Appendix B – Groundwater monitoring bore network

- Bore construction summaries
- Lithological borehole logs
- Bore construction licences

NOTE: THIS DATA IS PROVIDED ELECTRONICALLY ONLY
## Engineering Log - Borehole

**Client:** Metro Trains Melbourne  
**Principle:** Level Crossing Removal Authority  
**Project:** LCRP-CTF  
**Location:** ID47 - Station Street & Eel Race Road, Carrum  

### Drilling Information

<table>
<thead>
<tr>
<th>Borehole ID.</th>
<th>ID47-BH18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet No.</td>
<td>1 of 6</td>
</tr>
<tr>
<td>Project No.</td>
<td>GEOTABTF10294AA</td>
</tr>
<tr>
<td>Date Started</td>
<td>29 Sep 2016</td>
</tr>
<tr>
<td>Date Completed</td>
<td>04 Oct 2016</td>
</tr>
<tr>
<td>Logged By</td>
<td>RL</td>
</tr>
<tr>
<td>Checked By</td>
<td>KJ</td>
</tr>
</tbody>
</table>

**Position:** E: 335,261.22, N: 5,784,524.22 (MGA94)  
**Surface Elevation:** 6.10 m (AHD)  
**Angle from Horizontal:** 90°  
**Drill Model:** Comacchio 450P, Track mounted  
**Drilling Fluid:** Polymer  
**Hole Diameter:** 100 mm  

### Material Substance

**Soil Type:** Plasticity or particle characteristic, colour, secondary and minor components, structure and additional observations.

<table>
<thead>
<tr>
<th>Water Inflow</th>
<th>N*</th>
<th>E</th>
<th>Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Oct-12</td>
<td>1, 2, 3</td>
<td>N*5</td>
<td>SPT</td>
</tr>
<tr>
<td>1, 4, 4</td>
<td>N*18</td>
<td>E</td>
<td>SPT</td>
</tr>
<tr>
<td>2, 9, 9</td>
<td>N*18</td>
<td>SPT</td>
<td></td>
</tr>
<tr>
<td>20, 27, 27</td>
<td>N*54</td>
<td>SPT</td>
<td></td>
</tr>
<tr>
<td>15, 30-HB</td>
<td>N*15</td>
<td>SPT</td>
<td></td>
</tr>
</tbody>
</table>

**Support:**  
- M mud  
- N nil  
- C casing  

**Samples & Field Tests:**  
- B bulk disturbed sample  
- N* SPT - sample recovered  
- VS vane shear, peak/remoulded (kPa)  
- HB hammer bouncing  

**Classification Symbol & Soil Description:**  
- VS very soft  
- S soft  
- F firm  
- ST stiff  
- VST very stiff  
- MD medium dense  
- D dense  

**Consistency / Relative Density:**

- dry  
- moist  
- wet  
- plastic limit  
- liquid limit  

**Classification System:**

- very soft  
- soft  
- firm  
- stiff  
- very stiff  
- medium dense  
- dense  

**Additional Observations:**

- very loose  
- loose  

- VD very dense  

- HS hard  
- FB friable  

- VL very loose  
- L loose  

- MD medium dense  
- D dense  

- EB very loose  
- L loose  

- VD very dense  

**Material Substance:**  
- FILL: ASPHALT: 100mm.  
- FILL: Sandy GRAVEL: fine to coarse grained, angular, brown, with some angular cobbles.  
- SAND: fine to medium grained, dark grey, black. becoming pale grey  
- becoming fine to coarse grained, pale brown, pale grey  
- becoming grey  
- becoming dark brown  
- becoming brown white, trace of shells  

**Logging Information:**

- graphic log  
- classification symbol  
- samples & field tests  
- water outflow  
- water inflow  

**Logging Method:**  
- AD auger drilling  
- AS auger screwing  
- HA hand auger  
- W wash hose  

**Logging Support:**  
- M mud  
- N nil  
- C casing  

**Penetration:**  
- no resistance ranging to refusal  
- refusal  

**Water:**

- 10-Oct-12 water level on date shown  
- water inflow  
- water outflow  

**Hand Penetrometer:**

- D  
- M  
- N  
- VS  
- HB  

**PID:**  
- 0.1 ppm  
- 0.8 ppm  
- 2.9 ppm  

**Quaternary Sands:**

- 0.8 ppm  

**Depth (m):**  
- 0.0  
- 1.0  
- 2.0  
- 3.0  
- 4.0  
- 5.0  
- 6.0  
- 7.0  

**Position:**

- E: 335,261.22; N: 5,784,524.22 (MGA94)  

**Drilling Fluid:**

- Polymer  

**Angle from Horizontal:**

- 90°  

**Surface Elevation:**

- 6.10 m (AHD)  

**Drill Model:**

- Comacchio 450P, Track mounted  

**Hole Diameter:**

- 100 mm  

**Drawn By:**

- 27/03/2017 12:04
### Engineering Log - Borehole

**client:** Metro Trains Melbourne  
**principal:** Level Crossing Removal Authority  
**project:** LCRP-CTF  
**location:** ID47 - Station Street & Eel Race Road, Carrum

<table>
<thead>
<tr>
<th>position:</th>
<th>surface elevation:</th>
<th>angle from horizontal:</th>
</tr>
</thead>
<tbody>
<tr>
<td>E: 335,261.22; N: 5,784,524.22</td>
<td>6.10 m (AHD)</td>
<td>90°</td>
</tr>
</tbody>
</table>

