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LEVEL 1 INSPECTION & TESTING 80 WOODS ROAD - STAGE 3 TRUGANINA, VICTORIA

Prepared for Universal Corporation

Report Reference: GS4314.1 AA

Date: 16 June 2017

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PROJECT DETAILS

Project Reference	GS4314.1	Rev	AA
Project Title	80 Woods Road - Stage 3		
Project Location	Truganina	State	VIC
Date	16 June 2017		

CLIENT DETAILS

Prepared For (Client)	Universal Corporation
Client Address	57 Yale Drive, Epping

DISTRIBUTION

Original Held By	Ground Science Pty Ltd
One (1) Electronic Copy	Universal Corporation

This document presents the results of the Level 1 Inspection and Testing performed by Ground Science for the aforementioned project, as the nominated project Geotechnical Inspection & Testing Authority (GITA). This report is detailed for the sole use of the intended recipient(s). Should you have any questions related to this report please do not hesitate to contact the undersigned.

**For & on behalf of
Ground Science Pty Ltd**



**Daniel Schorer
Geotechnical Engineer**

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1. INTRODUCTION

This report presents the results of inspection activities, compaction control and laboratory testing services performed by Ground Science Pty Ltd at the project identified as 80 Woods Road - Stage 3, located in Truganina, Victoria (the 'site'). Ground Science was engaged to provide Level 1 Inspection and Testing services for this component of the project. Authorisation to proceed was provided by Universal Corporation (the 'Client').

Level 1 Testing as defined in AS3798 (2007) "Guidelines on Earthworks for Commercial and Residential Developments" provides for full time inspection of the construction of controlled fill and compaction testing in accordance with AS1289 'Methods of Testing Soils for Engineering Purposes'. The Level 1 Inspection and Testing services described in this report was undertaken by experienced geotechnicians from Ground Science.

2. SCOPE OF WORK

2.1 AREAS OF WORK

Ground Science provided Level 1 Inspection and Testing for the controlled fill placed on Lots 311, 321 – 326 & 331 – 337 as part of the construction of the residential estate. The areas on which controlled fill was placed is shown on site plan Figure 1 (presented in Appendix A), which is based on drawings prepared by Reeds Consulting (Ref: 22562E/3 Drawing No. 3R2 Rev E dated 20/07/16). It is understood that the controlled fill was placed and compacted to approximately 100mm below the required finished level, to allow for up to 100mm of topsoil placement.

This report details the Level 1 earthworks process performed on site which commenced on 24th May 2017 and was completed on 26th May 2017 which included 3 full days of filling operations, which were observed on a fulltime basis by Ground Science technicians.

2.2 PLACEMENT METHODOLOGY

The placement of controlled fill on the above-mentioned areas was carried out in accordance with AS3798 (2007) 'Guidelines on Earthworks for Commercial and Residential Developments'. A Technical specification for the controlled fill placement was not provided. The following placement methodology was adopted on site which is based on the guidelines presented in AS3798 (2007) for Level 1 controlled fill:

- Prior to filling, the area shall be stripped of topsoil, subsoil, soft material and vegetation to a firm base approved by the superintendent;
- Suitable fill material shall be placed in loose horizontal layers not exceeding 250mm in thickness;
- The fill shall be compacted to a Dry Density Ratio of at least 95% Standard (AS 1289: 5.1.1, 5.4.1 or 5.7.1) as per the project specification requirements;
- The fill is to be moisture conditioned to a moisture ratio of 85% – 115% of standard compaction (AS 1289 5.1.1, 5.4.1, or 5.7.1);
- The fill material shall not contain greater than 20% by volume, of particles coarser than 37.5mm and no particle over 200mm in any dimension;
- The frequency of field density testing shall be in accordance with the guidelines in AS3798 2007 for large scale developments (Type 1), which nominates a frequency of not less than:
 - 1 test per layer or 200mm per 2500m²;
 - 1 test per 500m³ distributed reasonably evenly throughout the full depth and area; or
 - 3 tests per site visit; whichever requires the most tests.

3. INSPECTION AND TESTING

3.1 SUBGRADE PREPARATION

Site stripping was conducted with the use of an excavator and grader. Observations of the stripped base indicated all surface soils and vegetation/topsoil was removed resulting in stripping of approximately 50mm across the allotments. The exposed subgrade was observed to be natural soils comprising of medium to high plasticity clay, generally brown/red in colour.

