



47 National Avenue,  
Pakenham VIC 3810

ph: 03 9769 5799  
fax: 03 9769 4799  
mob: 0417 004 072  
tseymour@terrafirmalabs.com.au

www.terrafirmalabs.com.au

ABN: 11 925 206 385

**Geotechnical Report  
Level One Inspection and Testing  
Version 2**

**Acacia Ridge Stage 11B  
Cranbourne South**

Prepared for:

**Streetworks Pty Ltd  
4 Len Thomas Place  
Narre Warren**

Project 9875

23 February 2018.

Prepared by:

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

47 National Avenue,  
Pakenham VIC 3810  
Phone: 03 9769 5799 Fax: 03 9769 4799  
Email: tseymour@terrafirmalabs.com.au

## **Geotechnical Report Level One Inspection and Testing Acacia Ridge Stage 11B**

### **1. Introduction**

Terra Firma Laboratories was engaged by *Streetworks Pty Ltd* as the geotechnical inspection and testing authority to provide Level 1 supervision and testing works on the earthworks component for Acacia Ridge Stage 11B. This work was conducted over the period of 25/09/2017 to 11/3/2018.

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 Lots 1101 to 1114, 1120 to 1128, 1132, 1134, 1140 and 1141. 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 GPR Consulting and provided by *Streetworks Pty Ltd*.

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 *Streetworks Pty Ltd*. 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.

A technical specification for compaction control requirements was provided by *Streetworks Pty Ltd* and established that:

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.

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:

- *Traxcavator*
- *Pad Foot Roller*
- *Trucks*
- *Excavator*
- *Pad Foot Roller*
- *Grader*
- *Watercart*
- *Dozer*

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

Test numbers 12, 35, 36, 37 and 38 originally failed to meet specification. *Streetworks Pty Ltd* were Notified and asked to rework the area appropriately. Upon adequate reworking *Terra Firma Laboratories* would perform a re-test.; 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 25/09/2017 or work completed after the 13/2/2018, may be certified as being compliant with the specification.

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



Tom Seymour  
Lab Manager



47 National Avenue,  
Pakenham VIC 3810

ph: 03 9769 5799  
fax: 03 9769 4799  
mob: 0417 004 072  
tseymour@terrafirmalabs.com.au

[www.terrafirmalabs.com.au](http://www.terrafirmalabs.com.au)

ABN: 11 925 206 385

## **APPENDICES**

**Appendix 1: Site Plans**

**Appendix 2: Test Summary**

**Appendix 3: Test Reports**



MATCH EXISTING URFACE ALONG WEST BOUNDARY OF STAGE

47 National Avenue  
Pakenham VIC 3810

### Test Location Plan

Streetworks Pty Ltd

Acacia Ridge Stage 11B

Scale  
NTS



## Level One Test Summary

**Client:** Streetworks Pty Ltd      **Specification:** 95%  
**Project:** Acacia Ridge Stage 11B      **Project No:** 9875

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
25/09/2017	1	L1		96.5	PASS	1121	9875-1
25/09/2017	2	L1		95.5	PASS	1126	9875-1
25/09/2017	3	L2		97	PASS	1124	9875-1
25/09/2017	4	L2		96	PASS	1122	9875-1
3/10/2017	5	L1		100.5	PASS	1112	9875-2
3/10/2017	6	L1		96	PASS	1110	9875-2
3/10/2017	7	L1		100.5	PASS	1113	9875-2
4/10/2017	8	L1		97	PASS	1109	9875-3
4/10/2017	9	L2		99.5	PASS	1111	9875-3
4/10/2017	10	L2		99	PASS	1112	9875-3
4/10/2017	11	L3		104	PASS	1113	9875-3
24/10/2017	12	L1		94.5	FAIL	1125	9875-4
24/10/2017	13	L4		97	PASS	1125	9875-4
24/10/2017	14	L2		100.5	PASS	1127	9875-4
25/10/2017	15	L1		98	PASS	1108	9875-5
25/10/2017	16	L3		99.5	PASS	1108	9875-5
25/10/2017	17	L2		100.5	PASS	1107	9875-5
25/10/2017	18	L1		95.5	PASS	1125	9875-5
26/10/2017	19	L3		99	PASS	1123	9875-6
26/10/2017	20	L3		97.5	PASS	1120	9875-6
26/10/2017	21	L4		95	PASS	1107	9875-6
26/10/2017	22	L1		98	PASS	1105	9875-6
26/10/2017	23	L2		100	PASS	1106	9875-6
26/10/2017	24	L5		95.5	PASS	1108	9875-6
27/10/2017	25	L4		100.5	PASS	1101	9875-7
27/10/2017	26	L4		97	PASS	1102	9875-7
27/10/2017	27	L4		102.5	PASS	1103	9875-7
30/10/2017	28	FSL		101	PASS	1104	9875-8
30/10/2017	29	FSL		100	PASS	1105	9875-8
30/10/2017	30	FSL		99.5	PASS	1107	9875-8
31/10/2017	31	L4		102	PASS	1134	9875-9
31/10/2017	32	L4		103.5	PASS	1133	9875-9
31/10/2017	33	L4		97.5	PASS	1120	9875-9
2/11/2017	34	L5		104	PASS	1124	9875-10
2/11/2017	35	L5		94.5	FAIL	1122	9875-11
2/11/2017	36	L5		94.5	FAIL	1121	9875-10
9/11/2017	37	FSL	36	90.6	FAIL	1121	9875-12
9/11/2017	38	FSL	35	94.5	FAIL	1122	9875-12
14/11/2017	39	FSL	37	96.5	PASS	1121	9875-13
14/11/2017	40	FSL	38	97.5	PASS	1122	9875-13
13/02/2018	41	FSL		101.5	PASS	1114	9875-14



