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**Geotechnical Report  
Level One Inspection and Testing**

**Riverwalk Estate Stage 9  
Werribee**

Prepared for:

**Excell Gray Bruni  
12 Allied Drive  
Tullamarine VIC**

PROJECT No 8284

29 May 2015.

Prepared by:

**TERRA FIRMA LABORATORIES**  
Geotechnical Inspection and Testing Authority

12 Enterprise Ave  
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## **Geotechnical Report Level One Inspection and Testing Riverwalk Estate Stage 9**

### **1. Introduction**

Terra Firma Laboratories was engaged by *Excell Gray Bruni* as the geotechnical inspection and testing authority to provide Level 1 supervision and testing works on the earthworks component for Riverwalk Estate Stage 9. This work was conducted over the period of 02/04/2015 to 23/05/2015.

This report presents that the allotment earthworks was carried out in accordance with *AS3798-2007 Guidelines for Earthworks for Commercial and Residential Development* and in compliance with the compaction control specifications established by the contractor.

### **2. Scope of Works**

#### **2.1. Areas of work**

The areas of work included lot numbers 299-303, 309-319, 331-333 and 343-346. The site will be a Residential Estate.

The area on which fill was placed is shown on site plan (Appendix 1) based on drawings prepared by Dalton Consulting Engineers and provided by *Excell Gray Bruni*.

The supervision work by *Terra Firma Laboratories* involved both inspection of sub grade preparation work and full time inspection and testing of fill placement.

#### **2.2. Specification**

The placement of fill on the areas of work was to be carried out in accordance with *AS3798-2007 Guidelines for Earthworks for Commercial and Residential Development*, as directed by *Excell Gray Bruni*. At all times during placement of fill materials Terra Firma Laboratories maintained a Geotechnical Technician on site to perform the supervision and testing as required by AS3798-2007.

As referenced from AS3798-2007 (Section 5.2) establishes a specification requirement for a minimum density ratio of not less than 95% noting that soils containing more than 20% of particles coarser than 37.5mm cannot be tested for relative compaction using the procedures of AS1289.

Field density testing shall be undertaken at a frequency of not less than 3 tests per visit.

Test Rolling is required for all layers of structural fill and materials within 150mm of permanent subgrade level so as to withstand test rolling without visible deformation or springing. Corrective action is required where unstable areas exceed 20% of the area being considered by test rolling.

### 3. Inspection and Testing

#### 3.1. Sub-Grade Preparation

Subgrade preparation involved stripping the site down of topsoil and organic matter to a depth of approximately 200mm below existing levels detailed on the site plans. The sub-grade area was then proof-rolled to determine soft or otherwise unsuitable zones and such zones rectified as necessary. The sub-grade was watered and scarified prior to fill placement to aid layer bonding.

#### 3.2. Fill materials

The materials used as fill were locally sourced and observed to generally consist of Silty Clay, sourced from stockpiled materials on site. No particles greater than 150mm were observed. The fill was nominated as clean fill by the contractor.

#### 3.3. Fill Construction

The contractor had the following plant available on-site during the construction period for use in the fill placement:

- *Dump Truck*
- *Excavator*
- *Grader*
- *Pad Foot Roller*
- *Water Cart*

All fill was placed in layers of thicknesses not exceeding 300mm. *The work area was typically a 2 or 3 lot area on any one particular day.* At the completion of a placed layer, compaction testing was performed to confirm appropriate compaction had been achieved and supported the observations made.

It was observed that finished levels were in accordance with levels marked on site by survey. These levels are shown on site plans attached in Appendix 1.

The final 300mm of fill placed across the site was placed as a topsoil layer/ growing medium and should be considered as non structural, as it was placed in an uncontrolled manner, as allowed by specifications.

### 4. Compaction Control Testing

Testing comprised of a total of 35 in-situ density tests, with a summary of results included in Appendix 2. Test Reports are referenced in Appendix 3.

Test numbers 17 and 18 originally failed to meet specification. *Excell Gray Bruni* was notified and asked to rework the area appropriately. Once adequate reworking had been completed *Terra Firma Laboratories* would conduct a retest; this process would continue until a minimum compaction effort of 95% was achieved.

