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LEVEL 1 INSPECTION & TESTING WALLARA WATERS ESTATE – STAGE 13 WALLAN, VICTORIA

Prepared for Bitu-Mill Pty Ltd

Report Reference: GS4817/1 AA

Date: 25 June 2019

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PROJECT DETAILS

Project Reference	GS4817/1	Rev	AA
Project Title	Wallara Waters Estate - Stage 13		
Project Location	Wallan	State	VIC
Date	25 June 2019		

CLIENT DETAILS

Prepared For (Client)	Bitu-Mill Pty Ltd
Client Address	133 Metrolink Circuit, Campbellfield, VIC 3061

DISTRIBUTION

Original Held By	Ground Science Pty Ltd
One (1) Electronic Copy	Bitu-Mill Pty Ltd

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.

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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 (Ground Science) on fill constructed within Stage 13 of the Wallara Waters Estate, located in Wallan, Victoria (the site). Authorisation to proceed was provided by Bitu-Mill Pty Ltd (the Client).

Level 1 Inspection & 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' and AS1726 (2017) 'Geotechnical Site Investigations'. Ground Science performed the role of the project Geotechnical Inspection & Testing Authority (GITA) with all Level 1 Inspection and Testing services described in this report undertaken by an experienced GITA site representative.

2. SCOPE OF WORK

2.1 AREAS OF WORK

Ground Science provided Level 1 Inspection and Testing of the controlled fill placed within the proposed allotment and pavement footprints (Wallara Waters Boulevard, Samson Brooke Drive, Ram Circuit and Staple Street) of the Wallara Waters Estate Stage 13. The areas requiring Level 1 Inspection and Testing are shown on site plans Figure 1 and Figure 2 in Appendix A of this report, which are based on drawings prepared by Reeds Consulting Pty (Drawing No. 13R31 Version C and 13R32 Version B, Ref 20569E/13, dated 10/12/18)

Level 1 Inspection and Testing commenced on the 18th December 2018 and was completed on the 23rd May 2019. The works included 43 full days and 4 half days of filling operations that were observed on a fulltime basis by Ground Science technician.

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' and clause 12 of the notes presented in Drawing no. 13R1, reference 2056E/13, Version D, Sheet 1. The following placement methodology was adopted on site which was based on both guidelines for the construction of 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 composite compacted layers not exceeding 300mm in thickness;
- The fill shall be compacted to a Dry Density Ratio of at least 95% Standard within residential allotments, 95% Standard for Wallara Waters Boulevard and 98% Standard within the top 150mm of subgrade for all other roads (AS 1289: 5.1.1, 5.4.1 or 5.7.1);
- A moisture variation of ± 3% of the soils optimum moisture content (OMC) was adopted during the fill process to assist with the compaction of fill materials. This was used as a guide for compaction purposes only without the presence of a specification for moisture;
- The fill material shall not contain greater than 20% by volume of particles coarser than 37.5mm and no particle over 2/3 layer thickness 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 2500m^2;
    - 1 test per 500m^3 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 in the presence of a Ground Science GITA representative. It is understood that site stripping was performed with the use of a dozer and generally involved the removal of all surface vegetation and topsoil, typically requiring approximately 50mm to 300mm of stripping until a suitable subgrade was achieved.

The above stripped subgrade was visually inspected and assessed using tactile methods described in AS1726 (2017). The subgrade soils were observed to comprise of silty clay (CI-CH), medium to high plasticity, black/brown and dry to damp in moisture condition. The exposed subgrade was inspected for surface deflection and/or soft spots with the use of a fully loaded single tandem. All tested subgrade passed and was considered suitable for subsequent fill placement with the exception of a swale drain alongside Samson Brook Drive. The soft areas within the swale dain were removed, replaced with suitable fill, compacted and passed the proof roll test.

3.2 CONSTRUCTION MATERIALS

Fill for the project is understood to have been sourced from onsite excavations and offsite locations. The material composition was inspected using visual/tactile assessment. The location of fill sources used for the construction of the subgrade to support residential allotments and road pavement are as follows:

- Onsite Stockpile 1 - Gravelly CLAY (CI-CH), medium to high plasticity, black/grey, damp;
- Onsite Stockpile 2 - Gravelly CLAY (CI-CH), medium to high plasticity, black/grey, damp;
- Onsite stockpile 3 – Silty CLAY (CI-CH), medium to high plasticity, black/grey, with gravel, damp;
- Onsite Stockpile 4 – Silty CLAY (CI), medium plasticity, brown/grey, damp;
- Onsite Burrow Pit - Gravelly CLAY (CH), high plasticity, yellow-orange/black, damp to moist;
- Donnybrook Road - Gravelly CLAY (CI-CH), medium to high plasticity, grey, damp;
- South Morang – Sandy CLAY (CI), medium plasticity, brown, damp;
- Epping – Gravelly CLAY (CL-CI), low to medium plasticity, brown, damp;
- Thornbury – Silty CLAY (CI-CH), medium to high plasticity, brown, with gravel, damp;
- Greenvale – Silty CLAY (CL-CI), low to medium plasticity, brown, with gravel, damp;
- Doreen – Silty CLAY, (CI), medium plasticity, brown, damp;
- Craigieburn – Silty CLAY (CL-CI), low to medium plasticity, brown, with gravel damp;
- Coburg – Sandy CLAY (CL-CI), low to medium plasticity, brown, with gravel damp;
- Mernda – Silty CLAY (CI), medium plasticity, grey, with gravel
- Mickleham – Silty CLAY (CL-CI), low to medium plasticity, brown, with gravel, damp; and
- Ascot Vale – Silty CLAY, (CL-CI, low to medium plasticity, brown, with gravel, damp;

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 suitable for use as engineered fill. It should be noted that no chemical analysis was conducted on the fill material.

3.3 FILL CONSTRUCTION

The contractor had the following plant available on site during the earthworks phase:

- Padfoot Roller;
- Dozer;
- Water Cart;
- 815 Compactor;
- Excavator.

During fill placement, the weather conditions were generally warm and sunny with temperature conditions ranging from 15 to 30 degrees Celsius. Heavy rainfall occurred on the 12th and 19th February 2019, a proof roll test on the exposed subgrade was conducted after each event and was noted to be suitable for further fill placement.

The filling process was generally consistent throughout the project and involved the approved fill sources stockpiled by dump trucks adjacent to the fill placement zones. Onsite dozer, grader and compactor were used to spread the material across the site. A compactor and padfoot roller compacted the materials into layers measuring approximately 300mm (each layer was compacted by applying a minimum of 6 to 8 passes). No oversize particles (greater than 2/3 layer thickness) were observed and moisture conditioning of the fill soils was performed with an onsite water cart to achieve a moisture condition close to the soils optimum moisture content (OMC).

The depth of filling within the site ranged from 1 to 6 layers of 300mm thick controlled fill placed and compacted to achieve the required finished surface levels. 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 and Figure 2 provides a guide to the areas of fill placement and the location of density tests performed. 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 146 in-situ density tests using a nuclear moisture-density gauge in accordance with Australian Standard (AS1289.5.8.1) together with 146 "Rapid HILF" Compaction tests (AS1289.5.7.1). The tests were conducted to assess the level of compaction and moisture ratio achieved for fill construction.

A summary of the field density tests performed for the project is presented in Appendix B of this report. Field density and compaction control testing report sheets are presented in Appendix C of this report. It should be noted that the tests are a representation of the fill placed and support the visual assessment of the works completed.

All tests were noted to meet the required density ratio of 95% Standard within residential allotments, 95% Standard on Wallara Waters Boulevard and all other roads pavement areas and 98% Standard within the top 150mm of Samson Brooke Drive, Ram Circuit and Staple Street pavement areas with the exception of few test areas. Test numbers #2, #29, #31, #47, #48, #55 and #74 did not meet the required density ratio of 95% Standard. These areas were reworked, retested as #7, #38, #31, #66, #67, #122 and #81 and achieved a compliant density ratio.

The moisture condition of the compacted fill material was noted to be generally within the recommended moisture variation of ± 3% of OMC. All laboratory testing was undertaken in our NATA accredited Thomastown laboratory.

3.5 FINAL SURFACE LEVELS

Observations were made by a Ground Science staff member that filling had been completed up to the nominated finished levels as per confirmation provided from the contractor's site foreman. 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 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 and Figure 2. 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 general construction notes, AS3798 (2007).

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

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REVIEWED:

Tim Hodgson
Senior Engineering Geologist

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.

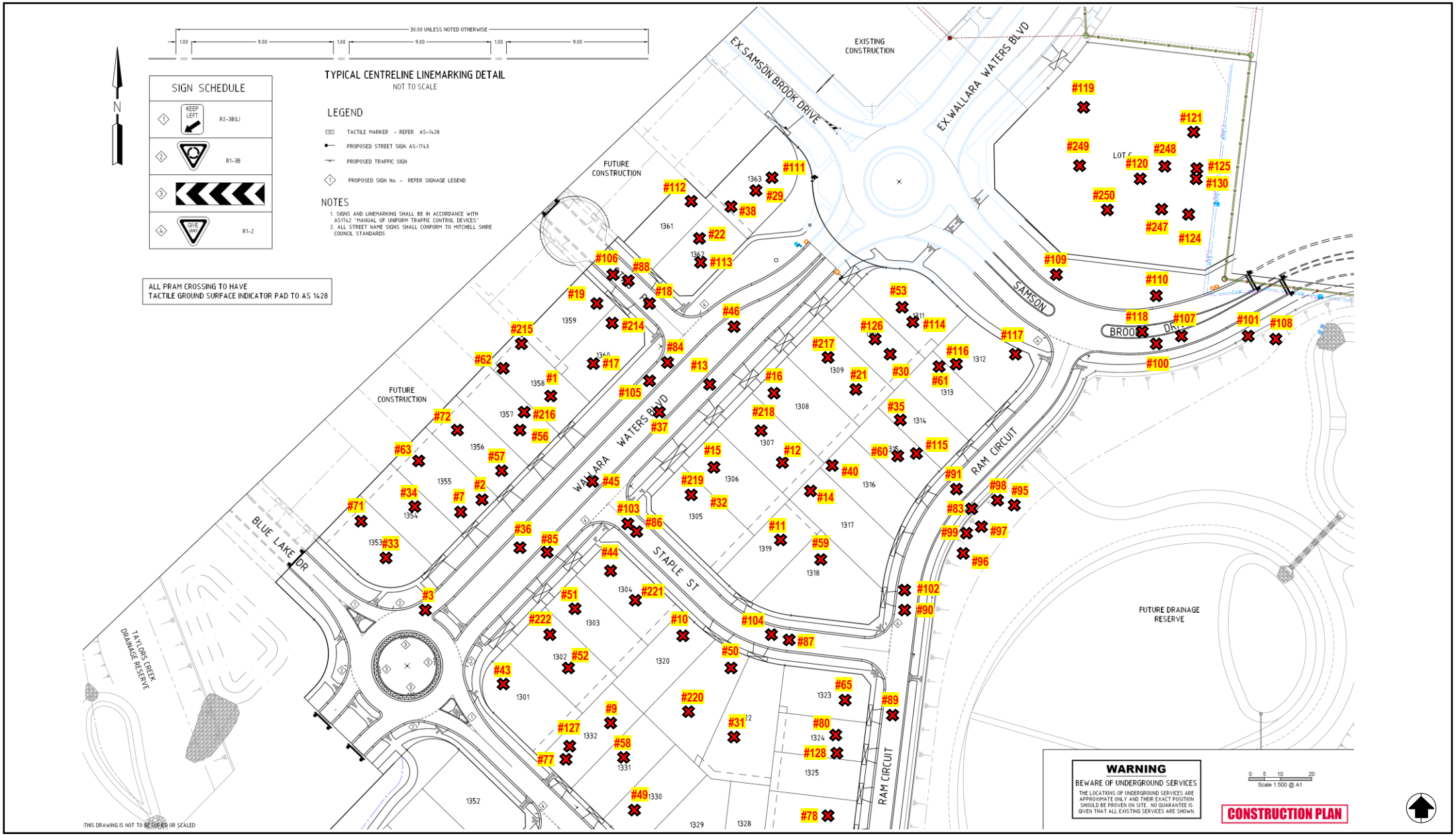
Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

