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
Revised Copy

Acacia Ridge Stage 5 and 7
Cranbourne

Prepared for:

Streetworks Pty Ltd
4 Len Thomas Place
Narre Warren 3805

PROJECT No 9384

7 April 2017.

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

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ph: 03 9769 5799
fax: 03 9769 4799
mob: 0417 004 072
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Geotechnical Report Level One Inspection and Testing
Acacia Ridge Stage 5 and 7

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 5. This work was conducted over the period of 18/01/2017 to 15/03/2017.

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 509 ,510, 511,515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 536, 537, 538, 539, 540, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 558, 559, 560, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720 and 721. 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 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*. 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.

terra firma laboratories

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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:

- *Excavator*
- *Compactor*
- *Dump Truck*
- *Water Cart*
- *Scrapper*
- *Pad Foot Roller*
- *Dozer*
- *Tractor*

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.

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4. Compaction Control Testing

Testing comprised of a total of 70 in-situ density tests, with a summary of results included in Appendix 2. Test Reports are referenced in Appendix 3.

Test numbers 6, 10, 15, 16, 25, 29, 31, 45, 46, 47, 53 and 55 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 18/01/2017 or work completed after the 15/03/2017, may be certified as being compliant with the specification.

For and on behalf of
Terra Firma Laboratories,

T Seym –

Tom Seymour
Lab Manager

terra firma laboratories

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fax: 03 9769 4799
mob: 0417 004 072
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APPENDICES

Appendix 1: Site Plans

Appendix 2: Test Summary

Appendix 3: Test Reports

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Level One Test Summary

Client: Streetworks Pty Ltd **Specification:** 95%
Project: Acacia Stage 5 and 7 **Project No:** 9384

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
18/01/2017	1	L1		96	PASS	710	9384-1
18/01/2017	2	L2		100	PASS	711	9384-1
18/01/2017	3	L2		100	PASS	712	9384-1
19/01/2017	4	L1		97.5	PASS	713	9384-2
19/01/2017	5	L1		99.5	PASS	714	9384-2
19/01/2017	6	L1		93.5	FAIL	715	9384-2
21/01/2017	7	L1	6	99	PASS	715	9384-3
21/01/2017	8	L2		99	PASS	716	9384-3
21/01/2017	9	L1		96	PASS	717	9384-3
21/01/2017	10	L1		93	FAIL	718	9384-3
23/01/2017	11	L1	10	96.5	PASS	718	9384-4
23/01/2017	12	L2		100	PASS	717	9384-4
23/01/2017	13	L3		100.5	PASS	715	9384-4
23/01/2017	14	L3		101	PASS	713	9384-4
24/01/2017	15	L3		91.5	FAIL	718	9384-5
24/01/2017	16	L2		94.5	FAIL	719	9384-5
25/01/2017	17	L3	15	101	PASS	718	9384-6
25/01/2017	18	L2	16	102	PASS	719	9384-6
25/01/2017	19	L2		98	PASS	720	9384-6
25/01/2017	20	L1		99	PASS	721	9384-6
30/01/2017	21	L4		105	PASS	719	9384-7
30/01/2017	22	L3		104	PASS	720	9384-7
31/01/2017	23	L1		96.5	PASS	518	9384-8
31/01/2017	24	L1		96.5	PASS	520	9384-8
31/01/2017	25	L1		94.5	FAIL	522	9384-8
31/01/2017	26	L1		98.5	PASS	524	9384-8
1/02/2017	27	L1	25	102	PASS	522	9384-9
1/02/2017	28	L1		103	PASS	519	9384-9
1/02/2017	29	L1		92	FAIL	521	9384-9
1/02/2017	30	L2		96.5	PASS	523	9384-9
1/02/2017	31	L2		94	FAIL	525	9384-9
2/02/2017	32	L1	29	97	PASS	521	9384-10R
2/02/2017	33	L2	31	95	PASS	525	9384-10R
2/02/2017	34	L1		97	PASS	546	9384-10R
2/02/2017	35	L1		97.5	PASS	551	9384-10R
2/02/2017	36	L2		97	PASS	544	9384-10R
3/02/2017	37	L2		95	PASS	553	9384-11R
3/02/2017	38	L3		101.5	PASS	547	9384-11R
3/02/2017	39	L3		98	PASS	545	9384-11R
4/02/2017	40	L3		99.5	PASS	549	9384-12
4/02/2017	41	L4		98.5	PASS	548	9384-12

