

Gardenia Estate Stage 3

GITA Inspection Verification Report

Prepared For:	Streetworks Pty Ltd
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Report Number	10057A V1
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Version Release Date	5 May 2020
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Report Released By	Chris Caufield
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Title	Project Manager
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Signature	
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1 Introduction

Terra Firma Laboratories was engaged by Streetworks Pty Ltd as the Geotechnical Inspection and Testing Authority (GITA) to provide Level 1 supervision and testing works on the earthworks component for Gardenia Stage 3. This work was conducted over the period of 15/12/2017 to 09/03/2018.

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 Work

2.1 Area of Work

The areas of work included lots 1 to 3 and 13 to 36. The site will be a residential estate.

The area on which fill was placed is shown on site plan (Appendix 1: *Test Location Plan*) based on drawings prepared by Dalton Consulting Engineers Ref 12455.DP01 Rev 1 and provided by Streetworks Pty Ltd.

The supervision work by the GITA involved both inspection of sub grade preparation work and full time inspection and testing of fill placement.

2.2 Specification

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

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.

Section 5.2 of 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 5.1.1 and AS1289 5.2.1.

In accordance with Table 8.1 (AS3798), for large scale operations, (greater than 1500m²), the minimum testing frequency is 1 test per layer per material type per 2500m² or 1 test per 500m³ distributed reasonable evenly throughout full depth and area or 3 tests per lot. AS3798 defines a

lot as “an area of work that is essentially homogenous in relation to material type and moisture condition, rolling response and compaction technique, and which has been used for the assessment of the relative compaction of an area of work”. All three of these test frequencies must be achieved and this is typically confirmed to have been achieved when 3 tests per visit (day) have been completed.

2.3 Limitations

Terra Firma Laboratories cannot verify any works completed by others outside of the time period specified in the introduction. Uncontrolled works may include, but are not limited to trenching for services, cut and fill works for slab preparation or subsequent removal of vegetation and back fill of holes unless specified in section 2.1 of this report.

Terra Firma Laboratories cannot verify that the material used as a filling medium is free from chemical or other contamination. The scope and the period of Terra Firma Laboratories as described in the introduction are subject to restrictions and limitations. Terra Firma Laboratories did not perform a complete assessment of all possible conditions and circumstances that may exist at the site. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Terra Firma Laboratories.

Verification of finished surface level to design levels is outside of the scope of the GITA report.

Any drawings or marked locations presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Terra Firma Laboratories for incomplete or inaccurate data supplied by others.

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3 Construction Method

3.1 Subgrade Preparation

At the time of subgrade inspection the following was observed:

- Subgrade preparation involved stripping the site of topsoil, vegetation and organic matter to a depth of approximately 200mm below existing levels.
- The site was cleared of all trees and stumps to the extent necessary for the fill placement to proceed
- The roots of all trees and any debris was removed from site prior to any fill placement

The sub-grade area was then proof-rolled to confirm it was capable of withstanding test rolling without visible deformation or springing and any areas observed to be soft or otherwise unsuitable were rectified. The sub-grade was watered and scarified prior to fill placement to aid layer bonding.

3.2 Fill Placement

The contractor was observed to have suitable construction equipment and plant available on-site during the construction period for use in the fill placement.

All fill was placed in layers of thicknesses not exceeding 300mm. At the completion of a placed layer, compaction testing was performed to confirm appropriate compaction had been achieved and supported the observations made. It should be noted that the compaction tests are representative samples of the fill placed and support the visual assessment of the works completed. Each house lot does not necessarily require a compaction test to have been conducted within the house allotment but may have been verified by testing conducted within up to a 2500m² area of the house lot.

Final fill placement levels were verified against design level by others. For the purposes of this report, it was observed that finished levels were in accordance with levels marked on site by survey markers.