7. REFERENCES

- AS3798 (2007) Guidelines on Earthworks for Residential and Commercial Developments.
- AS1289 Methods of Testing Soils for Engineering Purposes.
- AS1726 (1993): Geotechnical Site Investigations.
- Drawing No. 13R1, Reference 20569E/13, Version 2, Sheet 1 provided by Reed Consulting Pty Ltd

APPENDIX A

Figure 1 and 2: Site Plan and Test Locations



Rev		Drawn	Date	Checked	Scale
0	Figure 1: Density Test Location	AF	12/06/19	TH	NTS

Legend

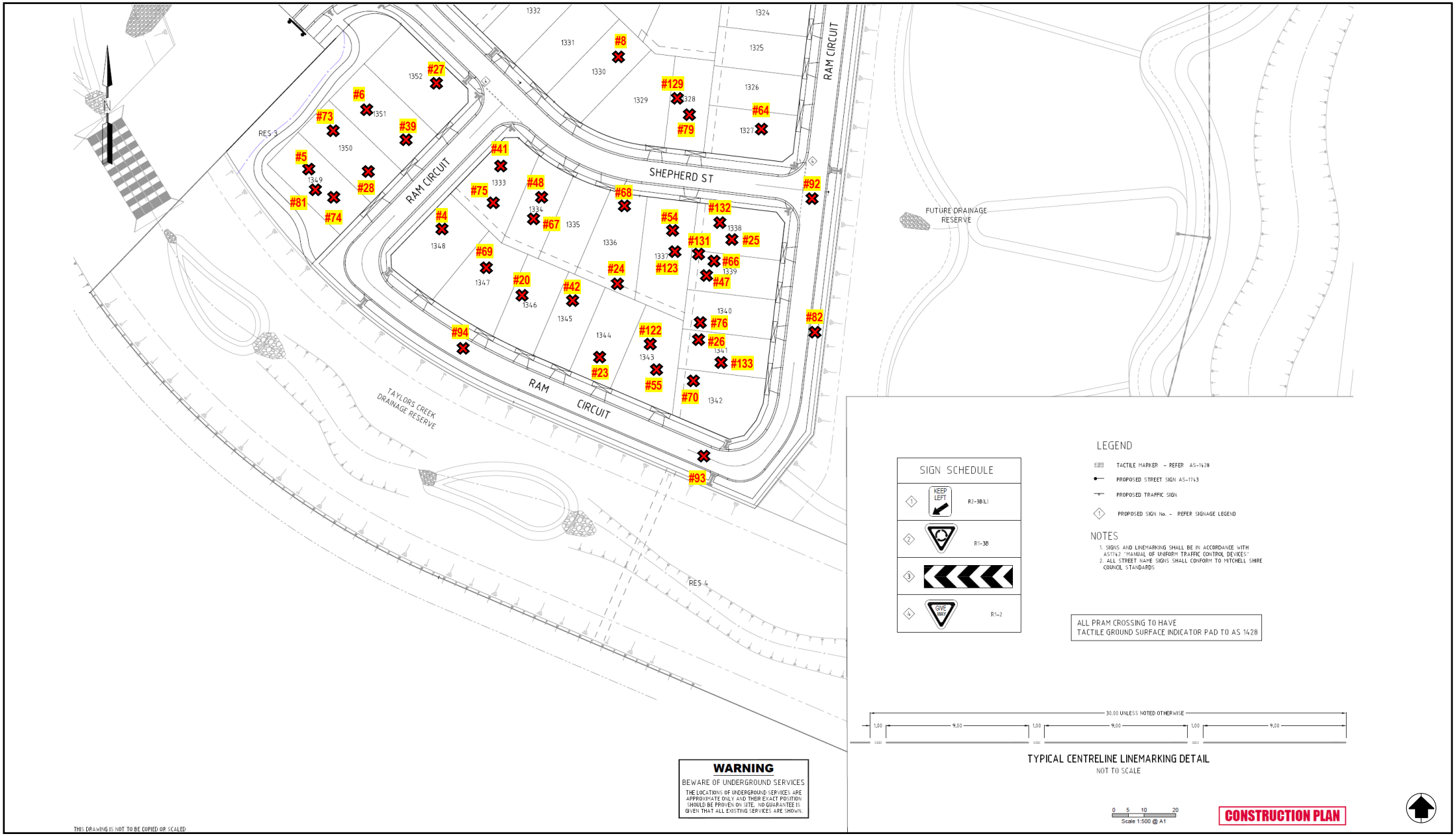
✖ Density Test Location

WALLARA WATERS ESTATE - STAGE 13, WALLAN

Prepared For: Bitu-mill Pty Ltd

Job No: GS4817.1 AA

GroundScience



Rev		Drawn	Date	Checked	Scale
0	Figure 2: Density Test Location	AF	12/06/19	TH	NTS

Legend

Density Test Location

WALLARA WATERS ESTATE - STAGE 13, WALLAN

Prepared For: Bitu-mill Pty Ltd

Job No: GS4817.1 AA

GroundScience

APPENDIX B

Field Density Test Summary

LEVEL 1 - COMPACTION TEST SUMMARY

Client:	**BITU-MILL (CAMPBELLFIELD)**	**Job No:**	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13**	**Tech:**	**PRD**
Location:	**WALLAN**		

Date	Test No.	Location	Layer No.	Density Ratio (%)	Moisture Ratio (%)	Moisture variation	(P) Pass (F) Fail	Comments
9/01/2019	1	North corner / Lot 1358 / 21m South East, 8m South West	1	101.0	79.0	-3.0	P	
9/01/2019	2	North Corner / Lot 1355 / 30m South East, 5m South West	1	92.5	91.0	-2.0	F	Retested (test #7)
9/01/2019	3	North Corner / Lot 1353 / 40m South East, 12m South West	1	104.5	86.0	-2.5	P	
10/01/2019	4	North Corner / Lot 1348 / 7m South East, 9m South West	1	96.0	110.0	2.0	P	
10/01/2019	5	North Corner / Lot 1349 / 11m South East, 6m South West	1	97.5	82.0	-3.0	P	
10/01/2019	6	North Corner / Lot 1351 / 12m South East, 9m South West	1	99.5	102.0	0.5	P	
11/01/2019	7	North Corner / Lot 1355 / 27m South East, 10m South West	1	110.0	100.0	0.0	P	Retest #2
11/01/2019	8	North Corner / Lot 1330 / 9m South East, 10m South West	1	100.5	100.0	0.0	P	
11/01/2019	9	North Corner / Lot 1332 / 9m South East, 9m South West	1	104.5	100.0	0.0	P	
11/01/2019	10	North Corner / Lot 1320 / 7m South East, 8m South West	1	Oversize	-	-	-	
14/01/2019	11	North Corner / Lot 1319 / 8m South East, 12m South West	1	101.5	97.0	-0.5	P	
14/01/2019	12	North Corner / Lot 1307 / 23m South East, 10m South West	1	97.0	115.0	3.0	P	
14/01/2019	13	North Corner / Lot 1362 / 39m South East, 40m South West	1	98.5	100.0	0.0	P	
15/01/2019	14	North Corner / Lot 1317 / 5m South East, 8m South West	1	100.5	113.0	2.5	P	
15/01/2019	15	North Corner / Lot 1306 / 7m South East, 9m South West	1	97.0	103.0	0.5	P	
15/01/2019	16	North Corner / Lot 1308 / 5m South East, 12m South West	1	99.0	108.0	1.5	P	
16/01/2019	17	North Corner / Lot 1360 / 8m South East, 18m South West	1	102.0	103.0	0.5	P	
16/01/2019	18	North Corner / Lot 1362 / 10m South East, 37m South West	1	102.0	100.0	0.0	P	
16/01/2019	19	North Corner / Lot 1359 / 12m South East, 5m South West	1	103.5	103.0	0.5	P	
17/01/2019	20	North Corner / Lot 1346 / 3m South East, 11m South West	1	100.5	100.0	0.0	P	
17/01/2019	21	North Corner / Lot 1309 / 7m South East, 23m South West	1	99.5	102.0	0.5	P	
17/01/2019	22	North Corner / Lot 1362 / 10m South East, 5m South West	1	99.5	103.0	0.5	P	
18/01/2019	23	North Corner / Lot 1344 / 6m South East, 22m South West	1	102.5	88.0	-4.5	P	
18/01/2019	24	North Corner / Lot 1336 / 14m South East, 26m South West	1	99.0	93.0	-2.5	P	
21/01/2019	25	North Corner / Lot 1338 / 12m South East, 10m South West	1	96.5	116.0	4.0	P	
21/01/2019	26	North Corner / Lot 1341 / 7m South East, 4m South West	1	100.5	110.0	2.5	P	
21/01/2019	27	North Corner / Lot 1352 / 21m South East, 5m South West	2	99.5	110.0	2.5	P	
21/01/2019	28	North Corner / Lot 1350 / 21m South East, 4m South West	2	100.0	112.0	3.0	P	
22/01/2019	29	North Corner / Lot 1363 / 10m South East, 21m South West	2	94.5	134.0	8.0	F	Retested (test #38)
22/01/2019	30	North Corner / Lot 1310 / 23m South East, 6m South West	2	98.0	121.0	5.0	F	Retested (test #126)

LEVEL 1 - COMPACTION TEST SUMMARY

Client:	**BITU-MILL (CAMPBELLFIELD)**	**Job No:**	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13**	**Tech:**	**PRD**
Location:	**WALLAN**		