The moisture at subgrade level was assessed to be damp throughout the project. At the commencement of each fill placement area, the subgrade was test rolled. No deflections and/or soft spots were observed and these areas were deemed suitable for subsequent fill placement.

3.2 CONSTRUCTION MATERIALS

Fill for the project is understood to have been sourced from onsite stockpiles generated from road boxing. The material was visually assessed to consist of clay and gravelly clay which was observed to be generally brown or red. The fill material used in this project was nominated by the on-site contractor. Ground Science performed an assessment of the fill source to identify the following material characteristics:

- Material suitability as an engineering property;
- Cohesiveness;
- Free from building debris and vegetative matter;
- Oversize rock particles.

Visual assessments on the above-mentioned properties were conducted on-site and the fill material used was considered acceptable for use on this project. It should be noted that no chemical analysis was conducted on the fill material. The maximum oversize particles within the fill matrix were observed to range up to 150mm. Where encountered, these were removed from the fill prior to placement. The fill source was assessed to be generally dry of optimum moisture content and was deemed suitable for use provided the fill was moisture conditioned before and during placement.

3.3 FILL CONSTRUCTION

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

- Padfoot Roller;
- Excavator;
- Grader;
- Moxy Dump Truck;
- Water Cart.

During fill placement, the weather conditions were generally cool and with typical temperature conditions during the works ranging from 15 to 20 degrees Celsius.

The filling process was generally consistent throughout the project. A grader was used to move the fill material from the existing onsite stockpiles and spread it into thin loose layers over the nominated placement areas. The onsite water cart was used to moisture condition the stockpiled fill material and the base prior to placement. Compaction was provided using a padfoot roller, applying a minimum of 6 or more passes per layer. The thin layers were compacted to form one composite layer, measuring approximately 200mm to 300mm in depth. Between 1 and 2 layers of fill were placed and compacted to achieve the required finished level.

Throughout the filling process and/or at the completion of the day's production, compaction testing was performed to assess the achieved density ratio of each layer. Figure 1 provides a guide to the fill placement and is limited to the areas described in this report. It should be noted that a further topsoil layer of approximately 100mm is expected to complete the finished levels of the fill and does not form part of the controlled fill. This layer is placed to provide a growing medium for grass and gardens. Any fill placed as part of drainage, sewer works or similar also does not form part of this Level 1 report.

3.4 RESULTS OF COMPACTION CONTROL TESTING

Level 1 Inspection and Testing was undertaken by experienced technicians from Ground Science who attended the site for the duration of the construction phase and nominated the location of the in-situ density tests. Testing comprised a total of 7 in-situ density tests using a nuclear moisture-density gauge in accordance with Australian Standard (AS1289 5.8.1) together with 7 "Rapid HILF" Compaction tests (AS1289 5.7.1).

Field density and compaction control testing results are presented on the NATA endorsed Field Density Test Reports in Appendix B. It should be noted that the tests are a representation of the fill placed and support the visual assessment of the works completed.

It is noted that all tests met the minimum density requirement of 95% standard compaction. The HILF rapid compaction testing was undertaken in our NATA accredited Thomastown laboratory. It is also noted that the moisture conditioning was generally found to be around optimum with all of the test results complying with the recommended moisture ratio of between 85% - 115%.

3.5 FINAL SURFACE LEVELS

Observations were made by a Ground Science staff member that filling had been complete up to the nominated finished levels as per confirmation provided from the contractor's site foreman that controlled fill operations were complete. The observed final levels are the constructed finished surface levels of the controlled fill. It should be noted that the overall fill depths are estimated using onsite visual tactile methods and may not be a true representation of fill depths given that conditions on site may change over time. True fill depths should be obtained from the contractor's survey data.

4. COMPLIANCE

Ground Science Staff have undertaken Level 1 Inspection and Testing services of the construction of the controlled fill in the areas designated on Figure 1. Ground Science field staff have also observed that the prepared subgrade provided an adequate base for the subsequent placement of controlled fill.

Based on observations made by Ground Science staff and the results of density tests, we consider that the controlled fill placed has been constructed in accordance with the stated intent of the Specification and AS3798 (2007) and AS2870 (2011).

It should be noted that the final fill layers may be subjected to adverse weather conditions resulting in either surface softening or drying and cracking over time; regardless of the compactive efforts and moisture conditioning applied during the works. The integrity of the top 200mm to 300mm of the fill will deteriorate with time and should be taken into account by the foundation engineer prior to the construction of a dwelling. The levels nominated in this report are a guide to amounts of fill placed and do not necessarily reflect an accurate survey of the fill levels.