It should be noted that the tests are a representation of the fill placed and support the visual assessment of the works completed. Each lot does not necessarily require a compaction test to comply. The compaction control testing indicated that the engineered fill on all lots complied with the technical specification.

## **5. Uncontrolled Works**

Terra Firma Laboratories cannot verify any works completed by others after the final date specified in the introduction. Uncontrolled works may include, but not limited to trenching for services, cut and fill works for slab preparation or subsequent removal of vegetation and back fill of holes.

## **6. Clean Fill**

Terra Firma Laboratories cannot guarantee that the material used as a filling medium is free from chemical or other contamination.

## **7. Statement of Compliance**

Inspections and testing of the fill areas at this site indicate that both sub grade preparation and fill placement have been conducted in accordance with the specification and that the completed fill areas of greater than 300mm, as shown on the site plan attached, and not any preceding the 02/04/2015 or work completed after the 23/05/2015, may be certified as being compliant with the specification.

For and on behalf of  
**Terra Firma Laboratories,**



Tom Seymour  
Lab Manager



## **APPENDICES**

**Appendix 1: Site Plans**

**Appendix 2: Test Summary**

**Appendix 3: Test Reports**

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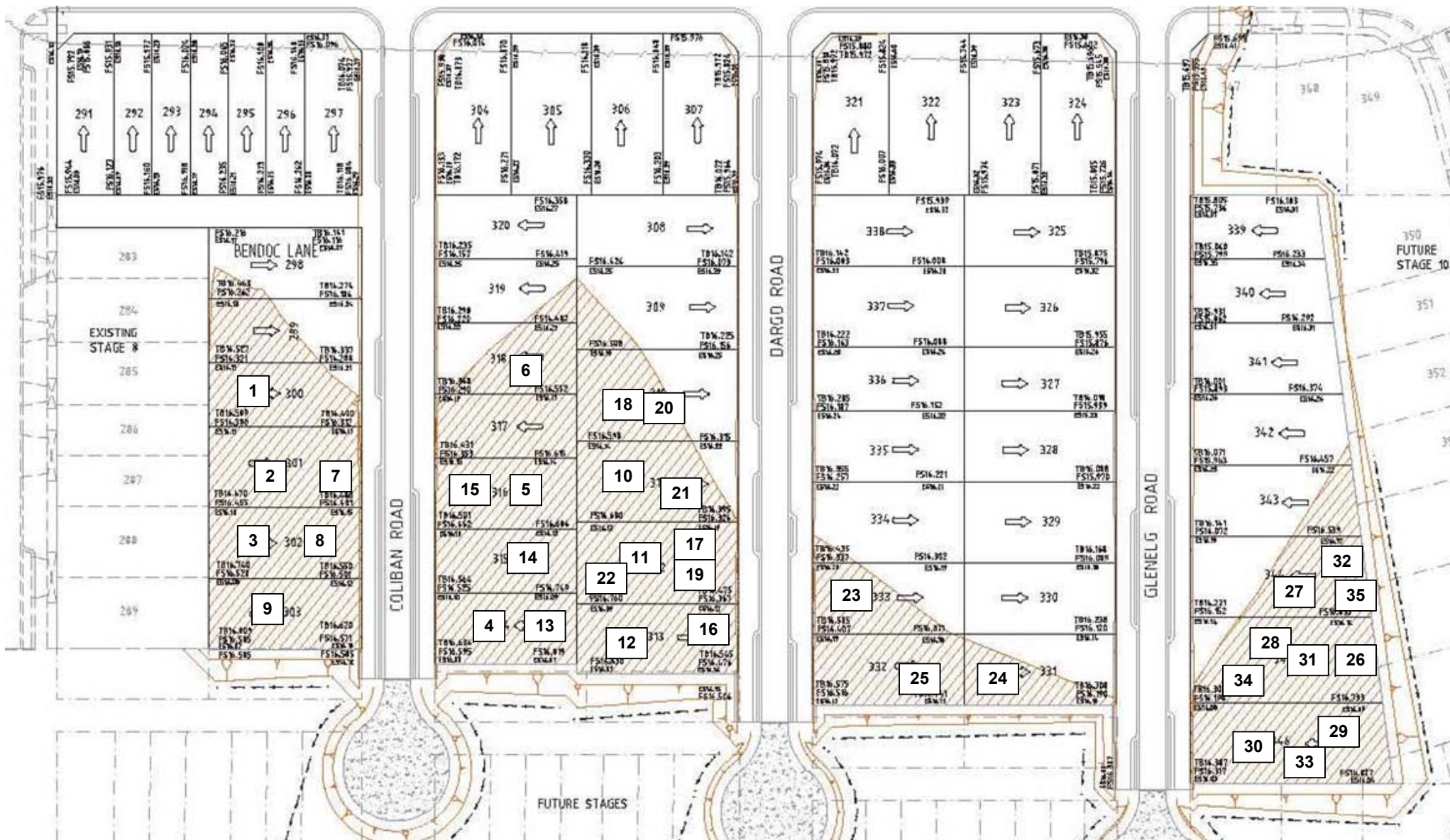
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ABN: 11 925 206 385