Date	Test No.	Location	Layer No.	Density Ratio (%)	Moisture Ratio (%)	Moisture variation	(P) Pass (F) Fail	Comments
22/01/2019	31	North Corner / Lot 1322 / 7m South East, 27m South West	1	94.5	118.0	4.0	F	Reworked (Pass)
23/01/2019	32	North Corner / Lot 1305 / 19m South East, 5m South West	2	101.0	126.0	3.0	P	
23/01/2019	33	North Corner / Lot 1353 / 20m South East, 7m South West	2	97.5	127.0	3.5	P	
23/01/2019	34	North Corner / Lot 1354 / 15m South East, 3m South West	3	97.5	131.0	3.5	P	
24/01/2019	35	North Corner / Lot 1314 / 8m South East, 10m South West	3	101.5	102.0	0.5	P	
24/01/2019	36	North Corner / Lot 1355 / 49m South East, 4m South West	2	96.5	85.0	-1.5	P	
24/01/2019	37	North Corner / Lot 1360 / 48m South East, 17m South West	2	106.5	90.0	-2.0	P	
24/01/2019	38	North Corner / Lot 1363 / 28m South East, 7m South West	2	106.5	108.0	2.5	P	Retest #29
25/01/2019	39	North Corner / Lot 1351 / 25m South East, 8m South West	3	102.0	112.0	3.5	P	
25/01/2019	40	North Corner / Lot 1316 / 3m South East, 11m South West	3	99.0	110.0	2.5	P	
29/01/2019	41	North Corner / Lot 1333 / 7m South East, 8m South West	2	99.5	110.0	2.5	P	
29/01/2019	42	North Corner / Lot 1345 / 6m South East, 7m South West	2	101.0	110.0	2.5	P	
29/01/2019	43	North Corner / Lot 1301 / 8m South East, 10m South West	2	95.5	111.0	2.5	P	
29/01/2019	44	North Corner / Lot 1304 / 7m South East, 8m South West	2	100.0	111.0	3.0	P	
30/01/2019	45	North Corner / Lot 1357 / 50m South East, 2m South West	4	102.5	74.0	-4.0	P	
30/01/2019	46	North Corner / Lot 1361 / 45m South East, 25m South West	4	104.0	82.0	-3.0	P	
30/01/2019	47	North Corner / Lot 1339 / 6m South East, 8m South West	2	93.0	105.0	0.5	F	Retested (test #66)
30/01/2019	48	North Corner / Lot 1334 / 7m South East, 10m South West	3	92.0	100.0	0.0	F	Retested (test #67)
30/01/2019	49	North Corner / Lot 1330 / 5m South East, 24m South West	2	107.0	92.0	-2.5	P	
30/01/2019	50	North Corner / Lot 1321 / 10m South East, 6m South West	2	100.5	100.0	0.0	P	
31/01/2019	51	North Corner / Lot 1303 / 7m South East, 7m South West	3	98.5	111.0	2.5	P	
31/01/2019	52	North Corner / Lot 1302 / 18m South East, 10m South West	3	95.0	100.0	0.0	P	
1/02/2019	53	North corner / Lot 1311 / 16m South East, 13m South West	4	95.0	115.0	5.0	F	Retested (test #114)
1/02/2019	54	North corner / Lot 1337 / 10m South East, 10m South West	3	94.5	125.0	7.0	F	Retested (test #123)
1/02/2019	55	North corner / Lot 1343 / 12m South East, 15m South West	3	94.0	127.5	7.5	F	Retested (test #122)
1/02/2019	56	North Corner / Lot 1357 / 22m South East, 8m South West	3	97.5	103.0	0.5	P	
1/02/2019	57	North Corner / Lot 1356 / 27m South East, 8m South West	3	99.0	86.0	-2.0	P	
1/02/2019	58	North Corner / Lot 1331 / 6m South East, 14m South West	3	99.0	100.0	0.0	P	
4/02/2019	59	North Corner / Lot 1318 / 6m South East, 6m South West	4	98.5	109.0	2.0	P	
4/02/2019	60	North Corner / Lot 1315 / 12m South East, 7m South West	4	98.5	122.0	5.0	F	Retested (test #115)

LEVEL 1 - COMPACTION TEST SUMMARY

Client:	**BITU-MILL (CAMPBELLFIELD)**	**Job No:**	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13**	**Tech:**	**PRD**
Location:	**WALLAN**		

Date	Test No.	Location	Layer No.	Density Ratio (%)	Moisture Ratio (%)	Moisture variation	(P) Pass (F) Fail	Comments
4/02/2019	61	North Corner / Lot 1313 / 7m South East, 3m South West	4	97.0	123.0	4.5	F	Retested (test #116)
4/02/2019	62	North Corner / Lot 1358 / 5m South East, 11m South West	3	103.0	93.0	-1.0	P	
4/02/2019	63	North Corner / Lot 1355 / 6m South East, 9m South West	3	101.5	109.0	2.0	P	
4/02/2019	64	North corner / Lot 1327 / 19m South East, 5m South West	3	104.5	86.0	-2.5	P	
4/02/2019	65	North corner: Lot 1339 / 8m S.E, 2m S.W	3	108.0	87.0	-2.0	P	
5/02/2019	66	North corner: Lot 1339 / 8m S.E, 2m S.W	2	102.5	125.0	5.0	F	Retest #47, Retested (test #131)
5/02/2019	67	North corner: Lot 1334 / 7m S.E, 20m S.W	3	102.0	112.0	3.0	P	Restest #48
5/02/2019	68	North corner: Lot 1336 / 6m S.E. 5m S.W	4	102.0	102.0	0.5	P	
5/02/2019	69	North corner: Lot 1347 / 7m S.E, 7m S.W	4	103.0	111.0	2.5	P	
5/02/2019	70	North corner: Lot 1342 / 7m S.E, 5m S.W	4	101.0	100.0	0.0	P	
6/02/2019	71	North corner: Lot 1353 / 7m S.E, 5m S.W	4	97.0	112.0	3.0	P	
6/02/2019	72	North corner: Lot 1356 / 8m S.E, 8m S.W	4	99.5	100.0	0.0	P	
6/02/2019	73	North corner: Lot 1350 / 9m S.E, 6m S.W	4	102.5	98.0	-0.5	P	
8/02/2019	74	North corner: Lot 1349 / 24m S.E, 7m S.W	5	93.0	71.0	-2.5	F	Retested (test #81)
11/02/2019	75	North corner: Lot 1333 / 11m S.E, 20m S.W	5	102.0	100.0	0.0	P	
11/02/2019	76	North corner: Lot 1340 / 6m S.E, 8m S.W	5	100.5	97.0	-1.0	P	
11/02/2019	77	North corner: Lot 1332 / 7m S.E, 26m S.W	4	106.5	84.0	-5.5	F	Retested (test #127)
12/02/2019	78	North corner: Lot 1326 / 18m S.E, 6m S.W	4	96.5	85.0	-2.0	P	
12/02/2019	79	North corner: Lot 1328 / 17m S.E, 6m S.W	4	102.0	62.0	-5.5	F	Retested (test #129)
12/02/2019	80	North corner: Lot 1324 / 18m S.E, 6m S.W	4	102.0	72.0	-4.0	F	Retested (test #128)
14/02/2019	81	North corner: Lot 1349 / 17m S.E, 10m S.W	5	103.0	84.0	-2.5	P	Retest #74
14/02/2019	82	North corner: Lot 1340 / 4m S.E, 10m S.W	2	95.5	84.0	-2.5	P	
14/02/2019	83	North corner: Lot 1315 / 43m S.E, 5m S.W	2	98.0	83.0	-2.5	P	
14/02/2019	84	North corner: Lot 1359 / 39m S.E, 5m S.W	3	102.0	71.0	-4.5	F	Retested (#105)
14/02/2019	85	North corner: Lot 1355 / 56m S.E, 2m S.W	3	102.5	80.0	-3.0	P	
15/02/2019	86	North corner: Lot 1305 / 8m S.E, 26m S.W	2	101.0	66.0	-4.5	F	Retested (#103)
15/02/2019	87	North corner: Lot 1318 / 18m S.E, 32m S.W	3	105.0	60.0	-5.5	F	Retested (#104)
15/02/2019	88	North corner: Lot 1361 / 10m S.E, 85m S.W	3	101.5	74.0	-3.0	F	Retested (#106)
18/02/2019	89	North corner: Lot 1323 / 36m S.E, 8m S.W	2	102.5	84.0	-2.0	P	
18/02/2019	90	North corner: Lot 1318 / 38m S.E, 0m S.W	3	103.5	66.0	-5.0	P	Retested (#102)

LEVEL 1 - COMPACTION TEST SUMMARY

Client:	**BITU-MILL (CAMPBELLFIELD)**	**Job No:**	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13**	**Tech:**	**PRD**
Location:	**WALLAN**		

Date	Test No.	Location	Layer No.	Density Ratio (%)	Moisture Ratio (%)	Moisture variation	(P) Pass (F) Fail	Comments
18/02/2019	91	North corner: Lot 1315 / 35m S.E, 2m S.W	3	105.0	82.0	-2.5	P	
19/02/2019	92	North corner: Lot 1327 / 36m S.E, 28m South	3	101.5	82.0	-2.5	P	
19/02/2019	93	North corner: Lot 1342 / 10m S.E, 27m South	3	100.5	91.0	-1.5	P	
19/02/2019	94	North corner: Lot 1347 / 18m S.E, 35m S.E	2	107.5	81.0	-2.5	P	
25/02/2019	95	North corner: Lot 1314 / 53m S.E, 5m S.W	3	95.5	100.0	0.0	P	
25/02/2019	96	North corner: Lot 1315 / 54m S.E, 7m S.W	4	97.0	85.0	-3.0	P	
25/02/2019	97	North corner: Lot 1316 / 56m S.E, 8m S.W	5	98.5	100.0	0.0	P	
26/02/2019	98	North corner: Lot 1314 / 53m S.E, 5m S.W	6	101.5	90.0	-2.0	P	
26/02/2019	99	North corner: Lot 1316 / 50m S.E, 4m S.W	6	99.5	100.0	0.0	P	
27/02/2019	100	North corner: Lot 1312 / 50m S.E, 36m N.E	3	102.0	95.0	-1.0	P	
27/02/2019	101	North corner: Lot 1312 / 70m S.E, 53m N.E	3	99.5	100.0	0.0	P	
27/02/2019	102	North corner: Lot 1318 / 38m S.E, 0m S.W	3	104.5	100.0	0.0	P	Retest #90
27/02/2019	103	North corner: Lot 1305 / 8m S.E, 26m S.W	2	104.5	100.0	0.0	P	Retest #86
27/02/2019	104	North corner: Lot 1318 / 18m S.E, 32m S.W	3	101.5	89.0	-1.5	P	Retest #87
28/02/2019	105	North corner: Lot 1360 / 24m S.E, 12m S.W	3	98.5	100.0	0.0	P	Retest #84
28/02/2019	106	North corner: Lot 1361 / 5m S.E, 38m S.W	3	99.0	87.0	-2.0	P	Retest #88
28/02/2019	107	North corner: Lot 1312 / 41m N.E, 55m S.E	5	100.0	100.0	0.0	P	
28/02/2019	108	North corner: Lot 1312 / 60m N.E, 74m S.E	5	98.0	88.0	-1.5	P	
28/02/2019	109	North corner: Lot 1312 / 11m S.E, 30m N.E	2	102.0	91.0	-1.5	P	
28/02/2019	110	North corner: Lot 1312 / 38m S.E, 46m N.E	2	100.5	86.0	-2.0	P	
7/03/2019	111	North corner: Lot 1363 / 13m S.E, 13m S.W	4	102.0	85.0	-2.5	P	
7/03/2019	112	North corner: Lot 1361 / 9m S.E, 5m S.W	4	98.0	103.0	0.5	P	
7/03/2019	113	North corner: Lot 1362 / 11m S.E, 14m S.W	4	103.0	95.0	-1.0	P	
12/03/2019	114	North corner / Lot 1311 / 16m South East, 13m South West	4	99.5	104.0	1.0	P	Retest #53
12/03/2019	115	North Corner / Lot 1315 / 12m South East, 7m South West	4	98.0	112.0	3.0	P	Retest #60
12/03/2019	116	North Corner / Lot 1313 / 7m South East, 3m South West	4	101.0	104.0	1.0	P	Retest #61
12/03/2019	117	North corner: Lot 1312 / 19m S.E, 0m S.W	4	103.5	88.0	-2.5	P	
12/03/2019	118	North corner: Lot 1312 / 42m S.E, 30m N.E	4	104.5	86.0	-3.0	P	
14/03/2019	119	North corner: Lot C / 21m South, 0m East	1	95.5	109.0	2.0	P	
14/03/2019	120	North corner: Lot C / 42m South, 21m East	1	100.5	98.0	-0.5	P	

LEVEL 1 - COMPACTION TEST SUMMARY

Client:	**BITU-MILL (CAMPBELLFIELD)**	**Job No:**	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13**	**Tech:**	**PRD**
Location:	**WALLAN**		