Level One Test Summary

Client: Streetworks Pty Ltd **Specification:** 95%
Project: Acacia Stage 5 and 7 **Project No:** 9384

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
4/02/2017	42	L4		98	PASS	546	9384-12
7/02/2017	43	L1		98	PASS	526	9384-13
7/02/2017	44	L2		97.5	PASS	517	9384-13
7/02/2017	45	L1		93.5	FAIL	515	9384-13
7/02/2017	46	L1		91.5	FAIL	516	9384-13
7/02/2017	47	L1		94	FAIL	509	9384-14
7/02/2017	48	L1		95.5	PASS	510	9384-14
7/02/2017	49	L1		99	PASS	511	9384-14
7/02/2017	50	L1		95	PASS	530	9384-14
7/02/2017	51	L2		96	PASS	528	9384-14
7/02/2017	52	L3		96.5	PASS	539	9384-14
7/02/2017	53	L4		93	FAIL	538	9384-15
8/02/2017	54	L1	45	98	PASS	515	9384-16
8/02/2017	55	L1	46	93	FAIL	516	9384-16
8/02/2017	56	L3		96.5	PASS	529	9384-17
8/02/2017	57	L5		97	PASS	537	9384-17
9/02/2017	58	L4	53	103	PASS	538	9384-18
9/02/2017	59	L4		101	PASS	536	9384-19
9/02/2017	60	L6		101	PASS	540	9384-20
9/02/2017	61	L5		96	PASS	543	9384-21
9/02/2017	62	L6		99	PASS	545	9384-18
10/02/2017	63	L1	55	100.5	PASS	516	9384-19
10/02/2017	64	L2		101	PASS	558	9384-19
10/02/2017	65	L4		98	PASS	559	9384-19
10/02/2017	66	L6		98	PASS	560	9384-19
15/02/2017	67	L1		95	PASS	527	9384-20
15/02/2017	68	L2		97	PASS	542	9384-20
15/02/2017	69	L3		99.5	PASS	542	9384-20
15/03/2017	70	L1	47	101	PASS	509	9384-21

WARNING

BEWARE OF UNDERGROUND SERVICES

The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works.

DIAL 1100 BEFORE YOU DIG

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NOTE: FENCING

VEHICLE EXCLUSION MEASURES WHERE ROADS ABUT A RESERVE ARE TO FORM PART OF THE LANDSCAPE WORKS.

NOTE: OPEN DRAINS

EXISTING OPEN DRAINS TO BE EXCAVATED TO A SOUND BASE AND FILLED AS SPECIFIED.

NOTE: DRIVEWAYS

1. DRIVEWAYS TO LOTS 730, 731, 737 & 738 TO BE 4.0m WIDE.
2. DOUBLE DRIVEWAY TO LOTS 720 & 721 TO BE 8.0m WIDE.

NOTE: HOUSE DRAINS

1. HOUSE DRAINS TO LOTS 734 & 740 TO BE OFFSET 2.0m FROM SIDE BOUNDARY.
2. HOUSE DRAIN TO LOT 728 TO BE OFFSET 6.0m FROM SIDE BOUNDARY.
3. HOUSE DRAINS TO LOT 730, 733 & 737 TO BE OFFSET 6.5m FROM SIDE BOUNDARY.

SERVICES OFFSET SCHEDULE

STREET NAME	ROAD RESERVE	BACK OF KERB	SEWER	GAS	NON DRINKING WATER	DRINKING WATER	COMMUNICATIONS	ELECTRICITY	LIGHT POLES
BINDARRI GROVE	18.00	5.20	1.00 N	2.10 N	2.60 N	3.10 N	1.85 S	2.60 S	4.40 S
COORONG STREET	15.00	2.20 N / 5.20 S		2.10 S	2.60 S	3.10 S	0.50 N	1.10 N	1.40 N
CORNFLOWER RISE	18.00	5.20		2.25 S	2.70 S	3.20 S	1.85 N	2.60 N	4.40 N
FREYCINET DRIVE	18.00	5.20	0.80 E	2.10 W	2.60 W	3.10 W	1.85 E	2.60 E	4.40 E
LINDENDERRY ROAD	18.00	5.20		2.10 S	2.60 S	3.10 S	1.85 N	2.60 N	4.40 N
RIVERWOOD DRIVE (LOT 705)	27.00	5.85		2.25 E	3.00 E	3.80 E	2.05 W	2.80 W	5.05 W
RIVERWOOD DRIVE (RESERVE)	24.00	5.15 W / 5.85 E		2.25 E	3.00 E	3.80 E	0.70 W	1.40 W	4.35 W