**drilling information**

<table>
<thead>
<tr>
<th>method &amp; penetration</th>
<th>water</th>
<th>samples &amp; field tests</th>
<th>depth (m)</th>
<th>graphic log</th>
<th>classification symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td></td>
<td></td>
<td>-2</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td></td>
<td></td>
<td>-3</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td></td>
<td></td>
<td>-4</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td>-5</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td></td>
<td></td>
<td>-6</td>
<td>CI</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td>-7</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td></td>
<td></td>
<td>-8</td>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>NDD non destructive drilling</td>
<td></td>
<td></td>
<td>-9</td>
<td>SP</td>
<td></td>
</tr>
</tbody>
</table>

**material substance**

<table>
<thead>
<tr>
<th>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</th>
<th>material description</th>
<th>hand penetrometer (kPa)</th>
<th>structure and additional observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine to medium grained, dark grey, black. (continued)</td>
<td>SAND: fine to medium grained, dark grey, black. becoming fine to medium grained, pale grey</td>
<td>W VD</td>
<td>QUATERNARY SANDS</td>
</tr>
<tr>
<td>Medium plasticity, grey, dark grey, fine to medium grained sand.</td>
<td>Sandy CLAY: medium plasticity, grey, dark grey, fine to medium grained sand.</td>
<td>M F</td>
<td></td>
</tr>
<tr>
<td>Fine to coarse grained, grey, with some medium plasticity clay pockets.</td>
<td>SAND: fine to coarse grained, grey, with some medium plasticity clay pockets.</td>
<td>W VD</td>
<td></td>
</tr>
</tbody>
</table>

**MOISTURE**

- W: dry
- M: moist
- L: wet

**CONSISTENCY / RELATIVE DENSITY**

- VS: very soft
- S: soft
- F: firm
- ST: stiff
- VST: very stiff

- H: hard
- Fb: friable
- VL: very loose
- L: loose
- MD: medium dense
- D: dense

**CONSISTENCY AND RELATIVE DENSITY**

- very loose
- loose
- medium dense
- dense

**MOISTURE**

- dry
- moist
- wet

**penetration**

- no resistance ranging to refusal

**water**

- 10-Oct. 12 water level on date shown
- water inflow
- water outflow

**classification symbol & soil description**

- based on Unified Classification System

- Vd: very dense
### Engineering Log - Borehole

**client:** Metro Trains Melbourne  
**principal:** Level Crossing Removal Authority  
**project:** LCRP-CTF  
**location:** ID47 - Station Street & Eel Race Road, Carrum

#### Drilling Information

<table>
<thead>
<tr>
<th>Method</th>
<th>Support</th>
<th>Water</th>
<th>Samples &amp; Field Tests</th>
<th>Material Substance</th>
<th>Material Description</th>
<th>Consistency / Relative Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>M mud</td>
<td>N nil</td>
<td>B - bulk disturbed sample</td>
<td>CLAYEY SAND</td>
<td>fine to coarse grained, green grey, high plasticity clay.</td>
<td>MVD</td>
</tr>
<tr>
<td>AS</td>
<td>C casing</td>
<td></td>
<td>D - disturbed sample</td>
<td>CLAY</td>
<td>medium to high plasticity, pale grey, green-grey, grey-brown.</td>
<td>SI</td>
</tr>
<tr>
<td>HA</td>
<td>SS split spoon</td>
<td></td>
<td>E - environmental sample</td>
<td>SAND</td>
<td>fine to coarse grained, pale brown.</td>
<td>WVD</td>
</tr>
<tr>
<td>W</td>
<td>U# undisturbed sample</td>
<td></td>
<td>F - vane shear, peak remoulded (kPa)</td>
<td>CLAY</td>
<td>high plasticity, grey.</td>
<td>SI-VS</td>
</tr>
<tr>
<td>HA</td>
<td>N standard penetration test (SPT)</td>
<td></td>
<td>G - hand penetrometer (kPa)</td>
<td>SAND</td>
<td>fine to coarse grained, pale grey.</td>
<td>D</td>
</tr>
<tr>
<td>NDD</td>
<td>HP - sample recovered</td>
<td></td>
<td>H - hand penetrometer (kPa)</td>
<td>SAND</td>
<td>fine to coarse grained, pale grey.</td>
<td></td>
</tr>
</tbody>
</table>

#### Material Substance

- **SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components

#### Additional Observations

- **SOIL TYPE:** based on Unified Classification System

#### Drilling Data

- **Position:** E: 335,261.22; N: 5,784,524.22 (MGA94)
- **Surface Elevation:** 6.10 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Model:** Comacchio 450P, Track mounted
- **Drilling Fluid:** Polymer

#### Logging Data

- **Borehole ID:** ID47-BH18
- **Date Started:** 29 Sep 2016
- **Date Completed:** 04 Oct 2016
- **Logged by:** RL
- **Checked by:** KJ

#### Drilling Method

- **HA:** hand auger
- **AD:** auger drilling
- **AS:** auger screwing
- **W:** washbore
- **NDD:** non-destructive drilling

#### Geotechnical Parameters

- **Penetration:** no resistance ranging to refusal
- **10-Oct-12 Water Level on Date Shown:** 6.10 m (AHD)
- **Water Inflow:**
- **Water Outflow:**

#### Additional Notes

- **Material Condition:**
  - **VD:** very dense
  - **D:** dense
  - **MD:** medium dense
  - **VD:** very dense

#### Soil Descriptions

- **CLAYEY SAND:** fine to coarse grained, green grey, high plasticity clay.
- **CLAY:** medium to high plasticity, pale grey, green-grey, grey-brown, becoming pale brown.
- **SAND:** fine to coarse grained, pale brown.
- **CLAY:** high plasticity, grey.

