

# GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED ABSORPTION TRENCH

17 Bilberry Avenue, Bilgola Plateau

**Project Number: G2031** 

**Client: Ben Bolewski** 

November 2020

### Introduction

BMB Engineers was commissioned to carry out a geotechnical investigation for the proposed absorption trench at 17 Bilberry Avenue, Bilgola Plateau. This report discusses the results of a geotechnical investigation conducted on 18<sup>th</sup> of November 2020 for the site mentioned above to determine the hydraulic conductivity of soil and subsurface ground condition for the proposed development.

# **Site Description**

The following observations were made during fieldwork:

- The site slopes towards the rear boundary.
- The moisture condition of the site was moist.
- Few trees also exist at the sites.

# **Geotechnical and Hydraulic Investigation**

#### **In-situ Testing**

Dynamic Cone penetration (DCP) test was carried out in accordance with Australian Standard AS 1289, 'Methods of Testing Soil for Engineering Purposes.' The DCP test location is shown in Appendix A and the results are shown in Appendix B.

#### **Bore Drilling**

Two boreholes were drilled to a depth of 0.6 m and used for the soil permeability test. After completion of soil permeability test, all the boreholes were backfilled with the soil.

The locations of boreholes are presented in Appendix A.

#### **Soil Profiles**

The boreholes indicated the soil profile generally comprised of the following-

0.0 - 0.2 m: Type of soil: Fill Colour: dark grey silty sand, roots

0.2 - 0.6 m: Type of soil: Silty/Clay sand, Colour: Light grey to Pale Olive

Groundwater was not observed during the investigation.

The Borehole logs are included in Appendix C.

#### Infiltration Rate Testing

The infiltration test (IT) was undertaken in two boreholes to determine the coefficient of permeability (K) of the soil. These tests were undertaken on the site in accordance with AS/NZS: 1547-2012 on-site domestic wastewater management. Based on the infiltration rate tests, the permeability of the site has been estimated as 0.12 m/day. The absorption rate of site soil is estimated as 0.07 L/s/m<sup>2</sup>.

The infiltration test results are included in Appendix D.

### Limitations

Any sketches in this report should be considered as only approximate pictorial evidence of our work.

The report is based upon the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. The assumption cannot be substantiated until earthworks are almost complete. Where variations in conditions are encountered, further advice should be sought.

Should you need any further information, please do not hesitate to contact the undersigned.

On behalf of BMB Engineers

Prepared by Rudra Pun ME, BE (Civil), MIEAust Civil/Geotechnical Engineer

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Review and authorised by M Pradhan MIEAust, CPEng, NER Principal

### References

- AS1726-1993- Geotechnical site investigations
- AS 1289-2004 Methods of Testing Soil for Engineering Purposes
- AS/NZS 1547-2012 On-site domestic wastewater management



### Appendix A: DCP, Borehole and Infiltration test locations

Figure A DCP, Bore Hole and Infiltration Test Locations

# Appendix B: DCP Test Results

Site Address: Date of Fieldwork: 17 Bilberry Avenue, Bilgola Plateau 18/11/2020

|             | TEST NUMBER |         |  |  |  |  |
|-------------|-------------|---------|--|--|--|--|
| DEPTH (M)   | DCP 01      | DCP 02  |  |  |  |  |
| 0.00 - 0.10 | 2           | 3       |  |  |  |  |
| 0.10 - 0.20 | 3           | 3       |  |  |  |  |
| 0.20 - 0.30 | 4           | 3       |  |  |  |  |
| 0.30 - 0.40 | 4           | 4       |  |  |  |  |
| 0.40 - 0.50 | 4           | 3       |  |  |  |  |
| 0.50 - 0.60 | 3           | 3       |  |  |  |  |
| 0.60 - 0.70 | 4           | 2       |  |  |  |  |
| 0.70 - 0.80 | 3           | 4       |  |  |  |  |
| 0.80 - 0.90 | 3           | 3       |  |  |  |  |
| 0.90 - 1.00 | 3           | 2       |  |  |  |  |
| 1.00 - 1.10 | 6           | 4       |  |  |  |  |
| 1.10 - 1.20 | 11          | 5       |  |  |  |  |
| 1.20 - 1.30 | refusal     | 5       |  |  |  |  |
| 1.30 - 1.40 |             | 6       |  |  |  |  |
| 1.40 - 1.50 |             | 17      |  |  |  |  |
| 1.50 - 1.60 |             | refusal |  |  |  |  |