terra firma laboratories

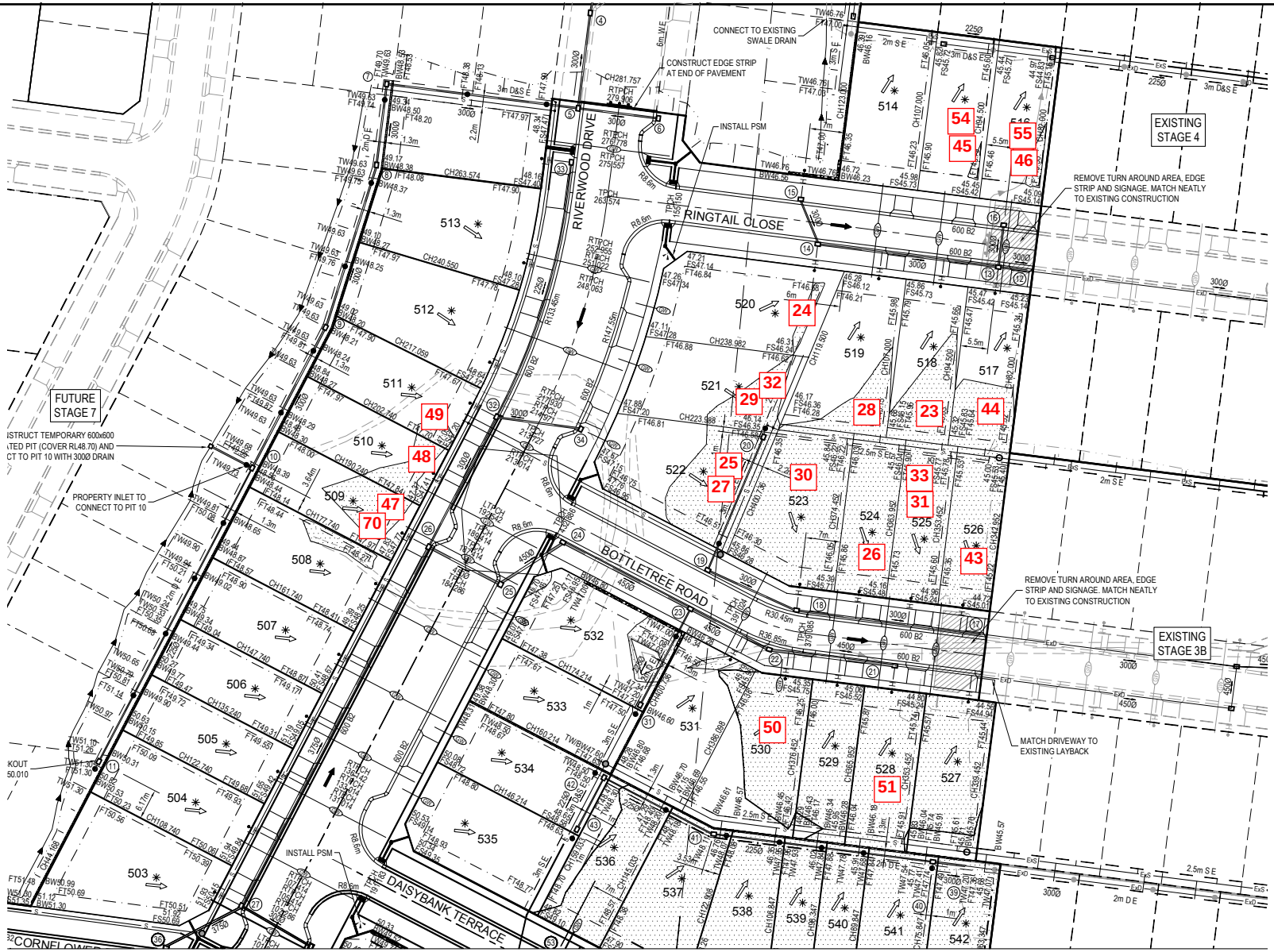
47 National Ave
Pakenham
Vic 3810

Test Location Plan

Client : Streetworks Pty Ltd

Project : Acacia Stage 7

Scale NTS



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47 National Ave
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Vic 3810