Date	Test No.	Location	Layer No.	Density Ratio (%)	Moisture Ratio (%)	Moisture variation	(P) Pass (F) Fail	Comments
14/03/2019	121	Lot C / 25m South, 36m East	1	99.0	100.0	0.0	P	
14/03/2019	122	North corner / Lot 1343 / 12m South East, 15m South West	3	105.5	99.0	-0.5	P	Retest #55
14/03/2019	123	North corner / Lot 1337 / 10m South East, 10m South West	3	101.0	109.0	2.5	P	Retest #54
19/03/2019	124	Lot C / 52m South, 39m East	2	100.0	87.0	-2.5	P	
19/03/2019	125	Lot C / 35m South, 40m East	2	101.5	68.0	-5.0	P	
19/03/2019	126	North Corner / Lot 1310 / 23m South East, 6m South West	2	102.5	98.0	-0.5	P	Retest #30
19/03/2019	127	North corner: Lot 1349 / 24m S.E, 7m S.W	4	99.5	82.0	-2.5	P	Retest #77
19/03/2019	128	North corner: Lot 1324 / 18m S.E, 6m S.W	4	102.5	98.0	-0.5	P	Retest #80
19/03/2019	129	North corner: Lot 1328 / 17m S.E, 6m S.W	4	98.0	89.0	-1.5	P	Retest #79
21/03/2019	130	Lot C / 53m South, 40m East	2	103.0	79.0	-4.0	P	
21/03/2019	131	North corner: Lot 1339 / 8m S.E, 2m S.W	2	99.5	113.0	3.0	P	Retest #66
27/03/2019	132	Lot 1338 / 5m S.E, 6m S.W	6	96.5	92.0	-1.5	P	
27/03/2019	133	Lot 1341 / 12m S.E, 9m S.W	6	96.0	85.0	-3.0	P	
14/05/2019	214	Lot 1360 / 3m S.E, 7m S.W	4	108.5	91.0	-2.5	P	
14/05/2019	215	Lot 1358 / 5m S.E, 2m S.W	4	102.0	100.0	0.0	P	
14/05/2019	216	Lot 1357 / 9m S.E, 2m S.W	4	102.5	102.0	0.5	P	
14/05/2019	217	Lot 1309 / 9m S.E, 6m S.W	4	106.5	98.0	-0.5	P	
14/05/2019	218	Lot 1307 / 10m S.E, 4m S.W	4	105.0	97.0	-0.5	P	
14/05/2019	219	Lot 1305 / 8m S.E, 4m S.W	4	100.5	110.0	1.5	P	
14/05/2019	220	Lot 1321 / 10m S.E, 21m S.W	4	100.5	103.0	0.5	P	
14/05/2019	221	Lot 1304 / 20m S.E, 8m S.W	4	102.0	115.0	2.5	P	
14/05/2019	222	Lot 1301 / 8m S.E, 5m S.W	4	102.0	107.0	1.0	P	
24/05/2019	247	Lot C / 50m South, 28m East	2	104.0	95.0	-1.0	P	
24/05/2019	248	Lot C / 33m South, 28m East	2	101.0	100.0	0.0	P	
24/05/2019	249	Lot C / 40m South, 0m East	1	102.0	100.0	0.0	P	
24/05/2019	250	Lot C / 53m South, 12m East	1	102.5	103.0	0.5	P	

APPENDIX C

Field Density Test Report Sheets

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AA**
location :	**WALLAN**	test date:	**9-Jan-19**

Test Number		1	2	3			
Test location taken from		Lot 1358	Lot 1355	Lot 1353			
North corner of lot		21m S.E	30m S.E	40m S.E			
		8m S.W	5m S.W	12m S.W			
Layer Number		1	1	1			
Time of tests		15:10:00	15:20:00	15:35:00			
Depth of Layer	mm	250	275	250			
Depth of Test	mm	225	250	225			
Field Wet Density	t/m^3	2.15	1.66	1.81			
*Field Moisture Content	%	11.0	20.5	14.5			
Oversize Material	Wet %	6	0	5			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	2.127	1.790	1.733			
*Optimum Moisture Content	%	14.0	22.5	17.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**79**	**91**	**86**			
Moisture Variation	%	**-3.0**	**-2.0**	**-2.5**			
Moisture Variation		**DRY**	**DRY**	**DRY**			
Density Ratio	%	**101.0**	**92.5**	**104.5**			

Specification Requirements 95% Standard compaction

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

Material description silty CLAY, gravel, medium to high plasticity, black

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

NATA Accredited Laboratory No. 15055
Accredited for compliance with ISO/IEC 17025 - Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National Standards

Chris Senserrick
Approved Signatory
Date 14-Jan-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AB**
location :	**WALLAN**	test date:	**10-Jan-19**

Test Number		4	5	6			
Test location taken from		Lot 1348	Lot 1349	Lot 1351			
North corner of lot		7m S.E	11m S.E	12m S.E			
		9m S.W	6m S.W	9m S.W			
Layer Number		1	1	1			
Time of tests		13:10:00	13:20:00	13:30:00			
Depth of Layer	mm	275	275	250			
Depth of Test	mm	250	250	225			
Field Wet Density	t/m^3	1.92	1.87	1.98			
*Field Moisture Content	%	22.5	13.5	24.5			
Oversize Material	Wet %	0	3	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	2.006	1.921	1.984			
*Optimum Moisture Content	%	20.5	16.5	24.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**110**	**82**	**102**			
Moisture Variation	%	**2.0**	**-3.0**	**0.5**			
Moisture Variation		**WET**	**DRY**	**WET**			
Density Ratio	%	**96.0**	**97.5**	**99.5**			

Specification Requirements 95% Standard compaction

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

Material description silty CLAY, medium to high plasticity, brown

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 14-Jan-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AC**
location :	**WALLAN**	test date:	**11-Jan-19**

Test Number	7	8	9	10		
Test location taken from	Lot 1355	Lot 1330	Lot 1332	Lot 1320		
North corner of lot	27m S.E	9m S.E	9m S.E	7m S.E		
	10m S.W	10m S.W	9m S.W	8m S.W		
Layer Number	1	1	1	1		
Time of tests	14:00:00	14:10:00	14:20:00	14:30:00		
Depth of Layer mm	250	300	275	300		
Depth of Test mm	225	275	250	275		
Field Wet Density t/m^3	2.21	2.01	2.08	2.07		
*Field Moisture Content %	12.5	20.5	20.0	13.5		

Oversize Material Wet %	5	0	0	20		
Sieve Size mm	19.0	19.0	19.0	37.5		
Peak Converted Wet Density t/m^3	2.016	2.001	1.994	-		
*Optimum Moisture Content %	12.5	20.5	20.0	-		
Compactive Effort Used std / mod	STD	STD	STD	STD		

Moisture Ratio %	**100**	**100**	**100**	**-**		
Moisture Variation %	**0.0**	**0.0**	**0.0**	**-**		
Moisture Variation	**-**	**-**	**-**	**-**		
Density Ratio %	**110.0**	**100.5**	**104.5**	**Oversize**		

Specification Requirements 95% Standard compaction

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

Material description Test #7: silty CLAY, medium to high plasticity, black, with gravel.

Test #8 - 10: silty CLAY, medium plasticity, brown, with gravel.

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 16-Jan-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AD**
location :	**WALLAN**	test date:	**14-Jan-19**

Test Number		11	12	13			
Test location taken from		Lot 1319	Lot 1307	Lot 1362			
North corner of lot		8m S.E	23m S.E	39m S.E			
		12m S.W	10m S.W	40m S.W			
Layer Number		1	1	1			
Time of tests		13:30:00	13:45:00	13:55:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	2.04	1.93	1.95			
*Field Moisture Content	%	17.0	23.5	16.5			
Oversize Material	Wet %	5	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	2.009	1.990	1.979			
*Optimum Moisture Content	%	17.5	20.5	16.5			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**97**	**115**	**100**			
Moisture Variation	%	**-0.5**	**3.0**	**0.0**			
Moisture Variation		**DRY**	**WET**	**-**			
Density Ratio	%	**101.5**	**97.0**	**98.5**			

Specification Requirements 95% Standard compaction

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

Material description silty CLAY gravel, medium plasticity, brown.

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

NATA Accredited Laboratory No. 15055
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Chris Senserrick
Approved Signatory
Date 16-Jan-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AE**
location :	**WALLAN**	test date:	**15-Jan-19**

Test Number		14	15	16			
Test location taken from		Lot 1317	Lot 1306	Lot 1308			
North Corner of each Lot		5m S.E	7m S.E	5m S.E			
Offset (m)		8m S.W	9m S.W	12m S.W			
Layer Number		1	1	1			
Time of tests		14:10:00	14:20:00	14:30:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	2.00	1.97	1.96			
*Field Moisture Content	%	22.5	19.0	20.5			
Oversize Material	Wet %	0	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	1.990	2.030	1.980			
*Optimum Moisture Content	%	20.0	18.5	19.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**113**	**103**	**108**			
Moisture Variation	%	**2.5**	**0.5**	**1.5**			
Moisture Variation		**WET**	**WET**	**WET**			
Density Ratio	%	**100.5**	**97.0**	**99.0**			

Specification Requirements: 95% Standard compaction

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

Material description: gravelly CLAY, medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

NATA ACCREDITED FOR TECHNICAL COMPETENCE

NATA Accredited Laboratory No. 15055
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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National Standards

Tim Senserrick
Approved Signatory
Date 17-Jan-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AF**
location :	**WALLAN**	test date:	**16-Jan-19**

Test Number		17	18	19			
Test location taken from		Lot 1360	Lot 1362	Lot 1359			
North corner of lot		8m S.E	10m S.E	12m S.E			
		18m S.W	37m S.W	5m S.W			
Layer Number		1	1	1			
Time of tests		13:10:00	13:20:00	13:30:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	2.00	1.93	2.08			
*Field Moisture Content	%	21.0	23.5	20.5			
Oversize Material	Wet %	0	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	1.959	1.892	2.011			
*Optimum Moisture Content	%	20.5	23.5	20.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**103**	**100**	**103**			
Moisture Variation	%	**0.5**	**0.0**	**0.5**			
Moisture Variation		**WET**	**-**	**WET**			
Density Ratio	%	**102.0**	**102.0**	**103.5**			

Specification Requirements 95% Standard compaction

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

Material description silty CLAY, medium plasticity, brown

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 18-Jan-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AG**
location :	**WALLAN**	test date:	**17-Jan-19**

Test Number		20	21	22			
Test location taken from		Lot 1346	Lot 1309	Lot 1362			
North corner of lot		3m S.E 11m S.W	7m S.E 23m S.W	10m S.E 5m S.W			
Layer Number		1	1	1			
Time of tests		14:00:00	14:10:00	14:20:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	1.94	1.91	1.93			
*Field Moisture Content	%	21.0	24.5	22.5			
Oversize Material	Wet %	0	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	1.931	1.911	1.944			
*Optimum Moisture Content	%	21.0	24.0	22.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**100**	**102**	**103**			
Moisture Variation	%	**0.0**	**0.5**	**0.5**			
Moisture Variation		**-**	**WET**	**WET**			
Density Ratio	%	**100.5**	**99.5**	**99.5**			

Specification Requirements 95% Standard compaction

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

Material description Test #20 & 22: silty CLAY gravel, medium plasticity, brown

Test #21: silty CLAY gravel, medium to high plasticity, dark brown

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 21-Jan-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AH**
location :	**WALLAN**	test date:	**18-Jan-19**

Test Number		23	24				
Test location taken from		Lot 1344	Lot 1336				
North corner of each lot		6m S.E	14m S.E				
		22m S.W	26m S.W				
Layer Number		1	1				
Time of tests		13:00:00	13:10:00				
Depth of Layer	mm	300	300				
Depth of Test	mm	275	275				
Field Wet Density	t/m^3	1.96	1.92				
*Field Moisture Content	%	31.5	32.0				
Oversize Material	Wet %	0	0				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m^3	1.909	1.944				
*Optimum Moisture Content	%	36.0	34.5				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**88**	**93**				
Moisture Variation	%	**-4.5**	**-2.5**				
Moisture Variation		**DRY**	**DRY**				
Density Ratio	%	**102.5**	**99.0**				