# Appendix C: Borehole Logs

|                    |          |             |         |                |                   |                      |                |           |              |              |        |              | Job No:    | G2031       |  |
|--------------------|----------|-------------|---------|----------------|-------------------|----------------------|----------------|-----------|--------------|--------------|--------|--------------|------------|-------------|--|
|                    |          |             |         |                |                   |                      |                |           |              | Hole No:     | 1      |              |            |             |  |
|                    |          |             |         |                |                   |                      |                |           |              |              |        |              | Date:      | 18/11/2020  |  |
|                    |          |             |         |                |                   | ENGINEERS            |                |           |              |              |        |              | Logged:    | RP          |  |
|                    |          |             |         |                |                   |                      |                |           |              |              |        |              |            |             |  |
| Clier              | it:      |             |         |                |                   |                      | Sur            | face F    | RL:          |              | -      |              |            |             |  |
| Loca               | tion: 17 | Bilbe       | rry A   | ven            | ue, Bilgola Plate | eau                  | Test           | t Met     | hod:         |              |        |              |            |             |  |
| Depth (m)          | SPT      | Graphic Log | Unified | Classification | D                 | escription           | Moisture       | Condition | Consistency/ | Rel. Density | Pocket | Penetrometer | Addition   | al Comments |  |
|                    |          |             |         |                |                   |                      |                |           |              |              |        |              |            |             |  |
| 0.20               |          |             |         |                | Dark Grey, silt   | y sand               | Μ              |           |              |              |        |              | Fill, Gras | ss roots    |  |
| 0.60               |          |             |         |                | Light Grey Silty  | ' Sand               | м              |           | ٢            | Л            |        |              |            |             |  |
|                    |          |             |         |                | Borehole was      | terminated at 0.6 m. |                |           |              |              |        |              |            |             |  |
|                    |          |             |         |                |                   |                      |                |           |              |              |        |              |            |             |  |
| <u>Consistency</u> |          |             |         | Moisture       |                   |                      | <u>Density</u> |           |              |              |        |              |            |             |  |
|                    | Soft     |             | S       |                | Dry               | D                    | Ver            | y Loo     | se           |              | VL     |              |            |             |  |
|                    | Firm     |             | F       |                | Slightly Moist    | SM                   | Loo            | se        |              |              | L      |              |            |             |  |
|                    | Stiff    |             | St      |                | Moist             | Μ                    | Me             | dium      | Dens         | e            | MD     |              |            |             |  |
|                    | Very St  | iff         | Vst     |                | Very Moist        | VM                   | Dense D        |           |              |              |        |              |            |             |  |
|                    | Hard     |             | Н       |                | Wet               | W                    | Ver            | y Den     | se           |              | VD     |              |            |             |  |
|                    |          |             |         |                |                   |                      |                |           |              |              |        |              |            |             |  |

|           |                |             |         |                |                   |                      |            |             |              |              |        |              | Job No:    | G2031       |   |
|-----------|----------------|-------------|---------|----------------|-------------------|----------------------|------------|-------------|--------------|--------------|--------|--------------|------------|-------------|---|
|           |                |             |         |                |                   |                      |            |             |              |              |        | Hole No:     | 2          |             |   |
|           |                |             |         |                |                   |                      |            |             |              |              |        |              | Date:      | 18/11/2020  | ) |
|           |                |             |         |                |                   | ENGINEERS            |            |             |              |              |        |              | Logged:    | RP          |   |
|           |                |             |         |                |                   |                      |            |             |              |              |        |              |            |             |   |
| Clien     | t:             |             |         |                |                   |                      | Surf       | ace F       | RL:          |              | -      |              |            |             |   |
| Locat     | ion: 17        | Bilbe       | rry A   | ven            | ue, Bilgola Plate | eau                  | Test       | Met         | hod:         |              |        |              |            |             |   |
| Depth (m) | SPT            | Graphic Log | Unified | Classification | De                | escription           | Moisture   | Condition   | Consistency/ | Rel. Density | Pocket | Penetrometer | Addition   | al Comment: | s |
| 0.20      |                |             |         |                | Dark Grey, silt   | y sand               | м          |             |              |              |        |              | Fill, Gras | ss roots    |   |
| 0.60      |                |             |         |                | Light Grey to Pa  | ale Olive Claye Sand | м          |             | I            | М            |        |              |            |             |   |
|           |                |             |         |                | Borehole was      | terminated at 0.6 m. |            |             |              |              |        |              |            |             |   |
|           |                |             |         |                |                   |                      |            |             |              |              |        |              |            |             |   |
|           | <u>Consist</u> | tency       |         |                | <u>Moisture</u>   |                      | <u>Den</u> | <u>sity</u> |              |              |        |              |            |             |   |
|           | Soft           |             | S       |                | Dry               | D                    | Very       | / Loo       | se           |              | VL     |              |            |             |   |
|           | Firm           |             | F       |                | Slightly Moist    | SM                   | Loos       | se          |              |              | L      |              |            |             |   |
|           | Stiff          |             | St      |                | Moist             | Μ                    | Med        | lium        | Dens         | е            | MD     |              |            |             |   |
|           | Very St        | iff         | Vst     |                | Very Moist        | VM                   | Den        | se          |              |              | D      |              |            |             |   |
|           | Hard           |             | Н       |                | Wet               | W                    | Very       | / Den       | se           |              | VD     |              |            |             |   |