Level 1 Inspection & Testing requires full time inspection and testing of the fill placement undertaken on a site. Ground Science (project GITA), are notified daily (or at the completion of each day's work) by the project foreman where subsequent days of fill placement under Level 1 is to occur. On projects that rely upon the importation of a fill source, there can be delays in the receipt of sufficient materials to warrant fill placement works which may result in periods of time where a GITA representative is not required on site. It is the contractor's responsibility to notify the GITA when works proceed and their attendance on site is required again. A GITA relies upon the integrity of

the contractor to advise when site attendance is required and makes all reasonable visual attempts to assess if the works are the same as the previous days attendance.

5. UNDERSTANDING LEVEL 1 INSPECTION & TESTING

The purpose of performing Level 1 Inspection and Testing is to ensure compliance of the fill with the specification. The engagement of a Geotechnical Inspection Testing Authority (GITA) allows the contractor to perform their role in the construction of the filling operation while the GITA monitors the quality control process of the fill placement. The visual observations of thorough processes and work practices by the contractor allows the GITA to approve the subsequent placement of fill without having to wait for the completion of testing and the extended time it takes to get a test result back. The GITA will however, carry out random spot checks of the filling operations throughout the day's production as confirmation that the placement procedures and the fill moisture content is appropriate. At the end of a day's production the GITA will sign off the completed works as satisfactory. Any failed tests will result in that particular area of operation requiring rectification in the following mornings activities. This may be as simple as extra rolling with compaction plant if moisture conditioning is suitable. Sometimes these areas may be retested if the GITA feels it is necessary.

While the code AS3798 2007 is a guideline on the minimum requirements of filling on commercial and residential developments, some projects require a more detailed project specification to deal with site specific issues. While moisture conditioning of fill sources aids in the ease with which compaction is achieved, it is not necessarily a physical characteristic that determines if the placed fill is acceptable. In some situations, the moisture requirement is an extremely important function of the final constructed product. In these situations, a specific project specification should apply to the project as detailed by the designing geotechnical engineer. These are typical of clay liners for wet lands, dams, landfill liners and caps and an array of other engineering situations. Creating a consolidated platform of which is similar to equivalent surrounding natural conditions is the primary aim of level one processes, preventing the occurrence of differential ground movements to footing structures.

**For & on behalf of
Ground Science Pty Ltd**



**Daniel Schorer
Geotechnical Engineer**



6. LIMITATIONS

This type of investigation (as per our commission) is not designed or capable of locating all soil conditions, (which can vary even over short distances). The advice given in this report is based on the assumption that the test results are representative of the overall soil conditions. However, it should be noted that actual conditions in some parts of the Site might differ from those found. If further sampling reveals soil conditions significantly different from those shown in our findings, Ground Science must be consulted. Maintenance and upkeep of finished fill placement must be regularly monitored as exposure to extended weather periods/other elements may cause surface drying which may lead to cracking. Conversely, excessive exposure to moisture may cause heaving/softening in the soils.

It is recognised that the passage of time affects the information and assessment provided in this document. Ground Science's assessment is based on information that existed at the time of the preparation of this document. It is understood that the services provided allowed Ground Science to form no more than an opinion of the actual site conditions observed during sampling and observations of the site visit and cannot be used to assess the effects of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

The scope and the period of Ground Science services are described in the proposal and are subject to restrictions and limitations. Ground Science did not perform a complete assessment of all possible conditions or 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 Ground Science in regards to it.

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 Ground Science for incomplete or inaccurate data supplied by others.

Any drawings or figures 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.

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7. REFERENCES

- AS3798 (2007) Guidelines on Earthworks for Residential and Commercial Developments.
- AS1289 Methods of Testing Soils for Engineering Purposes.