## Excell Gray Bruni River Walk Estate Stage 9 Werribee

## Level 1 - Supervision - Summary of Tests

**Client** Excell Gray Bruni  
**Project** Riverwalk Estate Stage 9  
**Job #** 8284  
**Density Ratio** 95%



Date	Test #	Retest of #	Layer	Density	Lot #	Report #	Pass/Fail
2/04/2015	1		-0.25	95.5	300	8284-1	P
2/04/2015	2		-0.25	95.5	301	8284-1	P
2/04/2015	3		-0.25	95	302	8284-1	P
8/04/2015	4		-0.25	97	314	8284-3	P
8/04/2015	5		-0.25	96.5	316	8284-3	P
8/04/2015	6		FSL	97.5	318	8284-3	P
9/04/2015	7		FSL	97.5	301	8284-4	P
9/04/2015	8		FSL	99.5	302	8284-4	P
9/04/2015	9		FSL	99.5	303	8284-4	P
9/04/2015	10		-0.25	99	311	8284-4	P
9/04/2015	11		-0.25	98.5	312	8284-4	P
9/04/2015	12		FSL	98.5	313	8284-4	P
10/04/2015	13		FSL	100	314	8284-5	P
10/04/2015	14		FSL	100	315	8284-5	P
10/04/2015	15		FSL	100	316	8284-5	P
13/04/2015	16		-0.25	95	313	8284-7	P
13/04/2015	17		FSL	89	312	8284-7	F
13/04/2015	18		-0.25	89	310	8284-7	F
14/04/2015	19	17	FSL	95.5	312	8284-8	P
14/04/2015	20	18	-0.25	96.5	310	8284-8	P
15/04/2015	21		FSL	100	311	8284-9	P
15/04/2015	22		FSL	99.5	312	8284-9	P
15/04/2015	23		FSL	95.5	333	8284-9	P
16/04/2015	24		FSL	97	331	8284-10	P
16/04/2015	25		FSL	98	332	8284-10	P
16/04/2015	26		-0.5	95.5	345	8284-10	P
17/04/2015	27		-0.25	96.5	344	8284-12	P
17/04/2015	28		-0.25	96.5	345	8284-12	P
17/04/2015	29		-0.25	97.5	346	8284-12	P
22/05/2015	30		FSL	95	346	8284-19	P
22/05/2015	31		FSL	98.5	345	8284-19	P
22/05/2015	32		FSL	97	344	8284-19	P
23/05/2015	33		FSL	104	346	8284-20	P
23/05/2015	34		FSL	97	345	8284-20	P
23/05/2015	35		FSL	103.5	344	8284-20	P



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-1  
date of issue 07/04/15

Client Excell Gray Bruni  
Client address 12 Allied Drive Tullamarine  
Project Riverwalk Estate Stage 9  
Location Werribee

Feature Lot Fill  
Layer thickness (mm) 250

tested by DC  
time All Day  
date 02/04/15  
checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		1	2	3		
location	chainage offset	Lot Number 300	Lot Number 301	Lot Number 302		
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	-0.25	-0.25	-0.25		
measurement depth	mm	225	225	225		
field wet density	t/m <sup>3</sup>	2.04	2.01	2.03		
field dry density	t/m <sup>3</sup>	1.74	1.71	1.72		
field moisture content	%	16.9	17.7	17.8		

