Your Worksite is Our Laboratory.

Geotechnical Report
Level One Inspection and Testing
Version 2

Summerhill Estate Stage 5
Cranbourne South

Prepared for:

Streetworks Pty Ltd
45 Commercial Drive
Pakenham 3810

Project 10194

14th September 2018

Prepared by:

TERRA FIRMA LABORATORIES
Geotechnical Inspection and Testing Authority

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Geotechnical Report Level One Inspection and Testing
Summerhill Estate Stage 5

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 Summerhill Estate Stage 5. This work was conducted over the period of 27/03/2018 to 05/04/2018.

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 area of work included lots 502 through to 518. The areas of work also included lot 501 which had fill placed in a non-structural area, there was no test performed on the lot but fill was placed under level one supervision. 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 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.

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:

- Compactor
- Scraper
- Trucks
- Dozer
- Excavator
- 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 17 in-situ density tests, with a summary of results included in Appendix 2. Test Reports are referenced in Appendix 3.

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 27/03/2018 or work completed after the 05/04/2018, may be certified as being compliant with the specification.

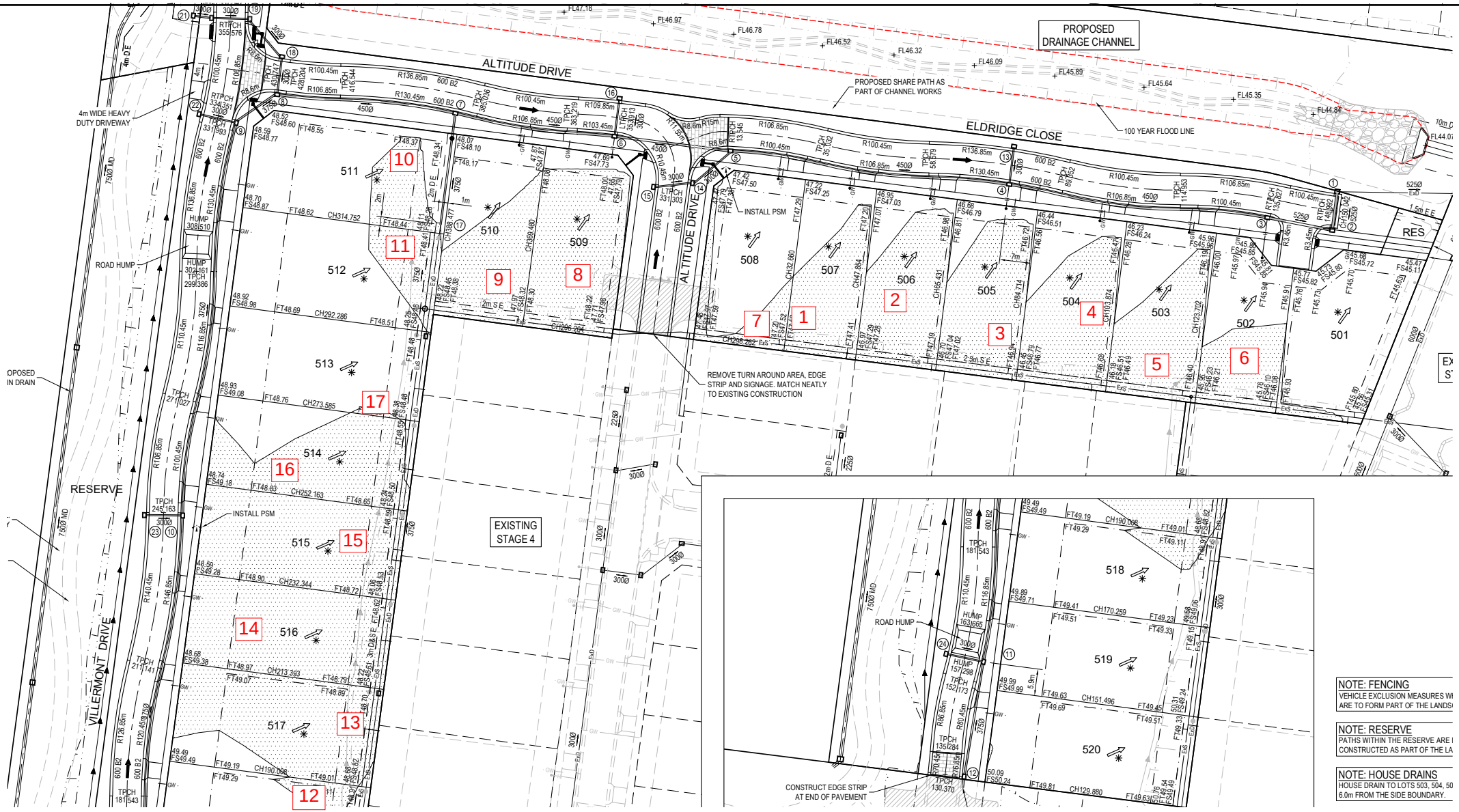
For and on behalf of
Terra Firma Laboratories,

Tom Seymour
Managing Director

Appendices

Our Head Office
47 National Ave
Pakenham, VIC 3810

Our Laboratories
Pakenham 03 9769 5799
Deer Park 03 8348 5596
Bibra Lake 0481 227 980



terra firma laboratories

47 National Avenue
Pakenham VIC 3810

Test Location Plan

Client : Streetworks Pty Ltd

Project : Summerhill Estate Stage 5

Scale
NTS

Level One Test Summary

Client: Streetworks
Project: Summerhill Stage 5
Project No: 10194
Specification: 95%