## Level One Test Summary

**Client:** Streetworks Pty Ltd      **Specification:** 95%  
**Project:** Acacia Ridge Stage 11B      **Project No:** 9875

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
13/02/2018	42	FSL		100.5	PASS	1128	9875-14
13/02/2018	43	FSL		101.5	PASS	1132	9875-14
13/02/2018	44	FSL		101.5	PASS	1140	9875-14
13/02/2018	45	FSL		105.5	PASS	1141	9875-14



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-1  
 date of issue 27-Sep-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	KC
time	All Day
date	25-Sep-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		1	2	3	4		
location	Lot No	1121	1126	1124	1122		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 1	Layer 1	Layer 2	Layer 2		
measurement depth	mm	275	275	275	275		
field wet density	t/m <sup>3</sup>	2.05	2.01	2.01	1.99		
field dry density	t/m <sup>3</sup>	1.69	1.68	1.63	1.63		
field moisture content	%	21.4	19.6	23.4	22.3		

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0		
percent of oversize material	wet	5	0	0	0		
peak converted wet density	t/m <sup>3</sup>	-	2.11	2.07	2.08		
adjusted peak converted wet density	t/m <sup>3</sup>	2.12	-	-	-		

moisture variation from OMC (-dry,+wet)%		3.0	2.5	3.0	3.5		
--	--	-----	-----	-----	-----	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>118.0</b>	<b>114.0</b>	<b>116.0</b>	<b>118.0</b>		
-----------------------	----------	--------------	--------------	--------------	--------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>96.5</b>	<b>95.5</b>	<b>97.0</b>	<b>96.0</b>		
--	----------	-------------	-------------	-------------	-------------	--	--

material description

**Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-2  
 date of issue 05-Oct-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	MH
time	All Day
date	03-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		5	6	7		
location	Lot No	1112	1110	1113		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 1	Layer 1	Layer 1		
measurement depth	mm	275	275	275		
field wet density	t/m <sup>3</sup>	2.04	1.96	2.03		
field dry density	t/m <sup>3</sup>	1.71	1.68	1.63		
field moisture content	%	19.1	16.8	24.0		

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>	2.03	2.04	2.01		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%		0.0	-1.0	0.5		
--	--	-----	------	-----	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>100.0</b>	<b>95.5</b>	<b>102.0</b>		
-----------------------	----------	--------------	-------------	--------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>100.5</b>	<b>96.0</b>	<b>100.5</b>		
--	----------	--------------	-------------	--------------	--	--

material description

**Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-3  
 date of issue 06-Oct-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	MH
time	All Day
date	04-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		8	9	10	11		
location	Lot No	1109	1111	1112	1113		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 1	Layer 2	Layer 2	Layer 3		
measurement depth	mm	275	275	275	275		
field wet density	t/m <sup>3</sup>	2.01	2.04	2.03	2.11		
field dry density	t/m <sup>3</sup>	1.66	1.66	1.66	1.71		
field moisture content	%	21.1	22.4	22.6	23.7		