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0		
percent of oversize material	wet	0	0	0		
peak converted wet density	t/m <sup>3</sup>	2.13	2.11	2.13		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%	1.0	1.0	1.0		
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Moisture ratio	%	106.0	105.0	105.0		
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Hilf density ratio ( R <sub>HD</sub> )	%	95.5	95.5	95.0		
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material description

Silty Clay



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards requirements.  
Accredited for compliance with ISO/IEC 17025

LABORATORY ACCREDITATION No 15357

Approved Signature  
P Jenke





# COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-3  
date of issue 10/04/15

Client Excell Gray Bruni  
Client address 12 Allied Drive Tullamarine  
Project Riverwalk Estate Stage 9  
Location Werribee

Feature Lot Fill  
Layer thickness (mm) 250

tested by DC  
time All Day  
date 08/04/15  
checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		4	5	6			
location	chainage offset	Lot Number 314	Lot Number 316	Lot Number 318			
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	-0.25	-0.25	FSL			
measurement depth	mm	225	225	225			
field wet density	t/m <sup>3</sup>	2.00	2.00	2.05			
field dry density	t/m <sup>3</sup>	1.69	1.69	1.73			
field moisture content	%	18.6	18.4	18.5			

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m <sup>3</sup>	2.06	2.07	2.11			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-			

moisture variation from OMC (-dry,+wet)%		-0.5	0.0	-0.5			
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<b>Moisture ratio</b>	<b>%</b>	<b>98.0</b>	<b>101.5</b>	<b>98.0</b>			
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>97.0</b>	<b>96.5</b>	<b>97.5</b>			
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material description

Silty Clay



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Accredited for compliance with ISO/IEC 17025

LABORATORY ACCREDITATION No 15357

*Denke*

Approved Signature

P Jenke



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-4  
date of issue 13/04/15

Client Excell Gray Bruni  
Client address 12 Allied Drive Tullamarine  
Project Riverwalk Estate Stage 9  
Location Werribee

Feature Lot Fill  
Layer thickness (mm) 250

tested by DC  
time All Day  
date 09/04/15  
checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		7	8	9	10	11	12
location	chainage offset	Lot Number 301	Lot Number 302	Lot Number 303	Lot Number 311	Lot Number 312	Lot Number 313
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL	FSL	-0.25	-0.25	-0.25
measurement depth	mm	225	225	225	225	225	225
field wet density	t/m <sup>3</sup>	2.03	2.06	2.05	2.07	2.05	2.00
field dry density	t/m <sup>3</sup>	1.69	1.72	1.72	1.73	1.72	1.73
field moisture content	%	20.1	19.6	19.7	19.9	19.3	15.4

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard	standard	standard	standard
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0	19.0	19.0
percent of oversize material	wet	0	0	0	0	0	0
peak converted wet density	t/m <sup>3</sup>	2.09	2.07	2.06	2.09	2.08	2.03
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-	-	-	-

moisture variation from OMC (-dry,+wet)%		1.0	-0.5	-0.5	1.0	0.5	-1.0
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Moisture ratio	%	106.5	97.0	97.0	106.5	103.0	93.5
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Hilf density ratio ( R <sub>HD</sub> )	%	97.5	99.5	99.5	99.0	98.5	98.5
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material description

Silty Sandy Clay



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Accredited for compliance with ISO/IEC 17025

LABORATORY ACCREDITATION No 15357

*Benke*

Approved Signature  
P Jenke



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-5  
date of issue 13/04/15

Client Excell Gray Bruni  
Client address 12 Allied Drive Tullamarine  
Project Riverwalk Estate Stage 9  
Location Werribee

Feature Lot Fill  
Layer thickness (mm) 250

tested by DC  
time All Day  
date 10/04/15  
checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		13	14	15			
location	chainage offset	Lot Number 314	Lot Number 315	Lot Number 316			
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	225	225	225			
field wet density	t/m <sup>3</sup>	1.99	2.00	2.02			
field dry density	t/m <sup>3</sup>	1.69	1.72	1.69			
field moisture content	%	17.6	16.7	19.8			

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m <sup>3</sup>	1.99	2	2.02			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-			

moisture variation from OMC (-dry,+wet)%	-0.5	-0.5	-0.5			
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Moisture ratio	%	98.0	97.5	97.0			
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Hilf density ratio ( R <sub>HD</sub> )	%	100.0	100.0	100.0			
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material description