The final 300mm of fill placed across the site was placed as a topsoil layer or growing medium and should be considered as non-structural, as it was placed in an uncontrolled manner, as allowed by specifications and placement of the final 300mm of fill was not observed by the GITA.

4 Construction Verification

Compaction Verification testing is summarized in a detailed test register with test certificates attached provided in Appendix 2: *Compaction Test Register and Test Certificates*. A test location plan (10057D1, Appendix 1) providing a schematic of test locations across the extent of scope of works for every placed layer of fill is also documented.

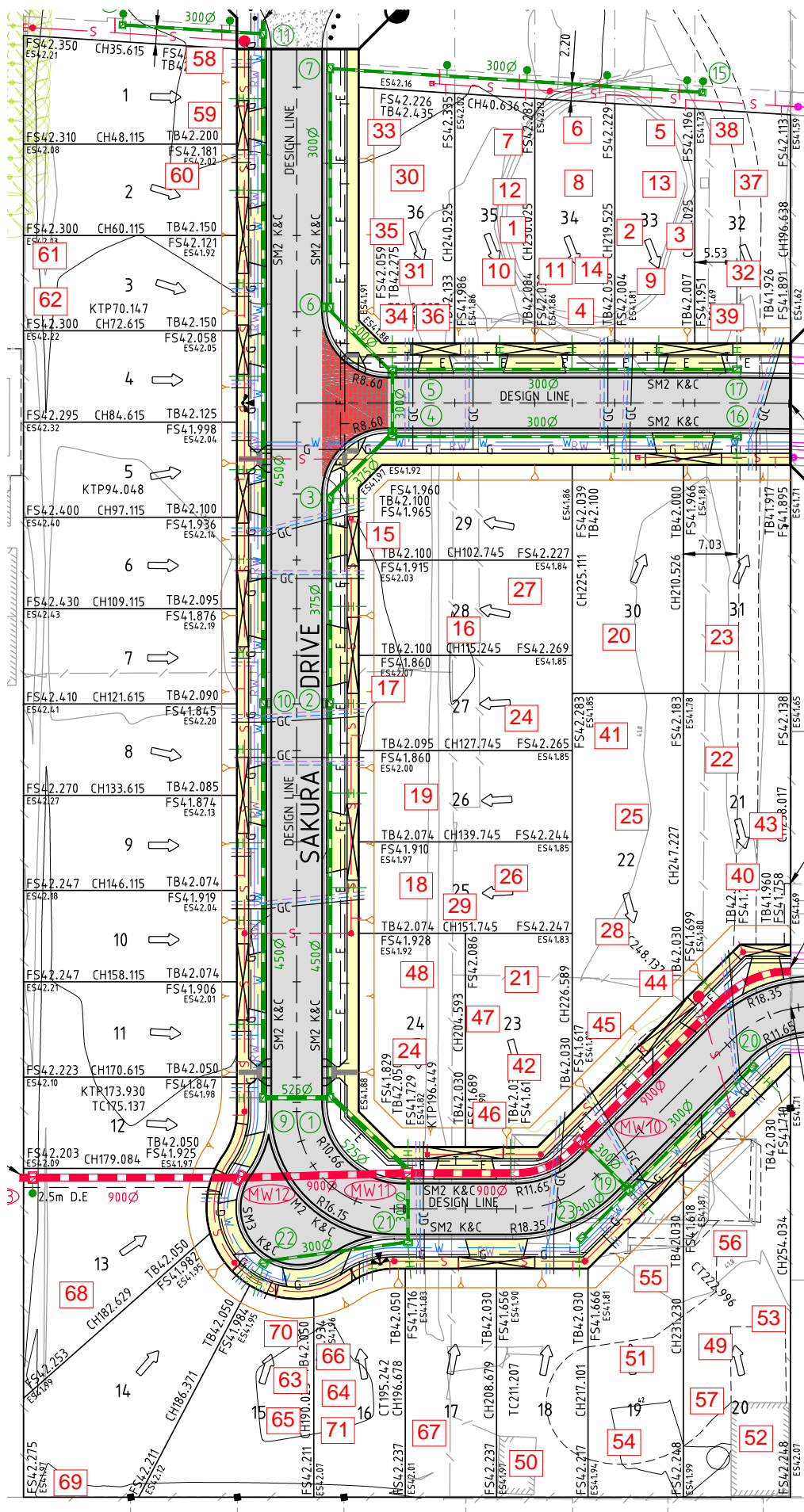
A total of 71 density tests (Hilf method in accordance with 1289 5.7.1) were undertaken with 2 failed results. The contractor was notified of any failed tests and the failed areas were ripped, watered, compacted and then re-tested to confirm compliance with the specification. The results summarised in the compaction test register (Appendix 2) confirm that for every layer of fill placed in a specific work area, satisfactory testing was completed.