Date:	Test Number:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
27/03/2018	1	L1		96	Pass	507	10194-1
27/03/2018	2	L1		103.5	Pass	506	10194-1
27/03/2018	3	L1		104	Pass	505	10194-1
28/03/2018	4	L3		100	Pass	504	10194-3
28/03/2018	5	L3		98.5	Pass	503	10194-3
28/03/2018	6	L3		102	Pass	502	10194-3
28/03/2018	7	L1		103	Pass	508	10194-3
4/04/2018	8	L1		98.5	Pass	509	10194-2
4/04/2018	9	L1		97	Pass	5010	10194-2
4/04/2018	10	L1		102.5	Pass	511	10194-2
4/04/2018	11	L1		101	Pass	512	10194-2
5/04/2018	12	L2		96	Pass	518	10194-4
5/04/2018	13	L2		98.5	Pass	517	10194-4
5/04/2018	14	L2		97.5	Pass	516	10194-4
5/04/2018	15	L2		98.5	Pass	515	10194-4
5/04/2018	16	L2		100.5	Pass	514	10194-4
5/04/2018	17	L2		97	Pass	513	10194-4

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

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report No 10194-1

date of issue 29-Mar-2018

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

Feature	Block Fill
Layer thickness (mm)	250

tested by	MH
time	All Day
date	27-Mar-2018
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**1**	**2**	**3**			
location	Lot No	507	506	505			
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	225	225	225			
field wet density	t/m^3	2.02	2.12	2.06			
field dry density	t/m^3	1.75	1.80	1.77			
field moisture content	%	15.4	17.9	16.2			
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	2.10	2.05	1.98			
adjusted peak converted wet density	t/m^3	-	-	-			
moisture variation from OMC (-dry,+wet)%		-1.0	-1.0	-1.0			
Moisture ratio	**%**	**95.0**	**95.0**	**94.0**			
Hilf density ratio (R_{HD})	**%**	**96.0**	**103.5**	**104.0**			

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

C Caulfield

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

terra firma laboratories

47 National Avenue, Pakenham VIC 3810

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report No 10194-2

date of issue 06-Apr-2018

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

Feature	Block Fill
Layer thickness (mm)	300

tested by	SP
time	All Day
date	04-Apr-2018
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**8**	**9**	**10**	**11**		
location	Lot No	509	510	511	512		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 1	Layer 1	Layer 1	Layer 1		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	1.99	1.96	2.13	2.12		
field dry density	t/m^3	1.73	1.69	1.86	1.83		
field moisture content	%	15.3	16.0	14.2	15.4		
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	2.02	2.02	2.08	2.09		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		-1.5	-1.5	0.5	-0.5		
Moisture ratio	**%**	**92.5**	**92.5**	**105.0**	**96.5**		
Hilf density ratio (R_{HD})	**%**	**98.5**	**97.0**	**102.5**	**101.0**		

material description

Silty CLAY

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LABORATORY ACCREDITATION No **15357**

Approved Signature

C Caulfield

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 10194-3

date of issue 11-Apr-2018

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

Feature	Block Fill
Layer thickness (mm)	300

tested by	MH
time	All Day
date	28-Mar-2018
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**4**	**5**	**6**	**7**		
location Lot No		504	503	502	508		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 3	Layer 3	Layer 3	Layer 1		
measurement depth	mm	275	275	275	275		
field wet density	t/m^3	2.08	2.02	1.97	2.02		
field dry density	t/m^3	1.78	1.74	1.61	1.70		
field moisture content	%	17.0	16.0	22.1	19.1		
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	2.08	2.05	1.93	1.96		
adjusted peak converted wet density	t/m^3	-	-	-	-		
moisture variation from OMC (-dry,+wet)%		-0.5	-1.5	-3.0	-2.0		
Moisture ratio	**%**	**96.5**	**90.0**	**87.5**	**90.0**		
Hilf density ratio (R_{HD})	**%**	**100.0**	**98.5**	**102.0**	**103.0**		

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 10194-4

date of issue 11-Apr-2018

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

Feature	Block Fill
Layer thickness (mm)	300

tested by	SP
time	04:36 PM
date	05-Apr-2018
checked by	CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		**12**	**13**	**14**	**15**	**16**	**17**
location Lot No		518	517	516	515	514	513
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 2	Layer 2	Layer 2	Layer 2	Layer 2	Layer 2
measurement depth	mm	275	275	275	275	275	275
field wet density	t/m^3	1.98	1.97	1.97	2.02	2.02	1.98
field dry density	t/m^3	1.58	1.62	1.65	1.67	1.68	1.68
field moisture content	%	25.4	21.9	19.4	20.7	20.2	17.7
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	3	0
peak converted wet density	t/m^3	2.05	2.00	2.02	2.05	-	2.04
adjusted peak converted wet density	t/m^3	-	-	-	-	2.01	-
moisture variation from OMC (-dry,+wet)%		1.5	1.0	0.5	1.0	0.0	0.5
Moisture ratio	**%**	**105.5**	**105.5**	**102.5**	**106.0**	**99.5**	**102.5**
Hilf density ratio (R_{HD})	**%**	**96.5**	**98.5**	**97.5**	**98.5**	**100.5**	**97.0**

material description

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