#### Testing Methods

- **SPT:** standard penetration test
- **SPT with solid cone:** SPT - sample recovered
- **Vane Shear:** SPT with solid cone
- **Hammer Bouncing:** SPT - sample recovered
### Engineering Log - Borehole

**client:** Metro Trains Melbourne  
**principal:** Level Crossing Removal Authority  
**project:** LCRP-CTF  
**location:** ID47 - Station Street & Eel Race Road, Carrum

**Position:**  
- E: 335,261.22; N: 5,754,523.22  
- Surface elevation: 6.10 m (AHD)  
- Angle from horizontal: 90°  
- Drill model: Comacchio 450P, Track mounted  
- Drilling fluid: Polymer  
- Hole diameter: 100 mm

**Drilling Information**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Graphic Log</th>
<th>Material Description</th>
<th>Material Substance</th>
<th>Soil Type / Consistency / Relative Density</th>
</tr>
</thead>
</table>
| 25.0      | SPT 10, 17, 21 N*28 SP | SAND: fine to coarse grained, pale grey.  
(continued) | W D | TERTIARY BRIGHTON GROUP |
| 26.0      | SPT 11, 16, 24 N*40 SC | CLAYEY SAND: fine grained, pale brown, pale grey, medium plasticity. | M |
| 27.0      | SPT 8, 19, 29 N*48 ML | Clayey Silt: low to medium liquid limit, brown mottled pale grey, trace of fine to medium grained gravel.  
becoming pale brown, with some fine grained sand | VSt |
| 28.0      | SPT 9, 11, 14 N*125 SC | CLAYEY SAND: fine to coarse grained, pale brown, medium plasticity. | VD |

**Additional Observations:**

- Capping shown by suffix
- No resistance ranging to refusal
- 10-Oct-12 water level on date shown
- Water inflow
- Water outflow
- Sample recovered
- Standard penetration test (SPT)
**Engineering Log - Borehole**

**client:** Metro Trains Melbourne  
**principal:** Level Crossing Removal Authority  
**project:** LCRP-CTF  
**location:** ID47 - Station Street & Eel Race Road, Carrum

**drilling information**

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>samples &amp; field tests</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD auger drilling</td>
<td>B disturbed sample</td>
<td>CLAYEY SAND: fine to coarse grained, pale brown, medium plasticity.</td>
</tr>
<tr>
<td>AS auger screwing</td>
<td>C casing</td>
<td></td>
</tr>
<tr>
<td>HA hand auger</td>
<td>GP pure</td>
<td></td>
</tr>
<tr>
<td>W washbar</td>
<td>ML low liquid limit, pale brown, trace of clay.</td>
<td></td>
</tr>
<tr>
<td>HA hand auger</td>
<td>SPT 5, 2, 1 N=13</td>
<td></td>
</tr>
<tr>
<td>NDD non destructive drilling</td>
<td>SPT 10, 26, 17 N=143</td>
<td></td>
</tr>
<tr>
<td>position: E: 335,261.22; N: 5,784,524.22 (MGA94)</td>
<td>surface elevation: 6.10 m (AHD)</td>
<td>angle from horizontal: 90°</td>
</tr>
<tr>
<td>drill model: Comacchio 450P, Track mounted</td>
<td>drilling fluid: Polymer</td>
<td>hole diameter: 100 mm</td>
</tr>
</tbody>
</table>

**material substance**

<table>
<thead>
<tr>
<th>SOIL TYPE</th>
<th>plasticity or particle characteristic, colour, secondary and minor components</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>CLAYEY SAND: fine to coarse grained, pale brown, medium plasticity.</td>
</tr>
<tr>
<td>GP</td>
<td>GRAVEL: Ironstone, red brown, high strength.</td>
</tr>
<tr>
<td>ML</td>
<td>SILT: low liquid limit, pale brown, trace of clay.</td>
</tr>
<tr>
<td>SPT 5, 2, 1 N=13</td>
<td>SPT 10, 26, 17 N=143</td>
</tr>
</tbody>
</table>

**structure and additional observations**

- **SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components
- **material description**: CLAYEY SAND: fine to coarse grained, pale brown, medium plasticity. (continued)
- **granular materials**: Silty CLAY: medium to high plasticity, pale grey mottled brown, with some fine to coarse grained sand.