5 Statement of Compliance

The intention of this report is to provide a description of the earthworks construction for Stage 3 at Gardenia Estate. For completed fill areas of greater than 300mm, and for works completed between 15/12/2017 and 09/03/2018, earthworks construction activities were conducted under the full time supervision of the Geotechnical Inspection and Testing Authority. 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. The earthworks construction for Stage 3 of Gardenia Estate was observed to be constructed in compliance with the requirements of the Technical Specification.

Appendix 1: Test Location Plan

Appendix 2: Compaction Test Register and Test Certificates



47 National Avenue
Pakenham VIC 3810

Test Location Plan

Client: Streetworks Pty Ltd

Project: Gardinia Stage 3

Reference: 10057D1

Scale
NTS



Compaction Test Register

Client: Streetworks Pty Ltd **Specification:** 95%
Project: Gardinia Estate Stage 3 **Project No:** 10057

Date:	Test No:	Layer:	Retest of:	Density:	Pass/Fail:	Lot No:	Report No:
15/12/2017	1	L1		96.5	Pass	35	10057-1
15/12/2017	2	L3		95	Pass	33	10057-1
15/12/2017	3	L5		95	Pass	33	10057-2
15/12/2017	4	L6		95	Pass	34	10057-2
16/12/2017	5	L6		96	Pass	33	10057-3
16/12/2017	6	L6		97	Pass	34	10057-3
16/12/2017	7	L6		97	Pass	35	10057-3
18/12/2017	8	L7		97	Pass	34	10057-4
18/12/2017	9	L8		98.5	Pass	33	10057-4
18/12/2017	10	L8		100	Pass	35	10057-4
19/12/2017	11	L9		94	Fail	34	10057-5
19/12/2017	12	L9		95	Pass	35	10057-5
19/12/2017	13	L9		96	Pass	33	10057-5
9/01/2018	14	FSL	11	100.5	Pass	34	10057-6
17/01/2018	15	L1		97	Pass	29	10057-7
17/01/2018	16	L1		100.5	Pass	28	10057-7
17/01/2018	17	L1		99	Pass	27	10057-7
18/01/2018	18	FSL		98.5	Pass	25	10057-10
18/01/2018	19	FSL		98.5	Pass	26	10057-10
18/01/2018	20	FSL		100	Pass	30	10057-10
19/01/2018	21	L3		97	Pass	23	10057-8
19/01/2018	22	L3		98	Pass	21	10057-8
19/01/2018	23	L3		96	Pass	31	10057-8
20/01/2018	24	L4		100.5	Pass	27	10057-9
20/01/2018	25	L4		98	Pass	22	10057-9
20/01/2018	26	L4		97	Pass	25	10057-9
22/01/2018	27	FSL		98.5	Pass	28	10057-13
22/01/2018	28	FSL		102	Pass	22	10057-13
22/01/2018	29	FSL		98	Pass	25	10057-13
24/01/2018	30	L1		97.5	Pass	36	10057-14
24/01/2018	31	L1		100.5	Pass	36	10057-14
24/01/2018	32	L1		99.5	Pass	32	10057-14
25/01/2018	33	L2		98.5	Pass	36	10057-15
25/01/2018	34	L2		91.5	Fail	36	10057-15
25/01/2018	35	L2		95	Pass	36	10057-15
29/01/2018	36	L2	34	100.5	Pass	36	10057-16
2/02/2018	37	L2		101	Pass	32	10057-17
2/02/2018	38	L2		95.5	Pass	32	10057-17
2/02/2018	39	L2		97.5	Pass	32	10057-17
6/02/2018	40	L1		97	Pass	21	10057-11
6/02/2018	41	L1		97	Pass	22	10057-11