Test Location Plan

Client : Streetworks Pty Ltd

Project : Acacia Stage 5

Scale
NTS

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47 National Ave
Pakenham
Vic 3810

Test Location Plan

Client : Streetworks Pty Ltd

Project : Acacia Stage 5

Scale
NTS

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9384-1

date of issue 20-Jan-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	All Day
date	18-Jan-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**1**	**2**	**3**			
location Lot No		710	711	712			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L2	L2			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.94	1.95	1.95			
field dry density	t/m^3	1.65	1.61	1.65			
field moisture content	%	17.7	20.9	18.0			
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^3	2.03	1.96	1.95			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.0	-1.5	-1.5			
Moisture ratio	**%**	**95.5**	**94.0**	**92.5**			
Hilf density ratio (R_{HD})	**%**	**96.0**	**99.5**	**100.5**			

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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

D Burgess

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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

report No 9384-2
date of issue 23-Jan-2017

Client	Streetworks	Feature	Block Fill	tested by	CC
Client address	4 Len Thomas Place, Narre Warren, 3805			time	All Day
Project	Acacia Ridge Stage 5	Layer thickness (mm)	300	date	19-Jan-2017
Location	Cranbourne			checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**4**	**5**	**6**			
location Lot No		713	714	715			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L1	L1			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.94	1.95	1.87			
field dry density	t/m^3	1.63	1.63	1.56			
field moisture content	%	19.2	20.2	19.2			
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^3	1.99	1.96	2.00			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.5	-2.0	1.0			
Moisture ratio	**%**	**93.5**	**91.5**	**106.0**			
Hilf density ratio (R_{HD})	**%**	**97.5**	**99.5**	**93.5**			

material description

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

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report No 9384-3

date of issue 24-Jan-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	All Day
date	21-Jan-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**7**	**8**	**9**	**10**		
location Lot No Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		715 Retest of #6	716	717	718		
depth from F.S.L.	m	L1	L2	L1	L1		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	1.95	1.95	1.96	1.96		
field dry density	t/m^3	1.65	1.57	1.61	1.58		
field moisture content	%	17.9	23.9	21.7	24.3		
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	0	0	0	0		
peak converted wet density	t/m^3	1.97	1.97	2.04	2.11		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		-0.5	1.0	1.0	1.0		
Moisture ratio	**%**	**98.0**	**105.0**	**105.5**	**103.5**		
Hilf density ratio (R_{HD})	**%**	**99.0**	**99.0**	**96.0**	**93.0**		

material description

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D Burgess

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9384-4

date of issue 25-Jan-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Backfill
Layer thickness (mm)	300

tested by	BM
time	All Day
date	24-Jan-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**11**	**12**	**13**	**14**		
location Lot No		718 Retest of #10	717	715	713		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L2	L3	L3		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	1.99	2.05	2.07	1.98		
field dry density	t/m^3	1.69	1.66	1.80	1.63		
field moisture content	%	17.8	23.3	15.4	22.0		
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^3	2.06	2.05	2.07	1.96		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		3.5	1.0	-1.0	0.5		
Moisture ratio	**%**	**124.0**	**105.0**	**94.5**	**103.0**		
Hilf density ratio (R_{HD})	**%**	**96.5**	**100.0**	**100.5**	**101.0**		

material description

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9384-5

date of issue 01-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	All Day
date	25-Jan-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**15**	**16**				
location Lot No		718	719				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L3	L2				
measurement depth	mm	275	275				
field wet density	t/m^3	1.90	2.01				
field dry density	t/m^3	1.61	1.73				
field moisture content	%	17.6	16.1				
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^3	2.08	2.13				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		1.0	0.5				
Moisture ratio	**%**	**106.5**	**104.5**				
Hilf density ratio (R_{HD})	**%**	**91.5**	**94.5**				

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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