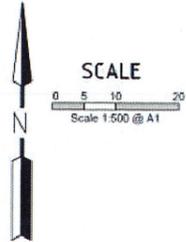
APPENDIX A

Figure 1: Site Figures

LEGEND

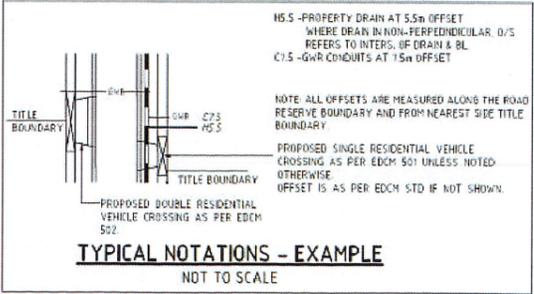
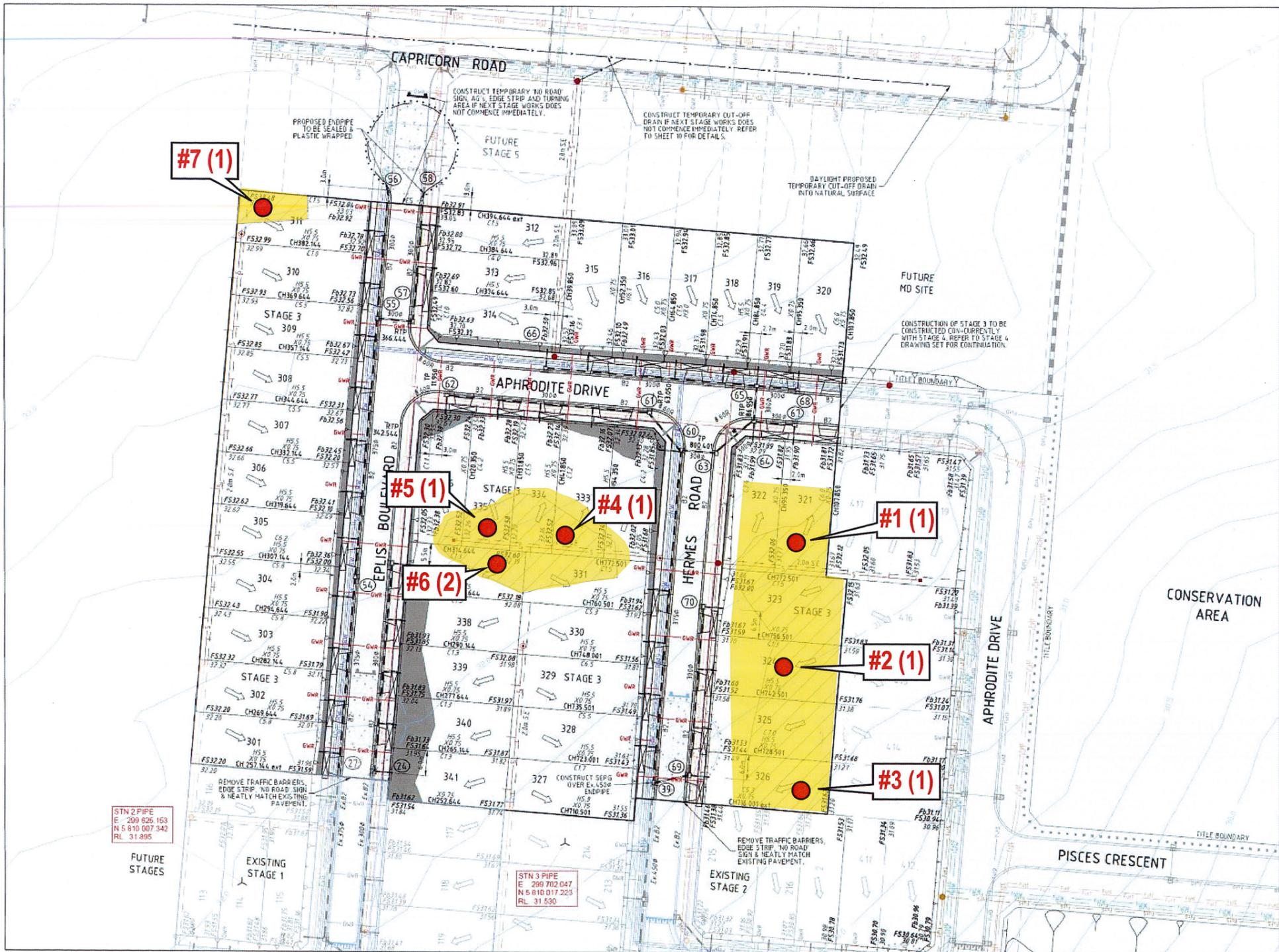
- CUT EARTHWORKS - CUT AREA WITHIN LOTS GREATER THAN 150mm DEPTH (FINISHED SURFACE OVER THE PRE-2012 BULK EARTHWORKS SURFACE)
- FILL EARTHWORKS - FILL AREA WITHIN LOTS GREATER THAN 150mm DEPTH (FINISHED SURFACE OVER THE PRE-2012 BULK EARTHWORKS SURFACE)
- B2 B2 TYPE KERB AS PER MPA FIG 008
- E5 15x150mm CONC. EDGE STRIP WITH SUBSOIL DRAINS UNDER
- TEMPORARY TURNING AREA INCLUDING BOLLARDS.
- PROPOSED 200mm DEPTH CL 3 (NOM 20mm) FOR PAVEMENT, BATTER TO SURFACE @ 1% AT EDGES & ACHIEVE FREE DRAINING SURFACE.
- TOP OF BATTER / RIDGE
- PROPOSED GAS & WATER/RECYCLED WATER CONDUITS } REFER NOTE 7 ON SHEET 1
- PROPOSED ELECT. & TELECOMM. CONDUITS
- EXISTING SURFACE CONTOURS (0.25m INT.)
- BOLLARDS AS INDICATED.
- DIRECTION OF LOT FINISHED SURFACE FALL
- 3.0m S.U.P. 3.0m SHARED USER PATH. REFER TO MPA FIG 006 FOR DETAILS.
- CUT-OFF DRAIN AS PER DETAIL ON SHEET 10