**sample & field tests**

- **penetration**: 10-Oct-12 water level on date shown
- **water inflow**: no resistance ranging to refusal
- **water outflow**: hammer bouncing

**classification symbol & soil description**

- **based on Unified Classification System**
- **soil description**: TERTIARY BRIGHTON GROUP

**method & support**

- **AD**: ADT
- **AS**: ADT
- **HA**: ADT
- **W**: ADT
- **NDD**: ADT

**support**

- **M**: mud
- **N**: nil
- **C**: casing

**samples & field tests**

- **samples**: B, bulk disturbed sample
- **field tests**: C, casing

**classification symbol**

- **clay**: SC
- **silt**: ML
- **sand**: GP

**hand penetrometer (kPa)**

- **HP**: 200 kPa
- **VS**: 200 kPa
### Engineering Log - Borehole

**client:** Metro Trains Melbourne  
**principal:** Level Crossing Removal Authority  
**project:** LCRP-CTF  
**location:** ID47 - Station Street & Eel Race Road, Carrum

#### Drilling Information

- **Borehole ID:** ID47-BH18  
- **Drill Model:** Comacchio 450P, Track mounted

#### Material Substance

**SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components

- **Moisture**
  - D: dry
  - S: soft
  - F: firm
  - VS: very stiff
  - H: hard
  - Fb: friable
  - VL: very loose
  - L: loose
  - MD: medium dense
  - D: dense
  - VD: very dense

- **Consistency / relative density**
  - VS: very soft
  - S: soft
  - F: firm
  - ST: stiff
  - VST: very stiff

- **Penetration**
  - no resistance ranging to refusal
  - 10-Oct-12 water level on date shown

#### Additional Observations

- **CI-CH:** Silty CLAY: medium to high plasticity, pale grey mottled brown, with some fine to coarse grained sand. (continued)
- **ML:** Clayey Silt: low liquid limit, grey, grey-brown.

#### Classification Symbol & Soil Description

- **Base on Unified Classification System**

- **Consistency / relative density**
  - VS: very soft
  - S: soft
  - F: firm
  - ST: stiff
  - VST: very stiff

- **Penetration**
  - no resistance ranging to refusal

- **10-Oct-12 water level on date shown**

#### Additional Notes

- **Borehole ID:** ID47-BH18 terminated at 45.80 m
- **Target depth:** 45.80 m

---

**graphic log**

**classification symbol**

**material description**

**method & support**

| method & support | water | samples & field tests | material description | classification symbol | hand penetrometer (kPa) | moisture | consistence / relative density | classification symbol & soil description
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td></td>
<td></td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
<td></td>
<td></td>
<td>VS</td>
<td>very soft</td>
<td>based on Unified Classification System</td>
</tr>
<tr>
<td>AS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S</td>
<td>soft</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>firm</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ST</td>
<td>stiff</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VST</td>
<td>very stiff</td>
<td></td>
</tr>
<tr>
<td>NDD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>hard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fb</td>
<td>friable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VL</td>
<td>very loose</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>loose</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MD</td>
<td>medium dense</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D</td>
<td>dense</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VD</td>
<td>very dense</td>
<td></td>
</tr>
</tbody>
</table>
Piezometer Installation Log

client: Metro Trains Melbourne
principal: Level Crossing Removal Authority
project: LCRP-CTF
location: ID47 - Station Street & Eel Race Road, Carrum

| position: E: 335,261.22; N: 5,784,524.22 (MGA94) | surface elevation: 6.10 m (AHD) | angle from horizontal: 90° |
| equipment type: Comacchio 450P, Track mounted | drilling fluid: Polymer | hole diameter: 100 mm |

Drilling Information

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>material substance</th>
<th>piezometer construction details</th>
</tr>
</thead>
<tbody>
<tr>
<td>graphic log</td>
<td>material name</td>
<td></td>
</tr>
<tr>
<td>water</td>
<td>FILL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QUATERNARY SANDS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| ID47-BH18        | Grout             |                                |
|                  | Bentonite         |                                |
|                  | Sand              |                                |

<table>
<thead>
<tr>
<th>ID47-BH18 standpipe piezo.</th>
<th>installation date</th>
<th>stickup (m)</th>
<th>tip depth (m)</th>
<th>water level (m)</th>
<th>Relative Levels (AHD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>04/10/2016</td>
<td>0.00 m</td>
<td>9.00 m</td>
<td></td>
<td>6.10 -2.90</td>
</tr>
</tbody>
</table>

Method & Support

- 04/10/16: Water inflow
- 04/10/16: Complete drilling fluid loss
- 04/10/16: Partial drilling fluid loss
- 04/10/16: Water pressure test result (lugeons) for depth interval shown
COPY OF RECORD IN THE VICTORIAN WATER REGISTER

LICENCE TO CONSTRUCT WORKS

under Section 67 of the Water Act 1989

The information in this copy of record is as recorded at the time of printing. Current information should be obtained by a search of the register. The State of Victoria does not warrant the accuracy or completeness of this information and accepts no responsibility for any subsequent release, publication or reproduction of this information.

This licence does not remove the need to apply for any authorisation or permission necessary under any other Act of Parliament with respect to anything authorised by the works licence.

Water used under this licence is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.

This licence is not to be interpreted as an endorsement of the design and/or construction of any works (including dams). The Authority does not accept any responsibility or liability for any suits or actions arising from injury, loss, damage or death to person or property which may arise from the maintenance, existence or use of the works.

Each person named as a licence holder is responsible for ensuring all the conditions of this licence are complied with.

This licence authorises its holders to construct the described works, subject to the conditions.