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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-1
date of issue 10-Jan-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by BM
time All Day
date 15-Dec-2017
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		1	2			
location	Lot No	35	33			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 1	Layer 3			
measurement depth	mm	275	275			
field wet density	t/m ³	1.95	1.94			
field dry density	t/m ³	1.61	1.66			
field moisture content	%	20.8	17.3			

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	2.04			
adjusted peak converted wet density	t/m ³	-	-			

moisture variation from OMC (-dry,+wet)%		0.5	-0.5			
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Moisture ratio	%	103.5	96.0			
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Hilf density ratio (R _{HD})	%	96.5	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.
Accredited for compliance with ISO/IEC 17025- Testing

LABORATORY ACCREDITATION No 15357

Approved Signature
C Caulfield



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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-2
date of issue 10-Jan-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by BM
time All Day
date 15-Dec-2017
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		3	4			
location	Lot No	33	34			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 5	Layer 6			
measurement depth	mm	275	275			
field wet density	t/m ³	2.04	1.92			
field dry density	t/m ³	1.78	1.59			
field moisture content	%	14.5	21.1			

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	2.15	2.03			
adjusted peak converted wet density	t/m ³	-	-			

moisture variation from OMC (-dry,+wet)%		0.5	-0.5			
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Moisture ratio	%	105.0	98.5			
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Hilf density ratio (R _{HD})	%	95.0	95.0			
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material description

Silty CLAY



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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-3
date of issue 10-Jan-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by BM
time All Day
date 16-Dec-2017
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		5	6	7		
location	Lot No	33	34	35		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 6	Layer 6	Layer 6		
measurement depth	mm	275	275	275		
field wet density	t/m ³	2.05	2.07	2.08		
field dry density	t/m ³	1.78	1.80	1.83		
field moisture content	%	14.7	15.3	13.7		

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 ³	2.14	2.14	2.16		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		0.5	-0.5	1.0		
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Moisture ratio	%	104.0	95.5	109.0		
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Hilf density ratio (R_{HD})	%	95.5	97.0	96.0		
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material description

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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-4
date of issue 10-Jan-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by MH
time All Day
date 18-Dec-2017
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		8	9	10		
location	Lot No	34	33	35		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 7	Layer 8	Layer 8		
measurement depth	mm	275	275	275		
field wet density	t/m ³	2.04	1.93	2.08		
field dry density	t/m ³	1.74	1.57	1.74		
field moisture content	%	17.2	22.6	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 ³	2.10	1.96	2.08		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	-1.0	0.5		
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Moisture ratio	%	96.5	96.5	103.0		
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Hilf density ratio (R _{HD})	%	97.0	98.5	100.0		
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material description

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-5
date of issue 10-Jan-2018

tested by CC
time All Day
date 19-Dec-2017
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		11	12	13		
location	Lot No	34	35	33		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 9	Layer 9	Layer 9		
measurement depth	mm	275	275	275		
field wet density	t/m ³	1.98	2.02	2.08		
field dry density	t/m ³	1.70	1.72	1.81		
field moisture content	%	16.4	17.1	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	2.11	2.12	2.17		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	1.0	1.0		
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Moisture ratio	%	97.0	106.5	106.5		
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Hilf density ratio (R_{HD})	%	94.0	95.0	96.0		
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material description