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.



CONSTRUCTION PLAN

DISCLAIMER
THE CONTENT ON THIS PLAN IS FOR PRELIMINARY PURPOSES ONLY AND IS SUBJECT TO THE FORMAL PLANNING APPROVAL BY WYNDHAM CITY COUNCIL, DETAILED ENGINEERING DESIGN AND APPROVALS FROM WYNDHAM CITY COUNCIL AND ALL SERVICE AUTHORITIES. AS SUCH THIS PLAN IS SUBJECT TO CHANGE WITHOUT NOTICE. THIS PLAN IS NOT TO BE USED FOR ANY PURPOSE OTHER THAN FOR PRELIMINARY PURPOSES. HOUSE SITING SHOULD ONLY BE COMPLETED ONCE COUNCIL APPROVED PLANS ARE ISSUED. THE DEVELOPER BEARS NO RESPONSIBILITY FOR ANY OF THESE CHANGES. THE PURCHASER SHOULD ASCERTAIN THE DETAILS ARE CORRECT BEFORE PROCEEDING.



- NOTES**
- DESIGN LINE IS NOT IN CENTRE OF ROAD RESERVE. REFER TO CROSS SECTION FOR DETAILS.
 - REFER TO SHEET 1 FOR MORE TOP DATA.
 - THIS PLAN SHOWS ONLY APPROXIMATE EXTENTS & LEVELS OF FILL TO BE PLACED DURING CONSTRUCTION. DEPTH OF FILL USED FOR TOP DRESSING ALL ALLOTMENTS MAY VARY BY UP TO 0.15m. THE EXTENT OF FILL SHOWN IS BASED ON DESIGN AND MAY BE SUBJECT TO CHANGE FOLLOWING FINAL INSPECTION BY GEOTECHNICAL ENGINEER. EXISTING SURFACE LEVELS SHOWN REFER TO THOSE LEVELS EXISTING PRIOR TO LOT EARTHWORKS COMPLETED IN 2012.
 - DRAINAGE CO-ORDINATES SHOWN REFER TO CENTRE OF PIT/PIPE.

SERVICE SCHEDULE

ROAD NAME	GAS O/S	Rec. WATER O/S	Dr. WATER O/S	ELECT. O/S	TELECOMM O/S	SEWER O/S	BOK-T B DIST. U.N.O.	CARRIAGEWAY WIDTH (FOK-FOK)	ROAD RES. WIDTH	PATH WIDTH
APHRODITE DRIVE (LOTS 336 - 419)	2.25 N	2.70 N	3.20 N	2.60 S	1.775 S	1.00 N	4.35 N 4.05 S	7.30	16.00	15.0 BOTH
ELPIS BOULEVARD	2.25 W	2.70 W	3.20 W	2.60 E	1.775 E	NA	4.35 W 4.05 E	7.30	16.00	15.0 BOTH
HERMES ROAD	2.25 W	2.70 W	3.20 W	2.60 E	1.775 E	1.00E	4.35 W 4.05 E	7.30	16.00	15.0 BOTH