Specification Requirements: 95% Standard compaction

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

Material description: CLAY, medium to high plasticity, yellow

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 24-Jan-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AI**
location :	**WALLAN**	test date:	**21-Jan-19**

Test Number		25	26	27	28		
Test location taken from		Lot 1338	Lot 1341	Lot 1352	Lot 1350		
North corner ofr each lot		12m S.E 10m S.W	7m S.E 4m S.W	21m S.E 5m S.W	21m S.E 4m S.W		
Layer Number		1	1	2	2		
Time of tests		13:10:00	13:20:00	14:00:00	14:10:00		
Depth of Layer	mm	300	300	300	300		
Depth of Test	mm	275	275	275	275		
Field Wet Density	t/m^3	1.89	1.89	1.94	1.94		
*Field Moisture Content	%	29.0	28.0	29.5	29.5		
Oversize Material	Wet %	0	0	0	0		
Sieve Size	mm	19.0	19.0	19.0	19.0		
Peak Converted Wet Density	t/m^3	1.950	1.879	1.949	1.936		
*Optimum Moisture Content	%	25.0	25.5	27.0	26.5		
Compactive Effort Used	std / mod	STD	STD	STD	STD		
Moisture Ratio	%	**116**	**110**	**110**	**112**		
Moisture Variation	%	**4.0**	**2.5**	**2.5**	**3.0**		
Moisture Variation		**WET**	**WET**	**WET**	**WET**		
Density Ratio	%	**96.5**	**100.5**	**99.5**	**100.0**		

Specification Requirements: 95% Standard compaction

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

Material description: Test #25 & 26: silty CLAY gravel, medium to high plasticity, black

Test #27&28: CLAY, high plasticity, yellow

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 24-Jan-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AJ**
location :	**WALLAN**	test date:	**22-Jan-19**

Test Number		29	30	31			
Test location taken from		Lot 1363	Lot 1310	Lot 1322			
North corner of each lot		10m S.E 21m S.W	23m S.E 6m S.W	7m S.E 27m S.W			
Layer Number		2	2	1			
Time of tests		13:05:00	13:20:00	13:30:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	1.85	1.91	1.86			
*Field Moisture Content	%	31.5	29.0	27.0			
Oversize Material	Wet %	0	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	1.955	1.946	1.973			
*Optimum Moisture Content	%	23.5	24.0	23.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**134**	**121**	**118**			
Moisture Variation	%	**8.0**	**5.0**	**4.0**			
Moisture Variation		**WET**	**WET**	**WET**			
Density Ratio	%	**94.5**	**98.0**	**94.5**			

Specification Requirements: 95% Standard compaction

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

Material description: Test #29: CLAY, high plasticity, yellow

Test #30 & 31: silty CLAY gravel, medium to high plasticity, black

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Approved Signatory
Date 24-Jan-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AK**
location :	**WALLAN**	test date:	**23-Jan-19**

Test Number		32	33	34			
Test location taken from		Lot 1305	Lot 1353	Lot 1354			
North corner of each lot		19m S.E 5m S.W	20m S.E 7m S.W	15m S.E 3m S.W			
Layer Number		2	2	3			
Time of tests		13:10:00	13:25:00	13:35:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	1.93	1.90	1.91			
*Field Moisture Content	%	14.5	16.5	15.0			
Oversize Material	Wet %	0	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	1.907	1.950	1.960			
*Optimum Moisture Content	%	11.5	13.0	11.5			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**126**	**127**	**131**			
Moisture Variation	%	**3.0**	**3.5**	**3.5**			
Moisture Variation		**WET**	**WET**	**WET**			
Density Ratio	%	**101.0**	**97.5**	**97.5**			

Specification Requirements: 95% Standard compaction

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

Material description: Test #32: CLAY, gravel, medium to high plasticity, black

Test #33 & 34: CLAY, high plasticity, yellow

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 05-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AL**
location :	**WALLAN**	test date:	**24-Jan-19**

Test Number		35	36	37	38		
Test location taken from		Lot 1314	Lot 1355	Lot 1360	Lot 1363		
North corner of each lot		8m S.E 10m S.W	49m S.E 4m S.W	48m S.E 17m S.W	28m S.E 7m S.W		
Layer Number		3	2	2	2		
Time of tests		13:10:00	13:20:00	13:30:00	14:10:00		
Depth of Layer	mm	300	300	300	300		
Depth of Test	mm	275	275	275	275		
Field Wet Density	t/m^3	1.87	2.07	2.08	1.90		
*Field Moisture Content	%	27.5	8.5	17.5	33.5		
Oversize Material	Wet %	0	4	0	0		
Sieve Size	mm	19.0	19.0	19.0	19.0		
Peak Converted Wet Density	t/m^3	1.839	2.134	1.951	1.777		
*Optimum Moisture Content	%	27.0	10.0	19.5	31.0		
Compactive Effort Used	std / mod	STD	STD	STD	STD		
Moisture Ratio	%	**102**	**85**	**90**	**108**		
Moisture Variation	%	**0.5**	**-1.5**	**-2.0**	**2.5**		
Moisture Variation		**WET**	**DRY**	**DRY**	**WET**		
Density Ratio	%	**101.5**	**96.5**	**106.5**	**106.5**		

Specification Requirements: 95% Standard compaction

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

Material description: Test #35: silty CLAY gravel, medium to high plasticity, black

Test #36 & 37: sandy CLAY gravel, medum plasticity, brown. Test #38: CLAY, high plasticity, yellow.

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 31-Jan-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AM**
location :	**WALLAN**	test date:	**25-Jan-19**

Test Number		39	40				
Test location taken from		Lot 1351	Lot 1316				
North corner of lot		25m S.E	3m S.E				
		8m S.W	11m S.W				
Layer Number		3	3				
Time of tests		10:25:00	10:45:00				
Depth of Layer	mm	300	300				
Depth of Test	mm	275	275				
Field Wet Density	t/m^3	1.88	1.90				
*Field Moisture Content	%	34.5	29.0				
Oversize Material	Wet %	0	0				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m^3	1.849	1.919				
*Optimum Moisture Content	%	31.0	26.5				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**112**	**110**				
Moisture Variation	%	**3.5**	**2.5**				
Moisture Variation		**WET**	**WET**				
Density Ratio	%	**102.0**	**99.0**				

Specification Requirements: 95% Standard compaction

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

Material description: Test #39: silty CLAY. High plasticity, yellow

Test #40: silty CLAY gravel, medium to high plasticity, black

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 31-Jan-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AN**
location :	**WALLAN**	test date:	**29-Jan-19**

Test Number		41	42	43	44		
Test location taken from		Lot 1333	Lot 1345	Lot 1301	Lot 1304		
North corner of lot		7m S.E 8m S.W	6m S.E 7m S.W	8m S.E 10m S.W	7m S.E 8m S.W		
Layer Number		2	2	2	2		
Time of tests		9:40:00	9:55:00	15:15:00	15:30:00		
Depth of Layer	mm	300	300	300	300		
Depth of Test	mm	275	275	275	275		
Field Wet Density	t/m^3	1.92	1.98	1.91	1.93		
*Field Moisture Content	%	27.0	27.0	26.0	32.0		
Oversize Material	Wet %	0	0	0	0		
Sieve Size	mm	19.0	19.0	19.0	19.0		
Peak Converted Wet Density	t/m^3	1.927	1.959	2.004	1.930		
*Optimum Moisture Content	%	24.5	24.5	23.5	29.0		
Compactive Effort Used	std / mod	STD	STD	STD	STD		
Moisture Ratio	%	**110**	**110**	**111**	**111**		
Moisture Variation	%	**2.5**	**2.5**	**2.5**	**3.0**		
Moisture Variation		**WET**	**WET**	**WET**	**WET**		
Density Ratio	%	**99.5**	**101.0**	**95.5**	**100.0**		

Specification Requirements: 95% Standard compaction

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

Material description: CLAY, high plasticity, yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 06-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AO**
location :	**WALLAN**	test date:	**30-Jan-19**

Test Number		45	46				
Test location taken from		Lot 1357	Lot 1361				
North corner of lot		50m S.E	45m S.E				
		2m S.W	25m S.W				
Layer Number		4	4				
Time of tests		9:00:00	9:10:00				
Depth of Layer	mm	300	300				
Depth of Test	mm	275	275				
Field Wet Density	t/m^3	2.02	2.13				
*Field Moisture Content	%	11.0	13.5				
Oversize Material	Wet %	0	2				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m^3	1.970	2.049				
*Optimum Moisture Content	%	15.0	16.5				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**74**	**82**				
Moisture Variation	%	**-4.0**	**-3.0**				
Moisture Variation		**DRY**	**DRY**				
Density Ratio	%	**102.5**	**104.0**				

Specification Requirements: 98% Standard compaction

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

Material description: silty CLAY gravel, low to medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 05-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AP**
location :	**WALLAN**	test date:	**30-Jan-19**

Test Number		47	48	49	50		
Test location taken from		Lot 1339	Lot 1334	Lot 1330	Lot 1321		
North corner of each lot		6m S.E	7m S.E	5m S.E	10m S.E		
		8m S.W	10m S.W	24m S.W	6m S.W		
Layer Number		2	3	2	2		
Time of tests		11:10:00	11:50:00	13:10:00	13:20:00		
Depth of Layer	mm	300	300	300	300		
Depth of Test	mm	275	275	275	275		
Field Wet Density	t/m^3	1.88	1.87	2.01	2.00		
*Field Moisture Content	%	12.0	12.5	28.5	24.0		
Oversize Material	Wet %	0	0	0	0		
Sieve Size	mm	19.0	19.0	19.0	19.0		
Peak Converted Wet Density	t/m^3	2.021	2.028	1.875	1.990		
*Optimum Moisture Content	%	11.5	12.5	31.0	24.0		
Compactive Effort Used	std / mod	STD	STD	STD	STD		
Moisture Ratio	%	**105**	**100**	**92**	**100**		
Moisture Variation	%	**0.5**	**0.0**	**-2.5**	**0.0**		
Moisture Variation		**WET**	**-**	**DRY**	**-**		
Density Ratio	%	**93.0**	**92.0**	**107.0**	**100.5**		

Specification Requirements: 95% Standard compaction

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

Material description: CLAY, high plasticity, yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 06-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AQ**
location :	**WALLAN**	test date:	**31-Jan-19**

Test Number		51	52				
Test location taken from		Lot 1303	Lot 1302				
North corner of each lot		7m S.E	18m S.E				
		7m S.W	10m S.W				
Layer Number		3	3				
Time of tests		13:00:00	13:10:00				
Depth of Layer	mm	300	300				
Depth of Test	mm	275	275				
Field Wet Density	t/m^3	1.95	1.93				
*Field Moisture Content	%	25.0	16.0				
Oversize Material	Wet %	0	10				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m^3	1.984	2.023				
*Optimum Moisture Content	%	22.5	16.0				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**111**	**100**				
Moisture Variation	%	**2.5**	**0.0**				
Moisture Variation		**WET**	**-**				
Density Ratio	%	**98.5**	**95.0**				

Specification Requirements: 95% Standard compaction

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

Material description: CLAY, high plasticity, yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 05-Feb-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 9464 4617 **Email** reception@groundscience.com.au

client : **BITU-MILL (CAMPBELLFIELD)** job No: **GS4817/1**

project : **WALLARA WATERS - STAGE 13 (LEVEL 1)** report No. **AR**

location : **WALLAN** test date: **31-Jan-19**

Test Number	53	54	55			
Test Location taken from	Lot 1311	Lot 1337	Lot 1343			
North corner of lot	16m S.E	10m S.E	12m S.E			
Offset (m)	13m S.W	10m S.W	15m S.W			
Layer Number	4	3	3			
Time of tests	13:20:00	15:00:00	15:10:00			
Depth of Layer mm	300	300	300			
Depth of Test mm	275	275	275			
Field Dry Density t/m3	1.38	1.41	1.42			
Field Moisture Content %	38.0	35.0	35.0			
Sieve Size mm	19.0	19.0	19.0			
Oversize Wet %	0	0	0			
Oversize Dry %	0	0	0			
Maximum Dry Density t/m^3	1.46	1.49	1.51			
Optimum Moisture Content %	33.0	28.0	27.5			
Moisture Ratio %	**115.0**	**125.0**	**127.5**			
Moisture Variation %	**5.0**	**7.0**	**7.5**			
Moisture Variation	**WET**	**WET**	**WET**			
Density Ratio %	**95.0**	**94.5**	**94.0**			

MDD & OMC determined on: 18/02/2019

Specification Requirements 95% Standard Compaction

Notes: MDD & OMC are based on individual compactions sampled from site.