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-6
date of issue 11-Jan-2018

tested by DM
time 02:00 PM
date 09-Jan-2018
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No	14					
location	Lot No	34				
		Retest of 11				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	FSL				
measurement depth	mm	275				
field wet density	t/m ³	2.07				
field dry density	t/m ³	1.80				
field moisture content	%	14.8				

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	2.05				
adjusted peak converted wet density	t/m ³	-				

moisture variation from OMC (-dry,+wet)%		-2.5				
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Moisture ratio	%	84.5				
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Hilf density ratio (R_{HD})	%	101.0				
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material description

Silty CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-7
date of issue 22-Jan-2018

tested by SP
time PM
date 18-Jan-2018
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 250

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		15	16	17		
location	Lot No	29	28	27		
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	2.11	2.13	2.11		
field dry density	t/m ³	1.89	1.97	1.93		
field moisture content	%	11.4	8.4	9.7		

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 ³	2.17	2.12	2.13		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	-2.0	-1.5		
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Moisture ratio	%	96.5	82.0	88.0		
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Hilf density ratio (R_{HD})	%	97.0	100.5	99.0		
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material description

Silty CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-8
date of issue 22-Jan-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 100

tested by DM
time All Day
date 19-Jan-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		21	22	23		
location	Lot No	23	21	31		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 3	Layer 3	Layer 2		
measurement depth	mm	75	75	75		
field wet density	t/m ³	2.09	2.11	2.06		
field dry density	t/m ³	1.89	1.92	1.82		
field moisture content	%	10.7	9.7	13.1		

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 ³	2.16	2.15	2.15		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	-0.5	0.5		
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Moisture ratio	%	97.0	93.5	103.5		
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Hilf density ratio (R_{HD})	%	97.0	98.0	96.0		
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material description

Silty CLAY



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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-9
date of issue 23-Jan-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 200

tested by CC
time PM
date 20-Jan-2018
checked by SB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		24	25	26		
location	Lot No	27	22	25		
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	175	175	175		
field wet density	t/m ³	2.11	2.13	2.06		
field dry density	t/m ³	1.91	1.95	1.80		
field moisture content	%	10.3	9.4	14.4		

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	2.17	2.13		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		1.0	-1.0	1.0		
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Moisture ratio	%	109.5	92.5	106.0		
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Hilf density ratio (R _{HD})	%	100.5	98.0	97.0		
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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.
Accredited for compliance with ISO/IEC 17025- Testing

LABORATORY ACCREDITATION No 15357

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COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-10
date of issue 08-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by SB
time All Day
date 18-Jan-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		18	19	20		
location	Lot No	25	26	30		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	0	0	0		
measurement depth	mm	275	275	275		
field wet density	t/m ³	2.11	2.11	2.15		
field dry density	t/m ³	1.88	1.91	1.94		
field moisture content	%	12.0	10.9	11.1		

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 ³	2.14	2.14	2.15		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		0.5	-0.5	0.5		
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Moisture ratio	%	106.0	95.0	105.5		
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Hilf density ratio (R_{HD})	%	98.5	98.5	100.0		
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material description

Silty CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-11
date of issue 09-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 200

tested by BM
time All Day
date 06-Feb-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		40	41	42		
location	Lot No	21	22	23		
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	175	175	175		
field wet density	t/m ³	2.13	2.21	2.15		
field dry density	t/m ³	1.96	2.01	1.98		
field moisture content	%	8.8	9.9	8.6		

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	3	8	0		
peak converted wet density	t/m ³	-	-	2.16		
adjusted peak converted wet density	t/m ³	2.19	2.28	-		

moisture variation from OMC (-dry,+wet)%		-1.5	-0.5	-3.0		
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Moisture ratio	%	84.0	95.0	74.0		
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Hilf density ratio (R _{HD})	%	97.0	97.0	99.5		
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material description