Licence Holder(s)

METRO TRAINS MELBOURNE PTY LTD C/- COFFEY of LEVEL 1, 436 JOHNSTON STREET
ABBOTSFORD VIC 3067

Licence Contact Details

METRO TRAINS MELBOURNE LEVEL 1, 436 JOHNSTON STREET
PTY LTD C/- COFFEY ABBOTSFORD VIC 3067

Licence Details

<table>
<thead>
<tr>
<th>Expiry date</th>
<th>11 Jan 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Active</td>
</tr>
<tr>
<td>Authority</td>
<td>Southern Rural Water</td>
</tr>
<tr>
<td>Name of waterway or aquifer</td>
<td>NA for construct/decommission</td>
</tr>
<tr>
<td>Water system</td>
<td>Frankston (GMU)</td>
</tr>
</tbody>
</table>

Summary of Licensed Works

The details in this section are a summary only. They are subject to the conditions specified in this licence.

<table>
<thead>
<tr>
<th>Works ID</th>
<th>Works type</th>
<th>Use of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRK095832</td>
<td>Bore</td>
<td>Observation</td>
</tr>
<tr>
<td>WRK095833</td>
<td>Bore</td>
<td>Observation</td>
</tr>
<tr>
<td>WRK095834</td>
<td>Bore</td>
<td>Observation</td>
</tr>
<tr>
<td>WRK095835</td>
<td>Bore</td>
<td>Observation</td>
</tr>
<tr>
<td>WRK095836</td>
<td>Bore</td>
<td>Observation</td>
</tr>
<tr>
<td>WRK098270</td>
<td>Bore</td>
<td>Observation</td>
</tr>
<tr>
<td>WRK098271</td>
<td>Bore</td>
<td>Observation</td>
</tr>
</tbody>
</table>
### Description of Licensed Works

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>WRK095832</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works type</td>
<td>Bore</td>
</tr>
<tr>
<td>Works subtype</td>
<td>Drilled bore</td>
</tr>
<tr>
<td>Proposed maximum depth</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

**Works location**

<table>
<thead>
<tr>
<th>Easting</th>
<th>Northing</th>
<th>Zone MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>335520.312</td>
<td>5783379.030</td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

**Land description**

Volume 7410 Folio 898
Lot 1 of Plan TP533906N

---

### Description of Licensed Works

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>WRK095833</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works type</td>
<td>Bore</td>
</tr>
<tr>
<td>Works subtype</td>
<td>Drilled bore</td>
</tr>
<tr>
<td>Proposed maximum depth</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

**Works location**

<table>
<thead>
<tr>
<th>Easting</th>
<th>Northing</th>
<th>Zone MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>335583.829</td>
<td>5783169.366</td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

**Land description**

**Property address**

69C YOUNG STREET FRANKSTON 3199

---

### Description of Licensed Works

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>WRK095834</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works type</td>
<td>Bore</td>
</tr>
<tr>
<td>Works subtype</td>
<td>Drilled bore</td>
</tr>
<tr>
<td>Proposed maximum depth</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

**Works location**

<table>
<thead>
<tr>
<th>Easting</th>
<th>Northing</th>
<th>Zone MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>335656.612</td>
<td>5782993.907</td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

**Land description**
Description of Licensed Works

**Property address**
69C YOUNG STREET FRANKSTON 3199

**Description of Licensed Works**

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>Description of Licensed Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRK095835</td>
<td><strong>Works type</strong> Bore</td>
</tr>
<tr>
<td></td>
<td><strong>Works subtype</strong> Drilled bore</td>
</tr>
<tr>
<td></td>
<td><strong>Proposed maximum depth</strong> Unrestricted</td>
</tr>
<tr>
<td></td>
<td><strong>Works location</strong></td>
</tr>
<tr>
<td></td>
<td><em>Easting</em></td>
</tr>
<tr>
<td></td>
<td>335408.316</td>
</tr>
<tr>
<td></td>
<td><em>Northing</em></td>
</tr>
<tr>
<td></td>
<td>5783796.679</td>
</tr>
<tr>
<td></td>
<td><em>Zone MGA</em></td>
</tr>
<tr>
<td></td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

**Property address**
1/ STATION STREET CARRUM 3197

**Description of Licensed Works**

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>Description of Licensed Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRK095836</td>
<td><strong>Works type</strong> Bore</td>
</tr>
<tr>
<td></td>
<td><strong>Works subtype</strong> Drilled bore</td>
</tr>
<tr>
<td></td>
<td><strong>Proposed maximum depth</strong> Unrestricted</td>
</tr>
<tr>
<td></td>
<td><strong>Works location</strong></td>
</tr>
<tr>
<td></td>
<td><em>Easting</em></td>
</tr>
<tr>
<td></td>
<td>335270.964</td>
</tr>
<tr>
<td></td>
<td><em>Northing</em></td>
</tr>
<tr>
<td></td>
<td>5784416.814</td>
</tr>
<tr>
<td></td>
<td><em>Zone MGA</em></td>
</tr>
<tr>
<td></td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

