped)	440-500 kg/m^3
	Filling Density (loose packed)	375-425 kg/m^3
FILTER VESSEL	FiltaCarb FCA900 Activated Carbon Filter is designed to reduce logistic and installation costs. The system is preloaded with media and is factory tested prior to installation. The filter vessel, fan and control panel are mounted on a galvanised skid arrangement	
	DIMENSIONS	
	Diameter (overall) – 2400 mm	
	Height (Filter Vessel) – 2220 mm	
	Overall Footprint including Skid – 5.96 m2	
	CONSTRUCTION	
	Filter vessels are constructed from P300 High Density Polyethylene (HDPE) material, which is made from UV-impregnated resins that are resistant and UV stabilized throughout the material. They have a high chemical-resistance to provide significant design life expectation and are suitable for all climatic conditions. Construction follows DVS technical codes on plastic jointing DVS 2202 / 2210. Jointing construction is butt-welded and extrusion welded. The vessel is constructed on a galvanised skid arrangement for ease of transport, lifting and installation.	
	MATERIAL SPECIFICATION	
	Specific Gravity	0.95 g/m^2
	Max Continuous Operating Temp.	80°C
	Max Short Term Operating Temp	100 °C
	Tensile Strength	22 MPa
	Hardness	63 Rockwell M
	Co-efficient of thermal expansion	150-230 m/(m.k) x 10≈6
	Dielectric Strength	45 KV/mm
	Surface Sensitivity	$>10^{14}$ OHMS
	Relative Abrasion Loss by Sand Slurry	500
	PENETRATIONS	
	All duct and pipe penetrations - HDPE	
	Screw inspection hatches - HDPE	
	Irrigation pipe – Schedule 80 uPVC	
	VESSEL AND LID CONNECTION	
	Double bell arrangement to secure both sides of the vessel wall of the lower vessel. Polyurethane seal inside the bell structure. Located with pre-drilled bolts (stainless steel) through three wall thicknesses	
DUCT AND PIPE SIZE	Minimum Duct @ 8 m/s – 378	
	Minimum Duct @ 10 m/s – 338	
	Waste Line – 100mm	
CONTROL PANEL	Electrical Control Panel is mounted to the control skid for local control. It has a manual ON/OFF/AUTO switch operation. Indicator lights show operational status.	
	Control Panel – Powder Coated Steel IP65 Rated	
	Power Requirements – 440VAC 15A	

	Variable Speed Control – Schneider Direct 1.5kw
	2 x Circuit Breakers
	1 x Local Relay
	1 x Client Relay (remote operation)
	ON/OFF/REMOTE Switch
	Switch Indicator Light
	Hour run meter
	Isolation switch
	E-Stop
	Ammeter
	Ventilation fan
	Optional – PLC Duty/Standby Fan Operation
FAN	Fan/s are mounted on the control skid and can operate in positive or negative pressure. The standard fan provided is corrosion and spark-proof.
	Fan Type – Seat 25
	Specified Flow – 900 LPS
	Maximum Flow – 1000 LPS @ 410.53 Pa
	Specified Pressure Drop – 410.53 Pa
	Inlet Size – 200mm
	Outlet Size – 200mm
	Fan Support – Stainless Steel
	Fan Mount – Vibration Mounts to Galvanised Steel Strut
	Motor Brand - TECO
	Motor Size – 2.2kw
	Power – 415VAC
	Rating – IP66
	Protection – Ex 'n'
	Cable – Shielded Cable to Control Panel
	Duct Connection – Flexible Coupling with Stainless Steel Clamps
OVERALL WEIGHT	2212.4 kg
INSTRUMENTS	Pressure Differential Gauge – Dwyer Magnehelic
INSTALLATION REQUIREMENTS	Concrete Slab Engineered to System Loading (Layout and Dimensions Provided)
	Power - 440VAC 15A with Individual Circuit Protection
OPTIONAL ITEMS	Standby Fan with PLC Upgrade
	Stainless Steel fans
	Duct Noise Attenuator
	Vandal-proof Security Structure



OdourPro®

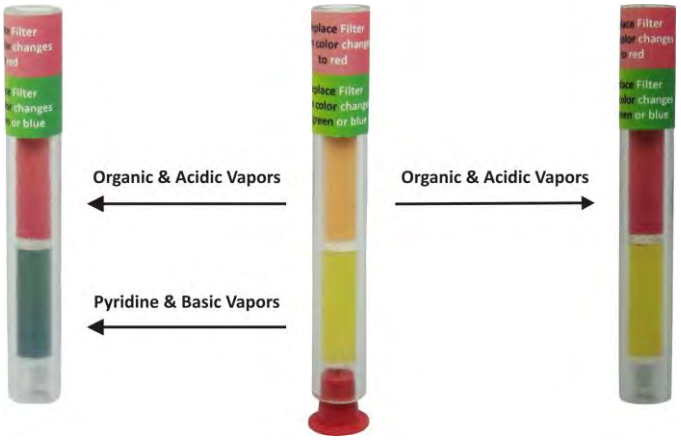
H2S Breakthrough Indicators

Odour Pro's Breakthrough Indicators provide real-time indication of carbon absorbers and filter saturation to ensure safety in the work place. The sorption media on top of the indicators sensor protect it from possible exposure to traces of hydrogen sulphide that might exist in the surrounding environment. The indicators are accurate, sensitive, easy to use and economical.