FIGURE 1
80 Woods Road - Stage 3, Truganina
Site and Test Location Plan

LEGEND

- FIELD DENSITY TEST (LAYER NUMBER)
- FILLING AREA

JOB NO: GS4314.1 AA
DATE: 15 JUNE 2017
DRAWN: CC
CHECKED: DS



THIS DRAWING IS NOT TO BE COPIED OR SCALED

APPENDIX B

Field Density Test Report Sheets



field density test results

A C N 105 704 078

13 Brock Street Thomastown Vic, P 03 9464 4617 F 9464 4618

client :	UNIVERSAL CORPORATION (EPPING)	job No:	GS4314/1
project :	WOODS ROAD - STAGE 3 (LEVEL 1)	report No.	AA
location :	TRUGANINA	test date:	25-May-17

Test Number	1	2	3			
Test location taken from	Lot 321	Lot 324	Lot 326			
North West Corner of Lots	20m South	7m South	6m South			
Offset (m)	19m East	20m East	19m East			
Layer Number	F.S.L (1)	F.S.L (1)	F.S.L (1)			
Time of tests	15:20:00	15:30:00	15:40:00			
Depth of Layer	mm 300	300	300			
Depth of Test	mm 275	275	275			
Field Wet Density	t/m ³ 2.04	2.05	2.06			
*Field Moisture Content	% 17.5	19.0	20.5			
Oversize Material	Wet % 11	6	5			
Sieve Size	mm 19.0	19.0	19.0			
Peak Converted Wet Density	t/m ³ 1.996	1.971	1.971			
*Optimum Moisture Content	% 17.5	21.0	23.0			
Compactive Effort Used	std / mod STD	STD	STD			
Moisture Ratio	% 100	91	89			
Moisture Variation	% 0.0	-2.0	-2.5			
Moisture Variation	-	DRY	DRY			
Density Ratio	% 102.0	104.0	104.5			

Specification Requirements 95% Standard compaction

Notes: Moisture Variation: (-) indicates dry; (+) indicates wet

Material description Gravelly CLAY

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

 <p>ACCREDITED FOR TECHNICAL COMPETENCE</p>	<p>NATA Accredited Laboratory No. 20109 Accredited for compliance with ISO/IEC 17025 The results of the tests, calibrations and/or measurements in this document are traceable to Australian/National Standards</p>	 <p>Chris Senserrick Approved Signatory Date</p>	<p>31-May-17</p>
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field density test results

A C N 105 704 078

13 Brock Street Thomastown Vic, P 03 9464 4617 F 9464 4618

client :	UNIVERSAL CORPORATION (EPPING)		job No:	GS4314/1	
project :	WOODS ROAD - STAGE 3 (LEVEL 1)		report No.	AB	
location :	TRUGANINA		test date:	26-May-17	
Test Number	4	5	6	7	
Test location taken from	Lot 333	Lot 335	Lot 337	Lot 311	
North West Corner of Lots	28m South	26m South	4m South	4m South	
Offset (m)	4m East	6m East	21m East	7m East	
Layer Number	1	1	F.S.L (2)	F.S.L (1)	
Time of tests	8:30:00	8:40:00	13:50:00	14:45:00	
Depth of Layer	mm 250	250	250	300	
Depth of Test	mm 225	225	225	275	
Field Wet Density	t/m ³ 1.91	1.94	1.81	1.81	
*Field Moisture Content	% 29.0	31.0	29.5	26.0	
Oversize Material	Wet % 0	3	0	4	
Sieve Size	mm 19.0	19.0	19.0	19.0	
Peak Converted Wet Density	t/m ³ 1.859	1.811	1.756	1.819	
*Optimum Moisture Content	% 29.0	29.5	32.0	28.0	
Compactive Effort Used	std / mod STD	STD	STD	STD	
Moisture Ratio	% 100	105	92	93	
Moisture Variation	% 0.0	1.5	-2.5	-2.0	
Moisture Variation	-	WET	DRY	DRY	
Density Ratio	% 102.5	107.0	103.0	99.5	

Specification Requirements 95% Standard compaction

Notes: Moisture Variation: (-) indicates dry; (+) indicates wet

Material description CLAY (fill)

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

 <p>ACCREDITED FOR TECHNICAL COMPETENCE</p>	<p>NATA Accredited Laboratory No. 20109 Accredited for compliance with ISO/IEC 17025 The results of the tests, calibrations and/or measurements in this document are traceable to Australian/National Standards</p>	 <p>Chris Senserrick Approved Signatory Date</p>	<p>31-May-17</p>
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