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0		
percent of oversize material	wet	0	0	0	0		
peak converted wet density	t/m <sup>3</sup>	2.08	2.05	2.05	2.03		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-	-		

moisture variation from OMC (-dry,+wet)%		0.5	1.0	1.0	1.0		
--	--	-----	-----	-----	-----	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>102.5</b>	<b>105.0</b>	<b>105.5</b>	<b>104.0</b>		
-----------------------	----------	--------------	--------------	--------------	--------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>97.0</b>	<b>99.5</b>	<b>99.0</b>	<b>104.0</b>		
--	----------	-------------	-------------	-------------	--------------	--	--

material description

**Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature  
 C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-4  
 date of issue 27-Oct-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	MK
time	All Day
date	24-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		12	13	14		
location	Lot No	1125	1125	1127		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 1	Layer 4	Layer 2		
measurement depth	mm	275	275	275		
field wet density	t/m <sup>3</sup>	1.96	1.98	1.99		
field dry density	t/m <sup>3</sup>	1.72	1.73	1.77		
field moisture content	%	14.2	14.5	12.6		

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>	2.07	2.04	1.98		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	-2.0	-2.5		
--	--	------	------	------	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>96.0</b>	<b>88.0</b>	<b>85.0</b>		
-----------------------	----------	-------------	-------------	-------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>94.5</b>	<b>97.0</b>	<b>100.5</b>		
--	----------	-------------	-------------	--------------	--	--

material description

**Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-5  
 date of issue 30-Oct-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	JH
time	01:45 PM
date	25-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		15	16	17	18		
location	Lot No	1108	1108	1107	1125	Retest of 12	
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 1	Layer 3	Layer 2	Layer 1		
measurement depth	mm	275	275	275	275		
field wet density	t/m <sup>3</sup>	1.98	2.08	2.07	2.09		
field dry density	t/m <sup>3</sup>	1.66	1.75	1.80	1.82		
field moisture content	%	18.9	18.4	15.5	15.2		

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard	standard		
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0		
percent of oversize material	wet	0	0	0	0		
peak converted wet density	t/m <sup>3</sup>	2.02	2.09	2.06	2.19		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	0.5	0.0	1.0		
--	--	------	-----	-----	-----	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>96.5</b>	<b>103.5</b>	<b>100.0</b>	<b>107.5</b>		
-----------------------	----------	-------------	--------------	--------------	--------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>98.0</b>	<b>99.5</b>	<b>100.5</b>	<b>95.5</b>		
--	----------	-------------	-------------	--------------	-------------	--	--

material description

**Sandy Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature  
 C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-6  
 date of issue 31-Oct-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	HC
time	All Day
date	26-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		19	20	21	22	23	24
location	Lot No	1123	1120	1107	1105	1106	1108
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 3	Layer 3	Layer 4	Layer 1	Layer 2	Layer 5
measurement depth	mm	275	275	275	275	275	275
field wet density	t/m <sup>3</sup>	2.12	2.05	1.98	1.99	2.08	2.01
field dry density	t/m <sup>3</sup>	1.75	1.71	1.70	1.68	1.78	1.75
field moisture content	%	21.0	19.9	16.7	18.1	16.7	14.7

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>	2.14	2.11	2.09	2.03	2.08	2.11
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-	-	-	-

moisture variation from OMC (-dry,+wet)%		3.5	3.0	0.5	-1.0	1.0	-0.5
--	--	-----	-----	-----	------	-----	------

<b>Moisture ratio</b>	<b>%</b>	<b>120.0</b>	<b>119.5</b>	<b>102.0</b>	<b>94.0</b>	<b>106.0</b>	<b>96.0</b>
-----------------------	----------	--------------	--------------	--------------	-------------	--------------	-------------

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>99.0</b>	<b>97.5</b>	<b>95.0</b>	<b>98.0</b>	<b>100.0</b>	<b>95.5</b>
--	----------	-------------	-------------	-------------	-------------	--------------	-------------

material description

Silty CLAY



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-7  
 date of issue 13-Nov-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	04:30 PM
date	27-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		25	26	27		
location	Lot No	1101	1102	1103		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 4	Layer 4	Layer 4		
measurement depth	mm	275	275	275		
field wet density	t/m <sup>3</sup>	2.04	2.03	2.00		
field dry density	t/m <sup>3</sup>	1.74	1.77	1.63		
field moisture content	%	17.7	14.2	22.8		