Visual indication of filter saturation. The hydrogen sulphide breakthrough indicator produce vivid colour changes from light blue to black when filter is saturated and exhausted.
Real-time indication. The high sensitivity of the breakthrough indicator to hydrogen sulphide provide user with immediate indication of filter saturation.
Reliable; no false positive or false negative results. The sorption media on top of the indicator's sensor protect it from possible exposure to traces of hydrogen sulphide that might exist in the surrounding environment. The colorimetric sensor is also selective to hydrogen sulphide gas. These two features eliminate the possibility of false positive indication. The high stability of the sensor to heat, light and possible ambient contaminants, prevent any false negative indication.
Economical and easy to use Using the breakthrough indicator allows user to get the most of their filters and sorption media while protecting themselves and the environment from exposure to toxic emissions

Filter Breakthrough Indicator
Total Organics
(TOV BTI LFF)

(PN: 146)



Manual

1. Application

The Breakthrough Indicator (PN: 146) is qualitative (yes/no) colorimetric indicator for the exhaustion and end-of-service life of low-flow filters. The indicator is designed to provide real-time indication of the breakthrough of organic vapors, including:

Acetone, Acetonitrile, Acids (i.e. acetic acid, hydrochloric acid, trifloroacetic acid trichloroacetic acid), Acrylonitrile, Aliphatic amines (i.e. methyl amine), Aliphatic hydrocarbons (i.e. hexane), Aromatic hydrocarbons (i.e. benzene, toluene and xylenes), Chlorinated hydrocarbons (i.e. carbon tetrachloride, chloroform and dichloromethane (methylene chloride), Ethanol, Ethyl acetate, Ethyl acrylate, Ethyl ether, Gasoline, HFIP (hexafluoroisopropanol), Methanol, Methyl acrylate, Naphtha, Phenol, Pyridine, Sulfolane, THF (Tetrahydrofuran).

2. Specifications

2.1. Overall Specification

a. Weight:	4.4g (0.16oz)
b. Dimensions:	79mm (3.1in), diameter: 10mm(0.39in)
c. Operating temperature:	4°C to 40°C (39°F to 104°F)
d. Operating humidity:	5% RH to 85%RH
e. Minimum detectable limit:	See table below
f. Color change:	Aliphatic hydrocarbons; orange to light red Other organics; orange to dark red Phenol and acidic vapors; orange to red Pyridine and basic vapors, yellow to green to blue
g. Storage temperature:	4°C to 25ºC, (39°F to 77°F)
h. Shelf life:	1 year at 4°C to 25°C, (39°F to 77°F)
i. Service life:	1 year

2.2. Performance Specification

To determine the sensitivity of the breakthrough indicator, a solution/mixture of 10% solvent in water was bubbled with ambient air at a flow rate of 5cc/min. The airflow was passed through the breakthrough indicator until a color change was observed. The elapsed time to observe the first noticeable and the final colors for the respective organic solvent is depicted in the table below.

2.3. Limitations

The indicator does not respond to gaseous aliphatic hydrocarbons (i.e. methane, ethane, propane and butane), aldehydes (i.e. formaldehyde). No other interferences or limitations are known.

3. Operating Instructions

a. Ensure that packaging pouch is intact.
b. Open packaging pouch by tearing off the top part from one of side notches.
c. Remove one Breakthrough Indicator from packaging pouch, reseal pouch.
d. Remove the ⅜" plug from the filter outlet lid.
e. Remove the protective red plug to activate the breakthrough indicator.
f. Attach Breakthrough Indicator into the ⅜" filter outlet lid (adapter might be needed, please contact us for further information).


Caution: Only hand-tie indicator into filter outlet

g. Replace filter when the Breakthrough Indicator changes color, See color changes above (2.1. f).

Solvent (10% in Water)	Breakthrough Indication Time	
	First Noticeable Color (min)	Final Color (min)
Acetone	10	10
Acetonitrile	10	30
Benzene	2	5
Carbon tetrachloride	10	30
Chloroform	12	30
Dichloromethane (methylene chloride))	5	15
Ethanol	10	30
Ethyl Acetate	2	5
Gasoline	14	60
Hexane	7	15
HFIP (Hexafluoroisopropanol)	1	4
Methanol	2	5
Methyl acrylate	4	36
Methyl amine	2	12
Naphtha	10	30
Phenol	20	6 hours
Pyridine	10	30
Sulfolane	8	17
THF (tetrahydrofuran)	10	20
Toluene	2	8
Trifloroacetic acid	4	30
Xylenes	14	60

Appendix 10

Surface Water Addendum Report