Material description CLAY, high plasticity, yellow mottled

Test Methods AS1289 5.8.1 5.1.1 2.1.1 5.4.1. 5.4.2. sampling : AS1289 1.2.1 (6.4b)

NATA Accredited Laboratory No. 15055
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The results of the tests, calibrations and/or measurements included in this document are

Chris Senserrick
Approved Signatory

18-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AS**
location :	**WALLAN**	test date:	**1-Feb-19**

Test Number		56	57	58			
Test location taken from		Lot 1357	Lot 1356	Lot 1331			
North corner of lot		22m S.E 8m S.W	27m S.E 8m S.W	6m S.E 14m S.W			
Layer Number		3	3	3			
Time of tests		13:25:00	13:40:00	14:00:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	2.05	1.98	2.07			
*Field Moisture Content	%	16.0	12.5	14.0			
Oversize Material	Wet %	2	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	2.098	2.002	2.088			
*Optimum Moisture Content	%	15.5	14.5	14.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**103**	**86**	**100**			
Moisture Variation	%	**0.5**	**-2.0**	**0.0**			
Moisture Variation		**WET**	**DRY**	**-**			
Density Ratio	%	**97.5**	**99.0**	**99.0**			

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY , low to medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 05-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AT**
location :	**WALLAN**	test date:	**4-Feb-19**

Test Number		59	60	61	62	63	
Test location taken from		Lot 1318	Lot 1315	Lot 1313	Lot 1358	Lot 1355	
North corner of lot		6m S.E 6m S.W	12m S.E 7m S.W	7m S.E 3m S.W	5m S.E 11m S.W	6m S.E 9m S.W	
Layer Number		4	4	4	3	3	
Time of tests		9:10:00	9:25:00	9:35:00	10:00:00	10:10:00	
Depth of Layer	mm	300	300	300	300	300	
Depth of Test	mm	275	275	275	275	275	
Field Wet Density	t/m^3	1.92	1.92	1.92	1.96	1.89	
*Field Moisture Content	%	25.0	28.5	24.0	23.0	24.0	
Oversize Material	Wet %	0	0	0	0	0	
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	
Peak Converted Wet Density	t/m^3	1.943	1.949	1.981	1.904	1.859	
*Optimum Moisture Content	%	23.0	23.5	19.5	24.0	22.0	
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	
Moisture Ratio	%	**109**	**122**	**123**	**96**	**109**	
Moisture Variation	%	**2.0**	**5.0**	**4.5**	**-1.0**	**2.0**	
Moisture Variation		**WET**	**WET**	**WET**	**DRY**	**WET**	
Density Ratio	%	**98.5**	**98.5**	**97.0**	**103.0**	**101.5**	

Specification Requirements: 95% Standard compaction

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

Material description: CLAY, high plasticity, yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 06-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AU**
location :	**WALLAN**	test date:	**4-Jan-19**

Test Number		64	65				
Test location taken from		Lot 1327	Lot 1323				
North corner of lot		19m S.E	19m S.E				
		5m S.W	9m S.W				
Layer Number		3	3				
Time of tests		14:00:00	14:10:00				
Depth of Layer	mm	300	300				
Depth of Test	mm	275	275				
Field Wet Density	t/m^3	2.03	1.98				
*Field Moisture Content	%	15.0	13.5				
Oversize Material	Wet %	0	4				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m^3	1.941	1.837				
*Optimum Moisture Content	%	17.5	15.5				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**86**	**87**				
Moisture Variation	%	**-2.5**	**-2.0**				
Moisture Variation		**DRY**	**DRY**				
Density Ratio	%	**104.5**	**108.0**				

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY gravel, low to medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 06-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**		job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**		report No.	**AV**
location :	**WALLAN**		test date:	**5-Feb-19**

Test Number		66	67	68	69	70	
Test location taken from		Lot 1339	Lot 1334	Lot 1336	Lot 1347	Lot 1342	
North corner of lot		8m S.E 2m S.W	7m S.E 20m S.W	6m S.E 5m S.W	7m S.E 7m S.W	7m S.E 5m S.W	
Layer Number		2	3	4	4	4	
Time of tests		9:00:00	9:10:00	11:50:00	12:10:00	12:20:00	
Depth of Layer	mm	300	300	300	300	300	
Depth of Test	mm	275	275	275	275	275	
Field Wet Density	t/m^3	1.92	1.93	1.93	1.91	1.91	
*Field Moisture Content	%	25.5	28.5	25.0	25.0	27.0	
Oversize Material	Wet %	0	0	0	0	0	
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	
Peak Converted Wet Density	t/m^3	1.875	1.892	1.890	1.855	1.891	
*Optimum Moisture Content	%	20.5	25.5	24.5	22.5	27.0	
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	
Moisture Ratio	%	**125**	**112**	**102**	**111**	**100**	
Moisture Variation	%	**5.0**	**3.0**	**0.5**	**2.5**	**0.0**	
Moisture Variation		**WET**	**WET**	**WET**	**WET**	**-**	
Density Ratio	%	**102.5**	**102.0**	**102.0**	**103.0**	**101.0**	

Specification Requirements: 95% Standard compaction

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

Material description: CLAY, high plasticity, yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 07-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AW**
location :	**WALLAN**	test date:	**6-Feb-19**

Test Number		71	72	73			
Test location taken from		Lot 1353	Lot 1356	Lot 1350			
North lot of corner		7m S.E 5m S.W	8m S.E 8m S.W	9m S.E 6m S.W			
Layer Number		4	4	4			
Time of tests		15:10:00	15:20:00	15:30:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	1.88	1.88	1.89			
*Field Moisture Content	%	29.0	27.0	28.0			
Oversize Material	Wet %	0	0	0			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	1.942	1.890	1.843			
*Optimum Moisture Content	%	26.0	27.0	28.5			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**112**	**100**	**98**			
Moisture Variation	%	**3.0**	**0.0**	**-0.5**			
Moisture Variation		**WET**	**-**	**DRY**			
Density Ratio	%	**97.0**	**99.5**	**102.5**			

Specification Requirements: 95% Standard compaction

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

Material description: CLAY, medium to high plasticity, black, yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 08-Feb-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AX**
location :	**WALLAN**	test date:	**8-Feb-19**

Test Number		74					
Test location taken from		Lot 1349					
North corner of lot		24m S.E					
		7m S.W					
Layer Number		5					
Time of tests		14:35:00					
Depth of Layer	mm	300					
Depth of Test	mm	275					
Field Wet Density	t/m^3	1.96					
*Field Moisture Content	%	6.0					
Oversize Material	Wet %	0					
Sieve Size	mm	19.0					
Peak Converted Wet Density	t/m^3	2.111					
*Optimum Moisture Content	%	8.5					
Compactive Effort Used	std / mod	STD					
Moisture Ratio	%	**71**					
Moisture Variation	%	**-2.5**					
Moisture Variation		**DRY**					
Density Ratio	%	**93.0**					

Specification Requirements 95% Standard compaction

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

Material description sandy CLAY, low to medium plasticity, brown

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 13-Feb-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

client :	**BITU-MILL (CAMPBELLFIELD)**	job No:	**GS4817/1**
project :	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	report No.	**AY**
location :	**WALLAN**	test date:	**11-Feb-19**

Test Number		75	76	77			
Test location taken from		Lot 1333	Lot 1340	Lot 1332			
North corner of each lot		11m S.E	6m S.E	7m S.E			
		20m S.W	8m S.W	26m S.W			
Layer Number		5	5	4			
Time of tests		9:40:00	9:50:00	15:05:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m^3	1.90	1.88	2.10			
*Field Moisture Content	%	30.0	29.0	27.5			
Oversize Material	Wet %	0	0	8			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m^3	1.862	1.869	1.971			
*Optimum Moisture Content	%	30.0	30.0	33.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**100**	**97**	**84**			
Moisture Variation	%	**0.0**	**-1.0**	**-5.5**			
Moisture Variation		**-**	**DRY**	**DRY**			
Density Ratio	%	**102.0**	**100.5**	**106.5**			

Specification Requirements 95% Standard compaction

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

Material description Test #75 - 76: CLAY, high plasticity, yellow mottled

Test #77: silty CLAY, low to medium plasticity, brown

Test Methods AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 13-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**AZ**
Location:	**WALLAN**	Test date:	**12-Feb-19**

Test Number		78	79	80		
Test location taken from		Lot 1326	Lot 1328	Lot 1324		
North corner of lot		18m S.E 6m S.W	17m S.E 6m S.W	18m S.E 6m S.W		
Layer Number		4	4	4		
Time of tests		11:10:00	11:20:00	11:35:00		
Depth of Layer	mm	300	300	300		
Depth of Test	mm	275	275	275		
Field Wet Density	t/m³	2.03	2.02	2.09		
Field Dry Density	t/m³	1.83	1.85	1.87		
Field Moisture Content	%	11.0	9.0	10.0		
Oversize Material	Wet %	2	3	15		
Sieve Size	mm	19.0	19.0	19.0		
Peak Converted Wet Density	t/m³	2.099	1.980	2.048		
Optimum Moisture Content	%	13.0	14.5	14.0		
Compactive Effort Used	std / mod	STD	STD	STD		
Moisture Ratio	%	**85**	**62**	**72**		
Moisture Variation	%	**-2.0**	**-5.5**	**-4.0**		
Moisture Variation		**DRY**	**DRY**	**DRY**		
Density Ratio	%	**96.5**	**102.0**	**102.0**		

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY gravel, low to medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 14-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BA**
Location:	**WALLAN**	Test date:	**14-Feb-19**

Test Number		81	82	83	84	85	
Test location taken from		Lot 1349	Lot 1340	Lot 1315	Lot 1359	Lot 1355	
North corner of lot		17m S.E 10m S.W	43m S.E 10m S.W	43m S.E 5m S.W	39m S.E 5m S.W	56m S.E 2m S.W	
Layer Number		5	2	2	3	3	
Time of tests		11:10:00	11:20:00	11:30:00	14:10:00	14:20:00	
Depth of Layer	mm	300	300	300	300	300	
Depth of Test	mm	275	275	275	275	275	
Field Wet Density	t/m³	2.03	1.92	2.00	2.02	2.12	
Field Dry Density	t/m³	5897.00	1.70	1.79	1.81	0.00	
Field Moisture Content	%	13.0	12.5	12.0	11.0	11.5	
Oversize Material	Wet %	7	2	1	4	2	
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	
Peak Converted Wet Density	t/m³	1.969	2.009	2.047	1.982	2.063	
Optimum Moisture Content	%	15.5	15.0	14.5	15.5	14.5	
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	
Moisture Ratio	%	**84**	**84**	**83**	**71**	**80**	
Moisture Variation	%	**-2.5**	**-2.5**	**-2.5**	**-4.5**	**-3.0**	
Moisture Variation		**DRY**	**DRY**	**DRY**	**DRY**	**DRY**	
Density Ratio	%	**103.0**	**95.5**	**98.0**	**102.0**	**102.5**	

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY, low to medium plasticity, brown.