D Burgess

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9384-6

date of issue 01-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	MW
time	All Day
date	25-Jan-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**17**	**18**	**19**	**20**		
location	Lot No	718 Retest 15	719 Retest 16	720	721		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L3	L2	L2	L1		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	1.94	2.02	1.98	2.04		
field dry density	t/m^3	1.62	1.63	1.63	1.79		
field moisture content	%	20.0	23.7	21.4	14.0		
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^3	1.92	1.98	2.02	2.07		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		-3.0	1.0	1.0	-3.0		
Moisture ratio	**%**	**86.0**	**104.5**	**105.0**	**81.5**		
Hilf density ratio (R_{HD})	**%**	**101.0**	**102.0**	**98.0**	**99.0**		

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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Accredited for compliance with ISO/IEC 17025- Testing

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9384-7

date of issue 01-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	MW
time	All Day
date	30-Jan-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**21**	**22**				
location	Lot No	719	720				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L4	L3				
measurement depth	mm	275	275				
field wet density	t/m^3	2.06	2.07				
field dry density	t/m^3	1.74	1.72				
field moisture content	%	18.5	20.1				
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^3	1.96	2.00				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		-1.5	-1.5				
Moisture ratio	**%**	**92.0**	**93.0**				
Hilf density ratio (R_{HD})	**%**	**105.0**	**104.0**				

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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

report No 9384-8
date of issue 02-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	PM
date	31-Jan-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**23**	**24**	**25**	**26**		
location Lot No		518	520	522	524		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L1	L1	L1		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	1.92	1.88	1.91	1.91		
field dry density	t/m^3	1.60	1.55	1.68	1.59		
field moisture content	%	19.5	21.8	14.1	20.7		
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^3	1.98	1.95	2.02	1.94		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		0.5	1.5	-3.0	-2.5		
Moisture ratio	**%**	**104.0**	**106.5**	**82.0**	**88.0**		
Hilf density ratio (R_{HD})	**%**	**97.0**	**96.5**	**94.5**	**98.5**		

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

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report No 9384-9

date of issue 03-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	All Day
date	01-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**27**	**28**	**29**	**30**	**31**	
location Lot No Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		522 Retest of 25	519	521	523	525	
depth from F.S.L.	m	L1	L1	L1	L2	L2	
measurement depth	mm	275	275	275	275	275	
field wet density	t/m^3	2.04	1.99	1.92	2.02	2.00	
field dry density	t/m^3	1.74	1.70	1.66	1.69	1.73	
field moisture content	%	17.2	16.9	15.8	19.4	15.5	
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^3	2.00	1.93	2.08	2.09	2.12	
adjusted peak converted wet density	t/m^3	-	-	-	-	-	
moisture variation from OMC (-dry,+wet)%		-1.0	-2.0	-0.5	1.0	0.5	
Moisture ratio	**%**	**95.0**	**90.0**	**96.0**	**105.0**	**104.5**	
Hilf density ratio (R_{HD})	**%**	**102.0**	**103.0**	**92.0**	**96.5**	**94.0**	

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No	9384-10R
date of issue	07-Apr-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	PM
date	02-Feb-2017
checked by	SB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**32**	**33**	**34**	**35**	**36**	
location	Lot No	521 Retest 29	525 Retest 31	546	551	544	
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L2	L1	L1	L2	
measurement depth	mm	275	275	275	275	275	
field wet density	t/m^3	1.99	1.95	2.01	1.97	1.95	
field dry density	t/m^3	1.69	1.65	1.73	1.71	1.60	
field moisture content	%	17.5	18.3	16.5	15.2	21.7	
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^3	2.05	2.05	2.07	2.02	2.01	
adjusted peak converted wet density	t/m^3	-	-	-	-	-	
moisture variation from OMC (-dry,+wet)%		1.0	1.5	0.5	0.5	1.5	
Moisture ratio	**%**	**107.0**	**108.5**	**104.5**	**105.0**	**107.0**	
Hilf density ratio (R_{HD})	**%**	**97.0**	**95.0**	**97.0**	**97.5**	**97.0**	

material description

Silty CLAY

Note: This report replaces 9384-10 issued on 09/02/2017

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No	9384-11R
date of issue	07-Apr-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	PM
date	03-Feb-2017
checked by	SB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**37**	**38**	**39**			
location	Lot No	553	547	545			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L2	L3	L3			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.92	2.02	1.96			
field dry density	t/m^3	1.66	1.73	1.72			
field moisture content	%	15.8	16.9	13.9			
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^3	2.03	1.99	1.99			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.5	-0.5	-1.5			
Moisture ratio	**%**	**92.0**	**98.0**	**90.5**			
Hilf density ratio (R_{HD})	**%**	**95.0**	**101.5**	**98.0**			