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>	2.03	2.09	1.95		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%		-1.0	-1.0	0.5		
--	--	------	------	-----	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>94.5</b>	<b>92.0</b>	<b>101.5</b>		
-----------------------	----------	-------------	-------------	--------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>100.5</b>	<b>97.0</b>	<b>102.5</b>		
--	----------	--------------	-------------	--------------	--	--

material description

<b>Gravelly Silty Clay</b>
----------------------------



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-8  
 date of issue 13-Nov-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	100

tested by	MH
time	All Day
date	30-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		28	29	30		
location	Lot No	1104	1105	1107		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	FSL	FSL	FSL		
measurement depth	mm	75	75	75		
field wet density	t/m <sup>3</sup>	2.03	2.11	2.01		
field dry density	t/m <sup>3</sup>	1.70	1.82	1.72		
field moisture content	%	19.8	15.9	16.5		

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>	2.01	2.11	2.02		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%		0.5	0.0	0.0		
--	--	-----	-----	-----	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>103.0</b>	<b>101.5</b>	<b>99.5</b>		
-----------------------	----------	--------------	--------------	-------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>101.0</b>	<b>100.0</b>	<b>99.5</b>		
--	----------	--------------	--------------	-------------	--	--

material description

**Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-9  
 date of issue 13-Nov-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	TR
time	All Day
date	31-Oct-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		31	32	33		
location	Lot No	1134	1133	1120		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 4	Layer 4	Layer 4		
measurement depth	mm	275	275	275		
field wet density	t/m <sup>3</sup>	2.07	2.06	2.03		
field dry density	t/m <sup>3</sup>	1.73	1.73	1.73		
field moisture content	%	19.8	19.2	17.5		

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>	2.03	1.99	2.08		
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-		

moisture variation from OMC (-dry,+wet)%		1.0	-0.5	0.0		
--	--	-----	------	-----	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>105.0</b>	<b>96.5</b>	<b>101.5</b>		
-----------------------	----------	--------------	-------------	--------------	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>102.0</b>	<b>103.5</b>	<b>97.5</b>		
--	----------	--------------	--------------	-------------	--	--

material description

Silty CLAY



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

LABORATORY ACCREDITATION No 15357

Approved Signature  
 C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-10  
 date of issue 13-Nov-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	HC
time	PM
date	02-Nov-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1							
<b>Test No</b>		<b>34</b>	<b>36</b>				
location	Lot No	1124	1121				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 5	Layer 5				
measurement depth	mm	275	275				
field wet density	t/m <sup>3</sup>	2.16	2.00				
field dry density	t/m <sup>3</sup>	1.82	1.67				
field moisture content	%	18.2	19.2				
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>	2.07	2.11				
adjusted peak converted wet density	t/m <sup>3</sup>	-	-				
moisture variation from OMC (-dry,+wet)%		-1.0	1.5				
<b>Moisture ratio</b>	<b>%</b>	<b>94.5</b>	<b>110.5</b>				
<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>104.0</b>	<b>94.5</b>				
material description							
<b>Silty CLAY</b>							



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

LABORATORY ACCREDITATION No 15357

Approved Signature  
 C Caulfield



47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

**COMPACTION ASSESSMENT**  
 BY NUCLEAR GAUGE METHOD

report No 9875-11  
 date of issue 13-Nov-2017

Client Streetworks  
 Client address 4 Len Thomas Place, Narre Warren, 3805  
 Project Acacia Ridge Stage 11B  
 Location Cranbourne South

chainage Block Fill  
 Layer thickness (mm) 300

tested by HC  
 time: PM  
 date: 02-Nov-2017  
 checked by SB

test procedures AS1289.2.1.1 & 5.8.1

<b>test No</b>		<b>35</b>				
location	Lot No	1122				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 5				
measurement depth	mm	275				
field wet density	t/m <sup>3</sup>	2.00				
field dry density	t/m <sup>3</sup>	1.66				
field moisture content	%	20.5				
laboratory compaction procedure AS1289.5.1.1 Standard Compaction						
standard maximum dry density	t/m <sup>3</sup>	<b>1.76</b>				
standard optimum moisture content	%	<b>16.5</b>				

test procedure AS1289.5.4.1

oversize material retained on AS sieve	mm	19.0				
percent of oversize material	wet	0				
percent of oversize material	dry	0				
adjusted standard maximum dry density	t/m <sup>3</sup>	0.00				
adjusted standard optimum moisture content	%	0.0				
moisture variation (-dry,+wet)	%	3.5				
<b>moisture ratio ( R<sub>m</sub> )</b>	<b>%</b>	<b>121.5</b>				
<b>dry density ratio ( R<sub>D</sub> )</b>	<b>%</b>	<b>94.5</b>				

material description

**Silty CLAY**

compaction test details

date mat'l sampled 02-Nov-2017  
 material source on site - On site  
 material stabilised  
 time elapsed