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 18-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BB**
Location:	**WALLAN**	Test date:	**15-Feb-19**

Test Number		86	87	88		
Test location taken from		Lot 1305	Lot 1318	Lot 1361		
North corner of lot		8m S.E	18m S.E	10m S.E		
		26m S.W	32m S.W	85m S.W		
Layer Number		2	3	3		
Time of tests		9:00:00	14:10:00	14:20:00		
Depth of Layer	mm	300	300	300		
Depth of Test	mm	275	275	275		
Field Wet Density	t/m³	2.05	2.06	2.09		
Field Dry Density	t/m³	1.88	1.91	1.90		
Field Moisture Content	%	8.5	8.0	8.5		
Oversize Material	Wet %	0	0	17		
Sieve Size	mm	19.0	19.0	19.0		
Peak Converted Wet Density	t/m³	2.030	1.958	2.060		
Optimum Moisture Content	%	13.0	13.5	11.5		
Compactive Effort Used	std / mod	STD	STD	STD		
Moisture Ratio	%	**66**	**60**	**74**		
Moisture Variation	%	**-4.5**	**-5.5**	**-3.0**		
Moisture Variation		**DRY**	**DRY**	**DRY**		
Density Ratio	%	**101.0**	**105.0**	**101.5**		

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY, low to medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 18-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BC**
Location:	**WALLAN**	Test date:	**18-Feb-19**

Test Number		89	90	91			
Test location taken from		Lot 1323	Lot 1318	Lot 1315			
North corner of lot		36m S.E 8m S.W	38m S.E 0m S.W	35m S.E 2m S.W			
Layer Number		2	3	3			
Time of tests		11:10:00	14:00:00	14:10:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m³	2.12	2.04	2.09			
Field Dry Density	t/m³	1.92	1.87	1.87			
Field Moisture Content	%	10.0	9.5	11.5			
Oversize Material	Wet %	0	0	1			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m³	2.070	1.976	1.985			
Optimum Moisture Content	%	12.0	14.5	14.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**84**	**66**	**82**			
Moisture Variation	%	**-2.0**	**-5.0**	**-2.5**			
Moisture Variation		**DRY**	**DRY**	**DRY**			
Density Ratio	%	**102.5**	**103.5**	**105.0**			

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY, low to medium plasticity, brown, trace gravel.

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 21-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BD**
Location:	**WALLAN**	Test date:	**19-Feb-19**

Test Number		92	93	94		
Test location taken from		Lot 1327	Lot 1342	Lot 1347		
North corner of lot		36m S.E 28m South	10m S.E 27m South	18m S.E 35m S.E		
Layer Number		3	3	2		
Time of tests		14:10:00	14:20:00	14:30:00		
Depth of Layer	mm	300	300	300		
Depth of Test	mm	275	275	275		
Field Wet Density	t/m³	2.08	2.09	2.09		
Field Dry Density	t/m³	1.86	1.83	1.88		
Field Moisture Content	%	11.5	14.0	10.5		
Oversize Material	Wet %	4	2	1		
Sieve Size	mm	19.0	19.0	19.0		
Peak Converted Wet Density	t/m³	2.054	2.082	1.940		
Optimum Moisture Content	%	14.0	15.5	13.0		
Compactive Effort Used	std / mod	STD	STD	STD		
Moisture Ratio	%	**82**	**91**	**81**		
Moisture Variation	%	**-2.5**	**-1.5**	**-2.5**		
Moisture Variation		**DRY**	**DRY**	**DRY**		
Density Ratio	%	**101.5**	**100.5**	**107.5**		

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY, low to medium plasticity, brown, trace gravel.

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

NATA Accredited Laboratory No. 15055
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Tim Senserrick
Approved Signatory
Date 21-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BE**
Location:	**WALLAN**	Test date:	**25-Feb-19**

Test Number		95	96	97			
Test location taken from		Lot 1314	Lot 1315	Lot 1316			
North corner of each lot		53m S.E	54m S.E	56m S.E			
		5m S.W	7m S.W	8m S.W			
Layer Number		3	4	5			
Time of tests		14:00:00	14:20:00	16:30:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m³	2.00	1.89	2.02			
Field Dry Density	t/m³	1.69	1.62	1.74			
Field Moisture Content	%	18.0	17.0	15.5			
Oversize Material	Wet %	0	0	3			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m³	2.091	1.948	2.048			
Optimum Moisture Content	%	18.0	20.0	15.5			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**100**	**85**	**100**			
Moisture Variation	%	**0.0**	**-3.0**	**0.0**			
Moisture Variation		**-**	**DRY**	**-**			
Density Ratio	%	**95.5**	**97.0**	**98.5**			

Specification Requirements: 95% standard compaction

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

Material description: silty CLAY, medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 27-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BF**
Location:	**WALLAN**	Test date:	**26-Feb-19**

Test Number		98	99				
Test location taken from		Lot 1314	Lot 1316				
North corner of lot		57m S.E	50m S.E				
		7m S.W	4m S.W				
Layer Number		6	6				
Time of tests		15:30:00	15:50:00				
Depth of Layer	mm	300	300				
Depth of Test	mm	275	275				
Field Wet Density	t/m³	2.04	2.03				
Field Dry Density	t/m³	1.74	1.72				
Field Moisture Content	%	17.5	18.0				
Oversize Material	Wet %	0	0				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m³	2.010	2.043				
Optimum Moisture Content	%	19.5	18.0				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**90**	**100**				
Moisture Variation	%	**-2.0**	**0.0**				
Moisture Variation		**DRY**	**-**				
Density Ratio	%	**101.5**	**99.5**				

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY, medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 28-Feb-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BG**
Location:	**WALLAN**	Test date:	**27-Feb-19**

Test Number		100	101	102	103	104	
Test location taken from		Lot 1312	Lot 1312				
North corner of lot		50m S.E 36m N.E	70m S.E 53m N.E	Retest of #90	Retest of #86	Retest of #87	
Layer Number		3	3	3	2	3	
Time of tests		8:30:00	8:40:00	13:10:00	14:10:00	15:35:00	
Depth of Layer	mm	300	300	300	300	300	
Depth of Test	mm	275	275	275	275	275	
Field Wet Density	t/m³	2.04	2.03	2.17	2.09	2.11	
Field Dry Density	t/m³	1.75	1.72	1.91	1.84	1.90	
Field Moisture Content	%	16.5	18.0	13.5	13.0	11.5	
Oversize Material	Wet %	0	0	0	1	0	
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	
Peak Converted Wet Density	t/m³	2.005	2.045	2.080	1.994	2.083	
Optimum Moisture Content	%	17.5	18.0	13.5	13.0	13.0	
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	
Moisture Ratio	%	**95**	**100**	**100**	**100**	**89**	
Moisture Variation	%	**-1.0**	**0.0**	**0.0**	**0.0**	**-1.5**	
Moisture Variation		**DRY**	**-**	**-**	**-**	**DRY**	
Density Ratio	%	**102.0**	**99.5**	**104.5**	**104.5**	**101.5**	

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY gravel, medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 01-Mar-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BH**
Location:	**WALLAN**	Test date:	**28-Feb-19**

Test Number		105	106	107	108	109	110
Test location taken from		Lot 1360	Lot 1361	Lot 1312	Lot 1312	Lot 1312	Lot 1312
North corner of each lot		24m S.E 12m S.W	5m S.E 38m S.W	41m N.E 55m S.E	60m N.E 74m S.E	11m S.E 30m N.E	38m S.E 46m N.E
Layer Number		3	3	5	5	2	2
Time of tests		9:00:00	9:15:00	11:10:00	11:40:00	15:00:00	15:10:00
Depth of Layer	mm	300	300	300	300	300	300
Depth of Test	mm	275	275	275	275	275	275
Field Wet Density	t/m³	2.04	2.04	2.02	2.03	2.07	2.02
Field Dry Density	t/m³	1.76	1.79	1.73	1.84	1.81	0.00
Field Moisture Content	%	15.5	13.5	16.0	10.5	14.0	12.0
Oversize Material	Wet %	1	3	8	1	0	0
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	19.0
Peak Converted Wet Density	t/m³	2.073	2.063	2.027	2.072	2.030	2.006
Optimum Moisture Content	%	15.5	15.5	16.0	12.0	15.5	14.0
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	STD
Moisture Ratio	%	**100**	**87**	**100**	**88**	**91**	**86**
Moisture Variation	%	**0.0**	**-2.0**	**0.0**	**-1.5**	**-1.5**	**-2.0**
Moisture Variation		**-**	**DRY**	**-**	**DRY**	**DRY**	**DRY**
Density Ratio	%	**98.5**	**99.0**	**100.0**	**98.0**	**102.0**	**100.5**

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY gravel, medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 05-Mar-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BI**
Location:	**WALLAN**	Test date:	**7-Mar-19**

Test Number		111	112	113			
Test location taken from		Lot 1363	Lot 1361	Lot 1362			
North corner of each lot		13m S.E	9m S.E	11m S.E			
		13m S.W	5m S.W	14m S.W			
Layer Number		4	4	4			
Time of tests		11:00:00	11:10:00	14:10:00			
Depth of Layer	mm	300	275	275			
Depth of Test	mm	275	250	275			
Field Wet Density	t/m³	2.07	1.96	2.06			
Field Dry Density	t/m³	1.81	1.61	1.76			
Field Moisture Content	%	14.0	22.0	16.5			
Oversize Material	Wet %	4	0	3			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m³	2.035	2.004	2.002			
Optimum Moisture Content	%	16.5	21.5	17.5			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**85**	**103**	**95**			
Moisture Variation	%	**-2.5**	**0.5**	**-1.0**			
Moisture Variation		**DRY**	**WET**	**DRY**			
Density Ratio	%	**102.0**	**98.0**	**103.0**			

Specification Requirements: 95% Standard compaction

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

Material description: Test #111 & 113: silty CLAY, medium plasticity, brown

Test #112: CLAY, high plasticity, yellow and black mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 12-Mar-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BJ**
Location:	**WALLAN**	Test date:	**12-Mar-19**

Test Number		114	115	116	117	118	
Test location taken from		Lot 1311	Lot 1315	Lot 1312	Lot 1312	Lot 1312	
North corner of each lot		Retest of #53	Retest of #60	Retest of #61	19m S.E 0m S.W	42m S.E 30m N.E	
Layer Number		4	4	4	4	2	
Time of tests		11:00:00	11:10:00	11:40:00	13:10:00	13:20:00	
Depth of Layer	mm	300	300	300	300	275	
Depth of Test	mm	275	275	275	275	250	
Field Wet Density	t/m³	1.95	1.93	1.93	2.02	2.02	
Field Dry Density	t/m³	1.56	1.51	1.50	1.70	1.72	
Field Moisture Content	%	25.0	28.0	28.5	18.5	18.0	
Oversize Material	Wet %	0	0	0	0	0	
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	
Peak Converted Wet Density	t/m³	1.966	1.968	1.905	1.952	1.933	
Optimum Moisture Content	%	24.0	25.0	27.5	21.0	21.0	
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	
Moisture Ratio	%	**104**	**112**	**104**	**88**	**86**	
Moisture Variation	%	**1.0**	**3.0**	**1.0**	**-2.5**	**-3.0**	
Moisture Variation		**WET**	**WET**	**WET**	**DRY**	**DRY**	
Density Ratio	%	**99.5**	**98.0**	**101.0**	**103.5**	**104.5**	