**Property address**
1/ STATION STREET CARRUM 3197

**Description of Licensed Works**

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>Description of Licensed Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRK098270</td>
<td><strong>Works type</strong> Bore</td>
</tr>
<tr>
<td></td>
<td><strong>Works subtype</strong> Drilled bore</td>
</tr>
<tr>
<td></td>
<td><strong>Proposed maximum depth</strong> Unrestricted</td>
</tr>
<tr>
<td></td>
<td><strong>Works location</strong></td>
</tr>
<tr>
<td></td>
<td><em>Easting</em></td>
</tr>
<tr>
<td></td>
<td>335455.613</td>
</tr>
<tr>
<td></td>
<td><em>Northing</em></td>
</tr>
<tr>
<td></td>
<td>5783550.662</td>
</tr>
<tr>
<td></td>
<td><em>Zone MGA</em></td>
</tr>
<tr>
<td></td>
<td>Zone 55</td>
</tr>
</tbody>
</table>
Land description

Property address
1/ STATION STREET CARRUM 3197

Description of Licensed Works

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>WRK098271</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works type</td>
<td>Bore</td>
</tr>
<tr>
<td>Works subtype</td>
<td>Drilled bore</td>
</tr>
<tr>
<td>Proposed maximum depth</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

Works location

<table>
<thead>
<tr>
<th>Easting</th>
<th>Northing</th>
<th>Zone MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>335257.861</td>
<td>5784514.546</td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

Other land description

95 C3

Property address

Location(s) in or near BONBEACH, Parish: Lyndhurst

Related Instruments

Related entitlements Nil
Related water-use entities Nil

Application History

<table>
<thead>
<tr>
<th>Reference</th>
<th>Type</th>
<th>Status</th>
<th>Lodged date</th>
<th>Approved date</th>
<th>Recorded date</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLV703729</td>
<td>Modify</td>
<td>Approved</td>
<td>11 Jan 2017</td>
<td>11 Jan 2017</td>
<td></td>
</tr>
<tr>
<td>WLI604791</td>
<td>Issue</td>
<td>Approved</td>
<td>01 Sep 2016</td>
<td>01 Sep 2016</td>
<td></td>
</tr>
</tbody>
</table>
Conditions
Licence WLE066488 is subject to the following conditions:

Siting and construction
1 The bore(s) must be drilled at the location specified in the application approved by the Authority.
2 If after drilling the bore is considered unsatisfactory a replacement bore may be drilled on the land specified in the licence.

Preventing pollution
3 All earthworks must be carried out, and all drilling fluids and waters produced during construction and development must be disposed of, in ways that avoid contaminating native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people’s property.
4 Construction must stop immediately if the Authority reasonably believes that fuel, lubricant, drilling fluid, soil or water produced during construction and development is at risk of being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people’s property.
5 The licence holder must construct and maintain bund walls, in accordance with the timeframe, specifications, guidelines or standards prescribed by the Authority, to prevent fuel, lubricant, drilling fluid, soil or water produced during construction and development from being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people’s property.

Construction standards
6 The bore(s) must be constructed, and where relevant decommissioned, in accordance with the Minimum Construction Requirements for Water Bores in Australia, Edition 3 or its successor.

Drilling licence and supervision requirements
7 The bore(s) must be constructed by, or under the direct supervision of, a driller licensed under the Water Act 1989 and endorsed as a [DrillerClass] driller, with appropriate endorsements.
8 If artesian pressure is expected or encountered, then a driller licensed under the Water Act 1989, and endorsed as a class 3 driller, must install casing in the bore(s) to a suitable depth, and in a suitable manner, to prevent its outbreak. A suitable valve must also be fitted to the bore.

Bore completion report
9 A Bore Completion Report must be submitted to the Authority within 28 working days of the bore(s) being completed.

Protecting water resources
10 No more than [dspNumberOfWorks] bore(s) may be brought to final development under this licence.
11 At the completion of drilling and before the drilling rig leaves the site, all but [dspNumberOfWorks] bore(s) must be decommissioned so as to eliminate physical hazards, conserve aquifer yield, prevent groundwater contamination and prevent the intermingling of desirable and undesirable waters.
12 The bore(s) must be located at least 30 metres from any authority's channel, reserve or easement unless authorised by the Authority.

Protecting water quality
13 Drilling must not exceed the maximum depth.
14 The bore(s) must be constructed so as to prevent aquifer contamination caused by vertical flow outside the casing.
15 If two or more aquifers are encountered, the bore(s) must be constructed to ensure that an impervious seal is made and maintained between each aquifer to prevent aquifer connection through vertical flow outside the casing; under no circumstances are two or more aquifers to be
screened within the one bore or in any other manner to allow connection between them.

16 Boreheads must be constructed, to ensure that no flood water, surface runoff or potential subsurface contaminated soakage can enter the bore or bore annulus.

Protecting other water users

17 The diameter of the drill casing must not exceed 130 millimetres.

18 The bore(s) must be constructed so that water levels in the bore(s) can be measured by an airline, a piezometer or a method approved in writing by the Authority.