Appendix D: Infiltration Test Results



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|   |  |               |                                       | Infilt         | ation Test Report   |                    |
|---|--|---------------|---------------------------------------|----------------|---|--------------------|
| Project No:   | G2031  |               |                                       |                | Test Date: 18/11/2020   |                    |
| ocation:  | 17 Bilberry                                  | Avenue, Bil   | gola Platea                           | au             | Tested by: BMB Engineers  |                    |
|   | Infil  | tration Tast  | 17.02                                 |                |   |                    |
|   | т  | est method    | 11 UZ<br>ΔΩ/NIZΩ 1/                   | 5/17:2012      |   |                    |
|   |  | est methou.   | Annendix                              | G Soil Permea  | hility Measurement-Constant Head Method (Normative)   |                    |
|   |  |               | The horeh                             | ole was soake  | d with notable water for 10 minutes prior to commencing the test  |                    |
|   |  |               |                                       |                |   |                    |
|   |  |               |                                       |                | dia   |                    |
|   |  | Test Fluid:   | Potable wa                            | ater           |   | -                  |
|   |  |               |                                       |                |   |                    |
|   | Hol  | e Radius, R:  | 0.05                                  | m              |   |                    |
|   | Но   | le Depth, D:  | 0.60                                  | m              | D   |                    |
|   |  |               |                                       |                | W Hc  |                    |
|   | Depth to                                     | o Water, wd : | 0.20                                  | m              |   |                    |
|   | Consta                                       | nt Head, Hc : | 0.40                                  | m              |   | _                  |
|   |  |               |                                       |                |   |                    |
| Depth to v  | vater table , V                              | √(if known):  |                                       | m              | S   |                    |
|   |  |               |                                       |                | $\downarrow$ Impermeable Layer $igvee$ $\downarrow$   |                    |
|   |  |               |                                       |                |   |                    |
|   |  |               |                                       |                |   |                    |
|   |  |               |                                       |                |   |                    |
| Reading   | Elapsed                                      | Time          | Water                                 | Discharge      |   |                    |
| No.   | Time   | Interval      | Added                                 | Rate           | Infiltration Test Calculation   |                    |
|   | t  | dt            | per dt                                |                |   |                    |
|   | (mins)                                       | (mins)        | (litres)                              | (litres/min)   | 0.05  |                    |
| 1   | 0.00   | 0.00          |                                       | 0.00           |   |                    |
| 2   | 5.00   | 5.00          | 0.210                                 | 0.0420         | 0.04  |                    |
| 3   | 10.00  | 5.00          | 0.180                                 | 0.0360         | 0.04  |                    |
| 4   | 20.00  | 5.00          | 0.170                                 | 0.0340         |   |                    |
| 6   | 20.00  | 5.00          | 0.100                                 | 0.0330         |   | $\left  - \right $ |
| 7   | 30.00  | 5.00          | 0 160                                 | 0.0320         | es/1  |                    |
| 8   | 35.00  | 5.00          | 0.165                                 | 0.0330         |   | $\vdash$           |
| 9   | 40.00  | 5.00          | 0.160                                 | 0.0320         |   |                    |
| 10  | 45.00  | 5.00          | 0.165                                 | 0.0330         |   |                    |
| 11  | 50.00  | 5.00          | 0.160                                 | 0.0320         | <u><u><u></u></u> <u></u> <u></u></u> | $\square$          |
| 12  | 55.00  | 5.00          | 0.155                                 | 0.0310         |   |                    |
| 13  | 60.00  | 5.00          | 0.150                                 | 0.0300         | 0.01  | $\left  - \right $ |
| 14  | 65.00  | 5.00          | 0.150                                 | 0.0300         |   |                    |
| 15  | 70.00  | 5.00          | 0.150                                 | 0.0300         | 0.01  | $\square$          |
|   |  |               | ──                                    |                |   |                    |
|   |  |               |                                       |                | 0 20 40 60  | 80                 |
|   |  |               | +                                     |                | Elapsed Time (mins)   |                    |
|   |  |               | +                                     | +              |   |                    |
|   |  |               | +                                     |                |   |                    |
|   | 1  |               | 1                                     | 1              |   |                    |
|   |  |               |                                       |                |   |                    |
|   |  |               |                                       |                | Discharge Rate Q = 0.0300 litres/min  |                    |
| Site Conditi  | ons  |               |                                       |                | 20.00 am <sup>3</sup> /min  |                    |
| Site Conditi  | ons  |               |                                       |                | 50.00 cm /mm  |                    |
| Site Conditi  | ons<br>condition:                            |               | Moist                                 |                | Hydraulic conductivity  |                    |
| Site Conditi<br>Soil moisture<br>/egetation c           | ons<br>condition:<br>over at the test        | site:         | Moist<br>Few trees                    | and grass on t | Hydraulic conductivity<br>ne site K = 0.0086 cm/min   |                    |
| Soil moisture<br>Yoil moisture<br>Yegetation co         | ons<br>condition:<br>over at the test        | : site:       | Moist<br>Few trees<br>4%              | and grass on t | Hydraulic conductivity<br>he site K = 0.0086 cm/min<br>= 1.44E-06 m/sec   |                    |
| Soil moisture<br>Yegetation co<br>Yope:<br>Surface crac | ons<br>condition:<br>over at the test<br>ks: | :site:        | Moist<br>Few trees<br>4%<br>None obse | and grass on t | Hydraulic conductivity<br>he site K = 0.0086 cm/min<br>= 1.44E-06 m/sec<br>= 0.12 m/day                               |                    |

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