material description

Silty CLAY

Note: This report replaces 9384-11 issued on 09/02/2017

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

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report No 9384-12

date of issue 09-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	PM
date	06-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**40**	**41**	**42**			
location Lot No		549	548	546			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L3	L4	L4			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.99	2.01	2.00			
field dry density	t/m^3	1.73	1.76	1.74			
field moisture content	%	15.2	14.5	14.9			
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^3	2.00	2.04	2.04			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.5	-1.5	-1.5			
Moisture ratio	**%**	**91.0**	**92.0**	**92.0**			
Hilf density ratio (R_{HD})	**%**	**99.5**	**98.5**	**98.0**			

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

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report No 9384-13

date of issue 09-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	MW
time	All Day
date	07-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**43**	**44**	**45**	**46**		
location Lot No		526	517	515	516		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L2	L1	L1		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	2.04	2.02	1.92	1.91		
field dry density	t/m^3	1.71	1.74	1.59	1.61		
field moisture content	%	19.8	15.8	21.2	18.5		
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^3	2.09	2.07	2.06	2.03		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		2.0	1.5	3.0	0.5		
Moisture ratio	**%**	**112.0**	**110.5**	**116.0**	**102.5**		
Hilf density ratio (R_{HD})	**%**	**98.0**	**97.5**	**93.5**	**94.0**		

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

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report No 9384-14

date of issue 09-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	MW
time	All Day
date	07-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**47**	**48**	**49**	**50**	**51**	**52**
location Lot No		509	510	511	530	528	539
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L1	L1	L1	L2	L3
measurement depth	mm	275	275	275	275	275	275
field wet density	t/m^3	1.98	2.03	2.01	1.74	1.83	1.98
field dry density	t/m^3	1.71	1.75	1.73	1.39	1.47	1.70
field moisture content	%	15.6	15.9	16.2	25.3	24.3	16.3
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^3	2.11	2.12	2.03	1.84	1.91	2.05
adjusted peak converted wet density	t/m^3	-	-	-	-	-	-
moisture variation from OMC (-dry,+wet)%		1.0	1.5	-1.0	-2.5	-1.5	-1.0
Moisture ratio	**%**	**107.0**	**108.5**	**94.5**	**91.0**	**94.0**	**95.0**
Hilf density ratio (R_{HD})	**%**	**94.0**	**95.5**	**99.0**	**95.0**	**96.0**	**96.5**

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

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report No 9384-15

date of issue 09-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	MW
time	All Day
date	07-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**53**					
location Lot No		538					
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L4					
measurement depth	mm	275					
field wet density	t/m^3	1.90					
field dry density	t/m^3	1.64					
field moisture content	%	16.0					
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard					
oversize material retained on AS sieve	mm	19.0					
percent of oversize material	wet	0					
peak converted wet density	t/m^3	2.04					
adjusted peak converted wet density	t/m^3	-					
moisture variation from OMC (-dry,+wet)%		-1.0					
Moisture ratio	**%**	**95.0**					
Hilf density ratio (R_{HD})	**%**	**93.5**					

material description

Silty CLAY

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COMPACTION ASSESSMENT

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47 National Avenue, Pakenham VIC 3810

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report No 9384-16

date of issue 09-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	MW
time	All Day
date	08-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**54**	**55**				
location Lot No		515 Retest 45	516 Retest 46				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L1	L1				
measurement depth	mm	275	275				
field wet density	t/m^3	1.98	1.97				
field dry density	t/m^3	1.68	1.68				
field moisture content	%	17.4	17.4				
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^3	2.02	2.12				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		-1.0	1.0				
Moisture ratio	**%**	**95.5**	**106.5**				
Hilf density ratio (R_{HD})	**%**	**98.0**	**93.0**				

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9384-17

date of issue 10-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	PM
date	08-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**56**	**57**				
location Lot No		529	537				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	L3	L5				
measurement depth	mm	275	275				
field wet density	t/m^3	1.96	2.01				
field dry density	t/m^3	1.62	1.72				
field moisture content	%	21.3	16.5				
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^3	2.03	2.07				
adjusted peak converted wet density	t/m^3	-	-				
moisture variation from OMC (-dry,+wet)%		1.0	0.5				
Moisture ratio	**%**	**105.5**	**104.5**				
Hilf density ratio (R_{HD})	**%**	**96.5**	**97.0**				