Fees and charges

19 The licence holder must, when requested by the Authority, pay all fees, costs and other charges under the Water Act 1989 in respect of this licence.
**Borehole Log**

**Monitoring Well** ID18-BH13

**Environmental-Groundwater**

<table>
<thead>
<tr>
<th>Client</th>
<th>Project</th>
<th>Project No.</th>
<th>Site</th>
<th>Location</th>
<th>Date Drilled</th>
<th>Drill Co.</th>
<th>Driller</th>
<th>Rig Type</th>
<th>Drill Method</th>
<th>Grid Ref</th>
<th>Elevation</th>
<th>Collar RL</th>
<th>Logged By</th>
<th>Checked By</th>
</tr>
</thead>
<tbody>
<tr>
<td>LXRA</td>
<td>LXRA Level Crossing</td>
<td>3133036</td>
<td>LXRA ID18</td>
<td></td>
<td>01/08/2017 - 01/08/2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GDA94_MGA_zone_55</td>
<td>-</td>
<td>Alan Wilson</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B.C.L No.</th>
<th>Casing</th>
<th>Screen</th>
<th>Surface Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>50 mm PVC (Class 18)</td>
<td>0.5mm Slotted PVC (Class 18)</td>
<td>Gatic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Drilling Method</th>
<th>Sample ID</th>
<th>Lithological Description</th>
<th>Comments/Contaminant Indicators</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>HA</td>
<td>ID18-BH13</td>
<td>Water, Well Details</td>
<td></td>
<td>-0.2</td>
</tr>
<tr>
<td>0.4</td>
<td></td>
<td></td>
<td>Grout</td>
<td></td>
<td>-0.4</td>
</tr>
<tr>
<td>0.8</td>
<td></td>
<td></td>
<td>Bentonite</td>
<td></td>
<td>-0.8</td>
</tr>
<tr>
<td>1.2</td>
<td></td>
<td></td>
<td>Sand</td>
<td></td>
<td>-1.2</td>
</tr>
<tr>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.4</td>
</tr>
<tr>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.6</td>
</tr>
<tr>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.8</td>
</tr>
<tr>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.0</td>
</tr>
<tr>
<td>2.2</td>
<td>SFA</td>
<td></td>
<td></td>
<td></td>
<td>-2.2</td>
</tr>
<tr>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.4</td>
</tr>
<tr>
<td>2.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.6</td>
</tr>
<tr>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.8</td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.0</td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.2</td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.4</td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.6</td>
</tr>
<tr>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.8</td>
</tr>
<tr>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.0</td>
</tr>
<tr>
<td>4.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.2</td>
</tr>
<tr>
<td>4.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.4</td>
</tr>
<tr>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.6</td>
</tr>
<tr>
<td>4.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.8</td>
</tr>
<tr>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-5.0</td>
</tr>
<tr>
<td>5.2</td>
<td></td>
<td></td>
<td></td>
<td>Termination Depth at: 5.00 m. Target depth achieved.</td>
<td>-5.2</td>
</tr>
</tbody>
</table>

**Notes**

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**

**Moisture Abbreviations**
- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

**Consistency Abbreviations**
- Granular Soils: VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense
- Cohesive Soils: VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand

**Termination Depth at: 5.00 m. Target depth achieved.**
**BOREHOLE LOG**

**ENVIRONMENTAL-GROUNDWATER**

**MONITORING WELL** ID18-BH10

**Client** LXRA  
**Project** LXRA Level Crossing  
**Project No.** 3133036  
**Site** LXRA ID18  
**Location**  
**Date Drilled** 31/07/2017 - 01/08/2017

**Drill Co.**  
**Driller**  
**Rig Type**  
**Drill Method**  
**Total Depth (m)** 11.90  
**Diameter (mm)**  
**Easting, Northing** 335346, 5788779  
**Grid Ref** GDA94_MGA_zone_55  
**Collar RL** 0.22  
**Logged By** Alan Wilson  
**Checked By**  

**B.C.L No.** N/A  
**Casing** 50 mm PVC (Class 18)  
**Screen** 0.5mm Slotted PVC (Class 18)  
**Surface Completion** Gatic

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Sample ID</th>
<th>Graphic Log</th>
<th>Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.</th>
<th>Moisture</th>
<th>Consistency</th>
<th>Odours, staining, waste materials, separate phase liquids, imported fill, ash.</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>HA</td>
<td>GRAVEL medium, angular, brown, with silt, trace rock fragments (NATURAL - SOIL)</td>
<td>D</td>
<td>D</td>
<td></td>
<td>-0.2</td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td></td>
<td>GRAVEL medium, angular, brown, with silt, trace rock fragments (NATURAL - SOIL)</td>
<td>W</td>
<td>D</td>
<td></td>
<td>-0.4</td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td></td>
<td>SAND medium, brown, with rock fragments, with silt (NATURAL - SOIL)</td>
<td>W</td>
<td>D</td>
<td></td>
<td>-0.6</td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td></td>
<td>SAND medium, grey, with rock fragments, with silt (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
<td>-0.8</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.0</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.2</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.4</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.6</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.8</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.0</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.2</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.4</td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.6</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.8</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.0</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.2</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.4</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.6</td>
<td></td>
</tr>
<tr>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.8</td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.0</td>
<td></td>
</tr>
<tr>
<td>4.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.2</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.4</td>
<td></td>
</tr>
<tr>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.6</td>
<td></td>
</tr>
<tr>
<td>4.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.8</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**  