Silty CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

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

report No 10057-12
date of issue 09-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by BM
time All Day
date 07-Feb-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		43	44	45		
location	Lot No	21	22	22		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 2	Layer 2	Layer 2		
measurement depth	mm	275	275	275		
field wet density	t/m ³	2.18	2.15	2.15		
field dry density	t/m ³	1.95	1.93	1.91		
field moisture content	%	11.4	11.1	12.5		

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 ³	2.18	2.22	2.20		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	0.0	0.0		
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Moisture ratio	%	96.0	99.0	98.0		
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Hilf density ratio (R_{HD})	%	100.0	97.0	97.5		
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material description

Silty CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-13
date of issue 09-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 125

tested by SP
time PM
date 22-Jan-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		27	28	29		
location	Lot No	28	22	25		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	FSL	FSL	FSL		
measurement depth	mm	100	100	100		
field wet density	t/m ³	2.11	2.09	2.09		
field dry density	t/m ³	1.88	1.91	1.86		
field moisture content	%	12.3	9.3	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 ³	2.15	2.05	2.13		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		0.5	-2.0	-0.5		
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Moisture ratio	%	104.0	81.0	97.5		
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Hilf density ratio (R_{HD})	%	98.5	102.0	98.0		
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material description

Sandy CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-14
date of issue 09-Feb-2018

tested by CC
time 02:30 PM
date 24-Jan-2018
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		30	31	32		
location	Lot No	36	36	32		
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 ³	2.14	2.22	2.15		
field dry density	t/m ³	1.94	1.98	1.90		
field moisture content	%	10.5	12.6	13.2		

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	2.20	2.21	2.16		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	0.5	-0.5		
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Moisture ratio	%	96.0	103.0	97.5		
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Hilf density ratio (R_{HD})	%	97.5	100.5	99.5		
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material description

Silty CLAY



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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-15
date of issue 09-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by MAA
time All Day
date 25-Jan-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		33	34	35		
location	Lot No	36	36	36		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 2	Layer 2	Layer 2		
measurement depth	mm	275	275	275		
field wet density	t/m ³	2.19	2.01	2.03		
field dry density	t/m ³	1.95	1.81	1.80		
field moisture content	%	12.4	11.1	12.7		

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	5	0	0		
peak converted wet density	t/m ³	-	2.19	2.14		
adjusted peak converted wet density	t/m ³	2.23	-	-		

moisture variation from OMC (-dry,+wet)%		0.5	-0.5	0.0		
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Moisture ratio	%	103.0	97.0	102.0		
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Hilf density ratio (R _{HD})	%	98.5	91.5	95.0		
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material description

Silty CLAY



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Approved Signature
C Caulfield

COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-16
date of issue 09-Feb-2018
tested by DM
time: 01:30 PM
date: 29-Jan-2018
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

chainage Block Fill
Layer thickness (mm) 300

test procedures AS1289.2.1.1 & 5.8.1

test No	36					
location	Lot No	36				
		Retest of # 34				
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 2				
measurement depth	mm	275				
field wet density	t/m ³	2.01				
field dry density	t/m ³	1.92				
field moisture content	%	4.5				
laboratory compaction procedure AS1289.5.1.1 Standard Compaction						
standard maximum dry density	t/m ³	1.91				
standard optimum moisture content	%	11.0				

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 ³	0.00				
adjusted standard optimum moisture content %		0.0				
moisture variation (-dry,+wet)	%	-6.5				
moisture ratio (R_m)	%	42.5				
dry density ratio (R_D)	%	100.5				

material description

Silty CLAY

compaction test details

date mat'l sampled 29-Jan-2018
material source Imported - imported
material stabilised
time elapsed

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-17
date of issue 09-Feb-2018

tested by HC
time All Day
date 02-Feb-2018
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 250