Specification Requirements: 95% Standard compaction

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

Material description: Tests #114 to 116: CLAY, high plasticity, yellow mottled

Tests #117 & 118: silty CLAY, low to medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 15-Mar-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BK**
Location:	**WALLAN**	Test date:	**14-Mar-19**

Test Number		119	120	121	122	123	
Test location taken from North corner of each lot		Lot C 21m South 0m East	Lot C 42m South 21m East	Lot C 25m South 36m East	Lot 1343 Retest of #55	Lot 1334 Retest of #54	
Layer Number		1	1	1	3	3	
Time of tests		9:30:00	9:45:00	10:00:00	14:10:00	14:30:00	
Depth of Layer	mm	225	275	300	300	300	
Depth of Test	mm	200	250	275	275	275	
Field Wet Density	t/m³	1.91	2.02	1.96	1.94	1.94	
Field Dry Density	t/m³	1.54	1.69	1.60	1.49	1.46	
Field Moisture Content	%	24.5	19.5	23.0	31.0	32.5	
Oversize Material	Wet %	0	0	0	0	0	
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	
Peak Converted Wet Density	t/m³	1.998	2.015	1.982	1.838	1.923	
Optimum Moisture Content	%	22.5	20.0	23.0	31.5	30.0	
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	
Moisture Ratio	%	**109**	**98**	**100**	**99**	**109**	
Moisture Variation	%	**2.0**	**-0.5**	**0.0**	**-0.5**	**2.5**	
Moisture Variation		**WET**	**DRY**	**-**	**DRY**	**WET**	
Density Ratio	%	**95.5**	**100.5**	**99.0**	**105.5**	**101.0**	

Specification Requirements: 95% Standard compaction

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

Material description: Tests #119 to 121: silty CLAY, medium to high plasticity, brown / yellow

Tests #122 & 123: CLAY, high plasticity, yellow / black

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 19-Mar-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BL**
Location:	**WALLAN**	Test date:	**19-Mar-19**

Test Number		124	125	126	127	128	129
Test location taken from		Lot C 52m South 39m East	Lot C 35m South 40m East	Lot 1310 Retest of #30	Lot 1332 Retest of #74	Lot 1324 Retest of #80	Lot 1328 Retest of #79
Layer Number		2	2	2	4	4	4
Time of tests		8:00:00	8:15:00	15:20:00	15:35:00	15:45:00	15:50:00
Depth of Layer	mm	275	275	300	300	300	300
Depth of Test	mm	250	250	275	275	275	275
Field Wet Density	t/m³	1.98	1.97	1.92	2.05	2.08	2.04
Field Dry Density	t/m³	1.70	1.78	1.57	1.84	1.63	1.78
Field Moisture Content	%	16.0	10.5	22.0	11.5	27.0	12.0
Oversize Material	Wet %	3	0	0	0	0	18
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	19.0
Peak Converted Wet Density	t/m³	1.980	1.943	1.868	2.064	2.024	2.082
Optimum Moisture Content	%	18.5	15.5	22.5	14.0	27.5	13.5
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	STD
Moisture Ratio	%	**87**	**68**	**98**	**82**	**98**	**89**
Moisture Variation	%	**-2.5**	**-5.0**	**-0.5**	**-2.5**	**-0.5**	**-1.5**
Moisture Variation		**DRY**	**DRY**	**DRY**	**DRY**	**DRY**	**DRY**
Density Ratio	%	**100.0**	**101.5**	**102.5**	**99.5**	**102.5**	**98.0**

Specification Requirements: 95% Standard compaction

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

Material description: Tests: #124 - 125 & #127 - 129: silty CLAY gravel, medium plasticity, brown

Test #126: CLAY, high plasticity, mottled black / brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 21-Mar-19

Field Density Test Results

A C N 105 704 078

13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BM**
Location:	**WALLAN**	Test date:	**21-Mar-19**

Test Number		130	131				
Test location taken from		Lot C 53m South 40m East	Lot 1339 Retest of #66				
Layer Number		2	2				
Time of tests		11:40:00	12:10:00				
Depth of Layer	mm	275	275				
Depth of Test	mm	250	250				
Field Wet Density	t/m³	2.01	1.98				
Field Dry Density	t/m³	1.76	1.56				
Field Moisture Content	%	14.5	27.0				
Oversize Material	Wet %	0	0				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m³	1.953	1.991				
Optimum Moisture Content	%	18.5	24.0				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**79**	**113**				
Moisture Variation	%	**-4.0**	**3.0**				
Moisture Variation		**DRY**	**WET**				
Density Ratio	%	**103.0**	**99.5**				

Specification Requirements: 95% Standard compaction

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

Material description: Test #130: silty CLAY, medium to high plasticity, brown

Test #131: CLAY, high plasticity, yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 25-Mar-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**BN**
Location:	**WALLAN**	Test date:	**27-Mar-19**

Test Number		132	133				
Test location taken from		Lot 1338	Lot 1341				
North corner of lot		5m S.E	12m S.E				
		6m S.W	9m S.W				
Layer Number		6	6				
Time of tests		13:10:00	13:20:00				
Depth of Layer	mm	200	200				
Depth of Test	mm	175	175				
Field Wet Density	t/m³	1.89	1.93				
Field Dry Density	t/m³	1.62	1.65				
Field Moisture Content	%	17.0	16.5				
Oversize Material	Wet %	0	0				
Sieve Size	mm	19.0	19.0				
Peak Converted Wet Density	t/m³	1.967	2.009				
Optimum Moisture Content	%	18.5	19.5				
Compactive Effort Used	std / mod	STD	STD				
Moisture Ratio	%	**92**	**85**				
Moisture Variation	%	**-1.5**	**-3.0**				
Moisture Variation		**DRY**	**DRY**				
Density Ratio	%	**96.5**	**96.0**				

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY, medium to high plasticity, brown/ yellow mottled

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

NATA Accredited Laboratory No. 15055
Accredited for compliance with ISO/IEC 17025 - Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National Standards

Chris Senserrick
Approved Signatory
Date 29-Mar-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**CH**
Location:	**WALLAN**	Test date:	**14-May-19**

Test Number		214	215	216	217	218	219
Test location taken from		Lot 1360	Lot 1358	Lot 1357	Lot 1309	Lot 1307	Lot 1305
North corner of each Lot		3m S.E 7m S.W	5m S.E 2m S.W	9m S.E 2m S.W	9m S.E 6m S.W	10m S.E 4m S.W	8m S.E 4m S.W
Layer Number		4	4	4	4	4	4
Time of tests		11:45:00	11:55:00	12:10:00	13:10:00	13:25:00	13:45:00
Depth of Layer	mm	300	300	300	300	300	300
Depth of Test	mm	275	275	275	275	275	275
Field Wet Density	t/m³	2.02	2.03	2.01	2.18	2.16	2.13
Field Dry Density	t/m³	1.61	1.66	1.64	1.84	1.85	1.83
Field Moisture Content	%	25.0	22.0	23.0	18.0	16.0	17.0
Oversize Material	Wet %	0	0	0	2	6	0
Sieve Size	mm	19.0	19.0	19.0	19.0	19.0	19.0
Peak Converted Wet Density	t/m³	1.862	1.983	1.966	2.048	2.059	2.120
Optimum Moisture Content	%	27.5	22.0	22.5	18.5	16.5	15.5
Compactive Effort Used	std / mod	STD	STD	STD	STD	STD	STD
Moisture Ratio	%	**91**	**100**	**102**	**98**	**97**	**110**
Moisture Variation	%	**-2.5**	**0.0**	**0.5**	**-0.5**	**-0.5**	**1.5**
Moisture Variation		**DRY**	**-**	**WET**	**DRY**	**DRY**	**WET**
Density Ratio	%	**108.5**	**102.0**	**102.5**	**106.5**	**105.0**	**100.5**

Specification Requirements: 95% Standard compaction

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

Material description: Tests #214 - 216: CLAY, high plasticity, brown

Tests #217 - 219: silty CLAY gravel, medium to high plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

ACCREDITED FOR TECHNICAL COMPETENCE

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Chris Senserrick
Approved Signatory
Date 16-May-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**CI**
Location:	**WALLAN**	Test date:	**14-May-19**

Test Number		220	221	222			
Test location taken from		Lot 1321	Lot 1304	Lot 1301			
North corner of each Lot		10m S.E 21m S.W	20m S.E 8m S.W	8m S.E 5m S.W			
Layer Number		4	4	4			
Time of tests		13:55:00	14:05:00	14:15:00			
Depth of Layer	mm	300	300	300			
Depth of Test	mm	275	275	275			
Field Wet Density	t/m³	2.10	2.11	2.13			
Field Dry Density	t/m³	1.78	1.77	1.80			
Field Moisture Content	%	17.5	19.5	17.0			
Oversize Material	Wet %	0	0	6			
Sieve Size	mm	19.0	19.0	19.0			
Peak Converted Wet Density	t/m³	2.085	2.071	2.091			
Optimum Moisture Content	%	17.0	17.0	16.0			
Compactive Effort Used	std / mod	STD	STD	STD			
Moisture Ratio	%	**103**	**115**	**107**			
Moisture Variation	%	**0.5**	**2.5**	**1.0**			
Moisture Variation		**WET**	**WET**	**WET**			
Density Ratio	%	**100.5**	**102.0**	**102.0**			

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY gravel, medium plasticity, brown

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Chris Senserrick
Approved Signatory
Date 16-May-19

Field Density Test Results

A C N 105 704 078
13 Brock Street Thomastown Vic, **P** 03 9464 4617 **Email** reception@groundscience.com.au

Client:	**BITU-MILL (CAMPBELLFIELD)**	Job No:	**GS4817/1**
Project:	**WALLARA WATERS - STAGE 13 (LEVEL 1)**	Report No.	**CP**
Location:	**WALLAN**	Test date:	**24-May-19**

Test Number		247	248	249	250		
Test location taken from		Lot C	Lot C	Lot C	Lot C		
North corner at each lot		50m South 28m East	33m South 28m East	40m South 0m East	53m South 12m East		
Layer Number		2	2	1	1		
Time of tests		14:10:00	14:20:00	15:20:00	15:30:00		
Depth of Layer	mm	300	300	300	300		
Depth of Test	mm	275	275	275	275		
Field Wet Density	t/m³	2.04	2.00	2.03	2.03		
Field Dry Density	t/m³	1.72	1.63	1.67	1.68		
Field Moisture Content	%	18.5	22.5	21.5	21.0		
Oversize Material	Wet %	0	0	0	0		
Sieve Size	mm	19.0	19.0	19.0	19.0		
Peak Converted Wet Density	t/m³	1.96	1.98	1.99	1.98		
Optimum Moisture Content	%	19.5	22.5	21.5	20.5		
Compactive Effort Used	std / mod	STD	STD	STD	STD		
Moisture Ratio	%	**95**	**100**	**100**	**103**		
Moisture Variation	%	**-1.0**	**0.0**	**0.0**	**0.5**		
Moisture Variation		**DRY**	**-**	**-**	**WET**		
Density Ratio	%	**104.0**	**101.0**	**102.0**	**102.5**		

Specification Requirements: 95% Standard compaction

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

Material description: silty CLAY, medium to high plasticity, brown and yellow

Test Methods: AS1289 5.8.1 5.7.1 2.1.1 1.2.1 (6.4)

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Tim Senserrick
Approved Signatory
Date 28-May-19