Silty Clay



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Accredited for compliance with ISO/IEC 17025

LABORATORY ACCREDITATION No 15357

Approved Signature

P Jenke

# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
 Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-7  
 date of issue 14/04/15

Client Excell Gray Bruni  
 Client address 12 Allied Drive Tullamarine  
 Project Riverwalk Estate Stage 9  
 Location Werribee

Feature Lot Fill  
 Layer thickness (mm) 250

tested by DC  
 time All Day  
 date 13/04/15  
 checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		16	17	18		
location	chainage offset	Lot Number 313	Lot Number 312	Lot Number 310		
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	FSL	-0.25	-0.25		
measurement depth	mm	225	225	225		
field wet density	t/m <sup>3</sup>	2.01	1.87	1.90		
field dry density	t/m <sup>3</sup>	1.71	1.62	1.64		
field moisture content	%	17.2	15.9	15.8		

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0		
percent of oversize material	wet	0	0	0		
peak converted wet density	t/m <sup>3</sup>	2.12	2.1	2.13		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%		1.0	1.0	0.5		
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<b>Moisture ratio</b>	<b>%</b>	<b>106.0</b>	<b>106.0</b>	<b>102.0</b>		
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>95.0</b>	<b>89.0</b>	<b>89.0</b>		
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material description

Silty Clay

# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
 Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-8  
 date of issue 15/04/15

Client Excell Gray Bruni  
 Client address 12 Allied Drive Tullamarine  
 Project Riverwalk Estate Stage 9  
 Location Werribee

Feature Lot Fill  
 Layer thickness (mm) 250

tested by DC  
 time All Day  
 date 14/04/15  
 checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		19	20			
location	chainage offset	Re Test 17	Re Test 18			
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	-0.25	FSL			
measurement depth	mm	225	225			
field wet density	t/m <sup>3</sup>	2.01	2.02			
field dry density	t/m <sup>3</sup>	1.71	1.71			
field moisture content	%	17.7	18.5			

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0			
percent of oversize material	wet	0	0			
peak converted wet density	t/m <sup>3</sup>	2.1	2.1			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-			

moisture variation from OMC (-dry,+wet)%		-0.5	-0.5			
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<b>Moisture ratio</b>	<b>%</b>	<b>97.0</b>	<b>97.0</b>			
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>95.5</b>	<b>96.5</b>			
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material description

Silty Clay

# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
 Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-9  
 date of issue 16/04/15

Client Excell Gray Bruni  
 Client address 12 Allied Drive Tullamarine  
 Project Riverwalk Estate Stage 9  
 Location Werribee

Feature Lot Fill  
 Layer thickness (mm) 250

tested by DC  
 time All Day  
 date 15/04/15  
 checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		21	22	23			
location	chainage offset	Lot Number 311	Lot Number 312	Lot Number 333			
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	225	225	225			
field wet density	t/m <sup>3</sup>	2.08	2.10	2.02			
field dry density	t/m <sup>3</sup>	1.76	1.76	1.71			
field moisture content	%	18.1	18.9	18.1			

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m <sup>3</sup>	2.08	2.11	2.12			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-			

moisture variation from OMC (-dry,+wet)%		0.5	1.0	1.0			
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<b>Moisture ratio</b>	<b>%</b>	<b>103.5</b>	<b>105.5</b>	<b>105.0</b>			
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>100.0</b>	<b>99.5</b>	<b>95.5</b>			
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material description

**Silty Sandy Clay**



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
 Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-10  
 date of issue 17/04/15

Client Excell Gray Bruni  
 Client address 12 Allied Drive Tullamarine  
 Project Riverwalk Estate Stage 9  
 Location Werribee

Feature Lot Fill  
 Layer thickness (mm) 250

tested by DC  
 time All Day  
 date 16/04/15  
 checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		24	25	26			
location	chainage offset	Lot Number 331	Lot Number 332	Lot Number 345			
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL	-0.5			
measurement depth	mm	225	225	225			
field wet density	t/m <sup>3</sup>	1.98	2.04	1.96			
field dry density	t/m <sup>3</sup>	1.70	1.71	1.67			
field moisture content	%	16.8	18.9	17.0			