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		37	38	39		
location	Lot No	32	32	32		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 2	Layer 2	Layer 2		
measurement depth	mm	225	225	225		
field wet density	t/m ³	2.24	2.10	2.11		
field dry density	t/m ³	2.05	1.94	1.95		
field moisture content	%	9.4	8.2	8.3		

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	2.22	2.20	2.17		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	-1.0	-2.0		
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Moisture ratio	%	96.5	90.5	82.0		
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Hilf density ratio (R_{HD})	%	101.0	95.5	97.5		
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material description

Silty CLAY



47 National Avenue, Pakenham VIC 3810
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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-18
date of issue 16-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by BM
time All Day
date 08-Feb-2018
checked by SB

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		46	47	48		
location	Lot No	23	23	24		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 2	Layer 2	Layer 2		
measurement depth	mm	275	275	275		
field wet density	t/m ³	2.15	2.05	2.08		
field dry density	t/m ³	1.90	1.83	1.82		
field moisture content	%	13.3	12.2	14.3		

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	6	12	0		
peak converted wet density	t/m ³	-	-	2.13		
adjusted peak converted wet density	t/m ³	2.13	2.16	-		

moisture variation from OMC (-dry,+wet)%		-0.5	-0.5	0.0		
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Moisture ratio	%	95.0	97.5	98.5		
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Hilf density ratio (R _{HD})	%	101.0	95.0	98.0		
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material description

Silty CLAY



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Approved Signature

S Benbow

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-19
date of issue 23-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by MH
time All Day
date 16-Feb-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		49	50	51		
location	Lot No	20	18	19		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	Layer 2	Layer 1	Layer 2		
measurement depth	mm	275	275	275		
field wet density	t/m ³	2.27	2.32	2.29		
field dry density	t/m ³	2.05	2.11	2.08		
field moisture content	%	10.5	10.3	10.1		

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	9	17		
peak converted wet density	t/m ³	2.23	-	-		
adjusted peak converted wet density	t/m ³	-	2.26	2.32		

moisture variation from OMC (-dry,+wet)%		1.0	0.0	-0.5		
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Moisture ratio	%	110.5	101.0	95.0		
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Hilf density ratio (R_{HD})	%	101.5	103.0	98.5		
--	----------	--------------	--------------	-------------	--	--

material description

Silty CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-20
date of issue 23-Feb-2018

tested by MH
time All Day
date 17-Feb-2018
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No	52	53	54			
location Lot No	20	20	19			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L. m	Layer 3	Layer 3	Layer 3			
measurement depth mm	275	275	275			
field wet density t/m ³	2.14	2.22	2.22			
field dry density t/m ³	1.92	2.00	2.02			
field moisture content %	11.3	11.0	10.0			

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	5	4	5			
peak converted wet density t/m ³	-	-	-			
adjusted peak converted wet density t/m ³	2.15	2.15	2.18			

moisture variation from OMC (-dry,+wet)%	-1.0	-1.0	-0.5			
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Moisture ratio %	91.0	91.5	94.0			
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Hilf density ratio (R_{HD}) %	100.0	103.0	102.0			
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material description

Silty CLAY



47 National Avenue, Pakenham VIC 3810
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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-21
date of issue 27-Feb-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 0

tested by BM
time All Day
date 22-Feb-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		55	56	57		
location	Lot No	19	20	20		
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	0	0	0		
field wet density	t/m ³	2.12	2.08	2.08		
field dry density	t/m ³	1.90	1.81	1.82		
field moisture content	%	12.0	14.7	14.1		

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 ³	2.16	2.13	2.14		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-0.5	0.5	0.5		
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Moisture ratio	%	97.5	103.0	105.0		
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Hilf density ratio (R _{HD})	%	98.5	97.5	97.0		
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material description