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-12  
 date of issue 13-Nov-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	02:30 PM
date	09-Nov-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1							
<b>Test No</b>		<b>37</b>	<b>38</b>				
location	Lot No	1121	1122				
		Retest of 36	Retest of 35				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL				
measurement depth	mm	275	275				
field wet density	t/m <sup>3</sup>	1.91	1.97				
field dry density	t/m <sup>3</sup>	1.57	1.65				
field moisture content	%	21.6	19.0				
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>	2.11	2.08				
adjusted peak converted wet density	t/m <sup>3</sup>	-	-				
moisture variation from OMC (-dry,+wet)%		3.5	1.0				
<b>Moisture ratio</b>	<b>%</b>	<b>119.5</b>	<b>105.5</b>				
<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>90.5</b>	<b>94.5</b>				
material description							
Silty CLAY							



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

LABORATORY ACCREDITATION No 15357

Approved Signature  
 C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-13  
 date of issue 16-Nov-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	10:15 AM
date	14-Nov-2017
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		39	40			
location	Lot No	1121	1122			
		Retest of 37	Retest of 38			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	FSL	FSL			
measurement depth	mm	275	275			
field wet density	t/m <sup>3</sup>	1.90	2.04			
field dry density	t/m <sup>3</sup>	1.62	1.81			
field moisture content	%	17.0	12.7			

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>	1.96	2.09			
adjusted peak converted wet density	t/m <sup>3</sup>	-	-			

moisture variation from OMC (-dry,+wet)%		-2.0	1.0			
--	--	------	-----	--	--	--

<b>Moisture ratio</b>	<b>%</b>	<b>90.0</b>	<b>106.5</b>			
-----------------------	----------	-------------	--------------	--	--	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>96.5</b>	<b>97.5</b>			
--	----------	-------------	-------------	--	--	--

material description

**Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature

C Caulfield



# COMPACTION ASSESSMENT

## BY NUCLEAR GAUGE METHOD

47 National Avenue, Pakenham VIC 3810  
 ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9875-14  
 date of issue 16-Feb-2018

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 11B
Location	Cranbourne South

Feature	Block Fill
Layer thickness (mm)	300

tested by	MH
time	09:30 AM
date	13-Feb-2018
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		41	42	43	44	45	
location	Lot No	1114	1128	1132	1140	1141	
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	FSL	FSL	FSL	FSL	FSL	
measurement depth	mm	275	275	275	275	275	
field wet density	t/m <sup>3</sup>	2.02	2.16	2.15	2.11	2.00	
field dry density	t/m <sup>3</sup>	1.61	1.87	1.84	1.88	1.81	
field moisture content	%	25.5	15.8	16.7	12.2	10.6	

laboratory compaction procedure AS1289 5.7.1

compactive effort		standard	standard	standard	standard	standard	
oversize material retained on AS sieve	mm	19.0	19.0	19.0	19.0	19.0	
percent of oversize material	wet	0	0	0	0	0	
peak converted wet density	t/m <sup>3</sup>	1.99	2.15	2.12	2.08	1.97	
adjusted peak converted wet density	t/m <sup>3</sup>	-	-	-	-	-	

moisture variation from OMC (-dry,+wet)%		-0.5	-5.0	-4.5	-4.5	-3.5	
--	--	------	------	------	------	------	--

<b>Moisture ratio</b>	<b>%</b>	<b>97.0</b>	<b>75.0</b>	<b>76.5</b>	<b>72.5</b>	<b>74.5</b>	
-----------------------	----------	-------------	-------------	-------------	-------------	-------------	--

<b>Hilf density ratio ( R<sub>HD</sub> )</b>	<b>%</b>	<b>101.5</b>	<b>100.5</b>	<b>101.5</b>	<b>101.5</b>	<b>101.5</b>	
--	----------	--------------	--------------	--------------	--------------	--------------	--

material description

**Silty CLAY**



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

LABORATORY ACCREDITATION No 15357

Approved Signature  
 C Caulfield