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m <sup>3</sup>	2.04	2.08	2.05			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-			

moisture variation from OMC (-dry,+wet)%	-0.5	0.5	-0.5			
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<b>Moisture ratio</b>	<b>%</b>	<b>96.0</b>	<b>104.0</b>	<b>97.5</b>			
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>97.0</b>	<b>98.0</b>	<b>95.5</b>			
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material description

**Silty Sandy Clay**

# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
 Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-12  
 date of issue 20/04/15

Client Excell Gray Bruni  
 Client address 12 Allied Drive Tullamarine  
 Project Riverwalk Estate Stage 9  
 Location Werribee

Feature Lot Fill  
 Layer thickness (mm) 250

tested by DC  
 time All Day  
 date 17/04/15  
 checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		27	28	29		
location	chainage offset	Lot Number 344	Lot Number 345	Lot Number 346		
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	-0.25	-0.25	-0.25		
measurement depth	mm	225	225	225		
field wet density	t/m <sup>3</sup>	2.03	2.05	2.07		
field dry density	t/m <sup>3</sup>	1.62	1.71	1.73		
field moisture content	%	25.6	19.3	19.7		

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0		
percent of oversize material	wet	0	0	0		
peak converted wet density	t/m <sup>3</sup>	2.1	2.12	2.12		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%	1.5	1.5	1.5		
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<b>Moisture ratio</b>	<b>%</b>	<b>107.0</b>	<b>109.5</b>	<b>109.5</b>		
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>96.5</b>	<b>96.5</b>	<b>97.5</b>		
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material description

**Silty Sandy Clay**

# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
 Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-19  
 date of issue 25/05/15

Client Excell Gray Bruni  
 Client address 12 Allied Drive Tullamarine  
 Project Riverwalk Estate Stage 9  
 Location Werribee

Feature Lot Fill  
 Layer thickness (mm) 250

tested by DC  
 time All Day  
 date 22/05/15  
 checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		30	31	32			
location	chainage offset	Lot Number 346	Lot Number 345	Lot Number 344			
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	225	225	225			
field wet density	t/m <sup>3</sup>	2.00	2.05	2.03			
field dry density	t/m <sup>3</sup>	1.67	1.71	1.68			
field moisture content	%	20.0	20.1	20.8			

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m <sup>3</sup>	2.11	2.08	2.09			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-			

moisture variation from OMC (-dry,+wet)%		1.0	1.0	1.5			
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<b>Moisture ratio</b>	<b>%</b>	<b>105.0</b>	<b>106.5</b>	<b>107.5</b>			
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>95.0</b>	<b>98.5</b>	<b>97.0</b>			
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material description

**Silty Sandy Clay**



# COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

Terraforma Laboratories - Deer Park Laboratory  
Factory 6 / 22-24 Westwood Drive, Deer Park Phone No: 8348 5596

report No 8284-20  
date of issue 25/05/15

Client Excell Gray Bruni  
Client address 12 Allied Drive Tullamarine  
Project Riverwalk Estate Stage 9  
Location Werribee

Feature Lot Fill  
Layer thickness (mm) 250

tested by DC  
time All Day  
date 23/05/15  
checked by PJ

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		33	34	35			
location	chainage offset	Lot Number 346	Lot Number 345	Lot Number 344			
Sampling procedures AS1289.1.1, 1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL	FSL			
measurement depth	mm	225	225	225			
field wet density	t/m <sup>3</sup>	2.17	2.07	2.17			
field dry density	t/m <sup>3</sup>	1.86	1.73	1.82			
field moisture content	%	16.3	19.1	19.5			

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard			
oversize material retained on AS sieve	mm	19.0	19.0	19.0			
percent of oversize material	wet	0	0	0			
peak converted wet density	t/m <sup>3</sup>	2.08	2.13	2.1			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-			

moisture variation from OMC (-dry,+wet)%	-1.5	1.0	-1.0			
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<b>Moisture ratio</b>	<b>%</b>	<b>91.0</b>	<b>106.5</b>	<b>95.5</b>			
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<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>104.0</b>	<b>97.0</b>	<b>103.5</b>			
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material description

**Silty Sandy Clay**



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian national standards requirements.  
Accredited for compliance with ISO/IEC 17025

LABORATORY ACCREDITATION No 15357

*Benke*

Approved Signature

P Jenke