Silty CLAY



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C Caulfield

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-22
date of issue 27-Feb-2018

tested by BM
time All Day
date 24-Feb-2018
checked by CC

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No	58	59	60			
location Lot No	1	1	2			
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L. m	Layer 1	Layer 2	Layer 2			
measurement depth mm	275	275	275			
field wet density t/m ³	2.13	1.99	2.02			
field dry density t/m ³	1.92	1.67	1.80			
field moisture content %	10.8	19.1	12.3			

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	2.04	2.07	2.01			
adjusted peak converted wet density t/m ³	-	-	-			

moisture variation from OMC (-dry,+wet)%	-1.5	-1.5	-3.0			
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Moisture ratio %	87.5	92.5	79.5			
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Hilf density ratio (R_{HD}) %	104.5	96.0	100.5			
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material description

Silty Sandy CLAY

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-23
date of issue 14-Mar-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by SP
time All Day
date 02-Mar-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		61	62	63	64		
location	Lot No	3	3	15	16		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)							
depth from F.S.L.	m	Layer 1	Layer 2	Layer 1	Layer 1		
measurement depth	mm	275	275	275	275		
field wet density	t/m ³	2.27	2.27	2.03	2.19		
field dry density	t/m ³	2.09	2.08	1.79	1.92		
field moisture content	%	8.5	9.0	13.5	14.5		

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	4	0	0		
peak converted wet density	t/m ³	2.26	-	2.03	2.03		
adjusted peak converted wet density	t/m ³	-	2.31	-	-		

moisture variation from OMC (-dry,+wet)%		-1.0	-1.0	-1.5	-1.5		
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Moisture ratio	%	89.5	90.0	89.5	90.0		
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Hilf density ratio (R_{HD})	%	100.5	98.5	100.0	108.0		
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material description

Silty CLAY



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COMPACTION ASSESSMENT BY NUCLEAR GAUGE METHOD

report No 10057-24
date of issue 14-Mar-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by CC
time 02:00 PM
date 07-Mar-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No		65	66	67		
location	Lot No	15	16	17		
Sampling procedures AS1289.1.1,1.2.1-Clause 6.4(b)						
depth from F.S.L.	m	0	0	0		
measurement depth	mm	275	275	275		
field wet density	t/m ³	1.99	2.13	2.01		
field dry density	t/m ³	1.75	1.88	1.82		
field moisture content	%	13.6	13.1	10.5		

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 ³	2.09	2.16	2.11		
adjusted peak converted wet density	t/m ³	-	-	-		

moisture variation from OMC (-dry,+wet)%		-1.0	-1.0	-1.0		
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Moisture ratio	%	93.5	94.5	91.5		
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Hilf density ratio (R _{HD})	%	95.0	98.5	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.
Accredited for compliance with ISO/IEC 17025- Testing

LABORATORY ACCREDITATION No 15357

Approved Signature
C Caulfield

COMPACTION ASSESSMENT

BY NUCLEAR GAUGE METHOD

report No 10057-25
date of issue 14-Mar-2018

Client Streetworks
Client address 4 Len Thomas Place, Narre Warren, 3805
Project Gardenia Stage 3
Location Officer

Feature Block Fill
Layer thickness (mm) 300

tested by KC
time All Day
date 09-Mar-2018
checked by CC

Field density test procedure AS1289.2.1.1 and 5.8.1

Test No	68	69	70	71		
location Lot No	13	14	15	16		
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		
measurement depth mm	275	275	275	275		
field wet density t/m ³	2.08	2.11	2.10	2.10		
field dry density t/m ³	1.83	1.87	1.87	1.83		
field moisture content %	13.7	12.5	12.8	14.6		

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	2.10	2.08	2.09	2.12		
adjusted peak converted wet density t/m ³	-	-	-	-		

moisture variation from OMC (-dry,+wet)%	-1.0	-1.5	-1.0	-0.5		
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Moisture ratio %	94.0	88.0	94.0	97.0		
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Hilf density ratio (R_{HD}) %	99.0	101.5	100.5	99.0		
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material description

Silty CLAY