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

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report No 9384-18

date of issue 17-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	BM
time	All Day
date	09-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**58**	**59**	**60**	**61**	**62**	
location Lot No		538 Retest of Test 53	536	540	543	545	
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 4	Layer 4	Layer 6	Layer 5	Layer 6	
measurement depth	mm	275	275	275	275	275	
field wet density	t/m^3	2.08	1.98	2.03	1.88	1.88	
field dry density	t/m^3	1.78	1.58	1.76	1.61	1.53	
field moisture content	%	17.3	24.7	15.6	17.0	22.9	
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^3	2.02	1.96	2.01	1.97	1.90	
adjusted peak converted wet density	t/m^3	-	-	-	-	-	
moisture variation from OMC (-dry,+wet)%		-1.0	-0.5	-1.0	-2.0	-1.0	
Moisture ratio	**%**	**93.5**	**98.5**	**95.0**	**88.5**	**95.5**	
Hilf density ratio (R_{HD})	**%**	**103.0**	**101.0**	**101.0**	**96.0**	**99.0**	

material description

Silty CLAY

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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Accredited for compliance with ISO/IEC 17025- Testing

LABORATORY ACCREDITATION No **15357**

Approved Signature

D Burgess

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

ph 03 5943 0980 www.terrafirmalabs.com.au

report No 9384-19

date of issue 17-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	MW
time	All Day
date	10-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**63**	**64**	**65**	**66**		
location Lot No		516 Retest of Test 55	558	559	560		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 1	Layer 2	Layer 4	Layer 6		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	2.05	2.01	1.91	1.93		
field dry density	t/m^3	1.72	1.69	1.56	1.62		
field moisture content	%	19.3	19.0	22.9	19.0		
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^3	2.04	1.99	1.95	1.97		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		0.5	-0.5	0.0	-1.5		
Moisture ratio	**%**	**102.0**	**98.0**	**99.0**	**93.5**		
Hilf density ratio (R_{HD})	**%**	**100.5**	**101.0**	**98.0**	**98.0**		

material description

Silty CLAY

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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

report No 9384-20
date of issue 17-Feb-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	Block Fill
Layer thickness (mm)	300

tested by	CC
time	All Day
date	15-Feb-2017
checked by	DB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**67**	**68**	**69**			
location	Lot No	527	542	542			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 1	Layer 2	Layer 3			
measurement depth	mm	275	275	275			
field wet density	t/m^3	1.98	2.04	2.05			
field dry density	t/m^3	1.63	1.73	1.75			
field moisture content	%	21.4	17.6	17.2			
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^3	2.09	2.10	2.06			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		1.0	1.0	0.0			
Moisture ratio	**%**	**105.5**	**107.0**	**100.0**			
Hilf density ratio (R_{HD})	**%**	**95.0**	**97.0**	**99.5**			

material description

Silty CLAY

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Approved Signature
D Burgess

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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47 National Avenue, Pakenham VIC 3810

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report No 9384-21

date of issue 22-Mar-2017

Client	Streetworks
Client address	4 Len Thomas Place, Narre Warren, 3805
Project	Acacia Ridge Stage 5
Location	Cranbourne

Feature	-
Layer thickness (mm)	300

tested by	BM
time	02:45 PM
date	15-Mar-2017
checked by	TS

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**70**					
location Lot No Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)		509 Retest of 47					
depth from F.S.L.	m	Layer 1					
measurement depth	mm	275					
field wet density	t/m^3	2.01					
field dry density	t/m^3	1.77					
field moisture content	%	13.8					
laboratory compaction procedure AS1289 5.7.1							
compactive effort		standard					
oversize material retained on AS sieve	mm	19.0					
percent of oversize material	wet	0					
peak converted wet density	t/m^3	1.99					
adjusted peak converted wet density	t/m^3	-					
moisture variation from OMC (-dry,+wet)%		-3.5					
Moisture ratio	**%**	**79.5**					
Hilf density ratio (R_{HD})	**%**	**101.0**					

material description

Silty CLAY

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T Seymour

Approved Signature

T Seymour