**Moisture Abbreviations**  
- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

**Consistency Abbreviations**  
- Granular Soils  
  - VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense  
- Cohesive Soils  
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Drilling Method</th>
<th>Sample ID</th>
<th>Well Details</th>
<th>Graphic Log</th>
<th>Lithological Description</th>
<th>Moisture</th>
<th>Consistency</th>
<th>Comments/Contaminant Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td></td>
<td>D18-BH10</td>
<td></td>
<td></td>
<td>CLAY high plasticity, medium, dark grey, trace sand (NATURAL - SOIL)</td>
<td>W</td>
<td>ST</td>
<td>Odours, staining, waste materials, separate phase liquids, imported fill, ash.</td>
</tr>
<tr>
<td>5.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy CLAY medium to high plasticity, medium, blue-grey, with fine sand (NATURAL - SOIL)</td>
<td>W</td>
<td>ST</td>
<td></td>
</tr>
<tr>
<td>5.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SAND fine, blue-grey, with clay (NATURAL - SOIL)</td>
<td>W</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>5.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SAND medium, grey (NATURAL - SOIL)</td>
<td>W</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SAND fine, grey (NATURAL - SOIL)</td>
<td>W</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy CLAY medium to high plasticity, fine to coarse, blue-grey, with medium to coarse sand (NATURAL - SOIL)</td>
<td>W</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, grey, trace clay (NATURAL - SOIL)</td>
<td>W</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

<table>
<thead>
<tr>
<th>Drilling Abbreviations</th>
<th>Moisture Abbreviations</th>
<th>Consistency Abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (m)</td>
<td>Drilling method</td>
<td>Sample ID</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**

**Moisture Abbreviations**
- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

**Consistency Abbreviations**
- Granular Soils: VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense
- Cohesive Soils: VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand
BOREHOLE LOG
ENVIRONMENTAL-GROUNDWATER

Client: LXRA
Project: LXRA Level Crossing
Project No.: 3133036
Site: LXRA ID18
Location: Total Depth (m) 2.95
Date Drilled: 01/08/2017 - 02/08/2017
Drill Co.: Drill Co.
Driller: Driller
Rig Type: Rig Type
Elevation: Elevation
Collar RL: 0.916
Logged By: Alan Wilson
Checked By: Checked By

B.C.L No.: N/A
Casing: 50 mm PVC (Class 18)
Screen: 0.5mm Slotted PVC (Class 18)
Surface Completion: Monument

Depth (m) | Sample ID | Water | Well Details | Graphic Log | LITHOLOGICAL DESCRIPTION | Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components. | Moisture | Consistency | COMMENTS/CONTAMINANT INDICATORS |
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
0.2 | HA | | ID18-BH16 | Grout | CLAY high plasticity, very fine, dark grey with mottled orange, trace rooflets (NATURAL - SOIL) | M | S | hydrocarbon staining |
0.6 | | | | Bentonite | CLAY high plasticity, very fine, dark grey with mottled orange, trace rooflets, and shells (NATURAL - 3OIL) | W | S | hydrocarbon staining |
1.2 | SFA | | | | CLAY high plasticity, very fine, black-brown (NATURAL - SOIL) | W | S | distinct organic odour |
3.0 | | | | | Termination Depth at: 2.90 m |

Notes:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations:

Moisture Abbreviations:
D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Consistency Abbreviations:
Granular Soils: VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense

COMMENTS/CONTAMINANT INDICATORS:
Odours, staining, waste materials, separate phase liquids, imported fill, ash.
## Borehole Log

### Environmental-Groundwater Monitoring Well

**Client**: LXRA  
**Project**: LXRA Level Crossing  
**Project No.**: 3133036  
**Site**: LXRA ID18  
**Location**: Total Depth (m) 2.15  
**Date Drilled**: 31/07/2017 - 01/08/2017  
**Drill Co.**:  
**Driller**:  
**Rig Type**:  
**Elevation**:  
**Collar RL**: 0.066  
**Logged By**: Alan Wilson  
**Checked By**:  

### Borehole Log Details

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Drilling Method</th>
<th>Sample ID</th>
<th>Casing</th>
<th>Screen</th>
<th>Surface Completion</th>
<th>Comments/Contaminant Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>HA</td>
<td>ID18-BH14</td>
<td>50 mm PVC (Class 18)</td>
<td>0.5mm Slotted PVC (Class 18)</td>
<td>Monument</td>
<td>CLAY high plasticity, very fine, pale brown with mottled orange, trace rootlets (NATURAL - SOIL)</td>
</tr>
<tr>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F weak organic odour</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>2.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>4.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>4.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td>4.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M F</td>
</tr>
</tbody>
</table>

**Termination Depth at 2.15 m. Target depth achieved.**

### Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**


**Moisture Abbreviations**


**Consistency Abbreviations**

- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated, VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense

**Granular Soils**

- VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense

**Cohesive Soils**

- VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand
BOREHOLE LOG
ENVIRONMENTAL-GROUNDWATER

Client: LXRA
Project: LXRA Level Crossing
Project No.: 3133036
Location: LXRA ID18
Date Drilled: 31/07/2017 - 31/07/2017

Drill Co.: 
Driller: 
Rig Type: 
Drill Method: 
Elevation: 
Collar RL: 0.253
Logged By: Alan Wilson
Checked By: 

Borehole Log ID: ID18-BH11

Easting, Northing: 335347, 5788774
Grid Ref: GDA94_MGA_zone_55

Elevation

Notes

GHD Soil Classifications

The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.


Consistency Abbreviations: D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Moisture Abbreviations: W-Wet, S-Saturated

Granular Soils: VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VO - Very Dense

Cohesive Soils: VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand

LD18-BH11

Sample ID

LITHOLOGICAL DESCRIPTION

Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

COMMENTS/ CONTAMINANT INDICATORS

Odours, staining, waste materials, separate phase liquids, imported fill, ash.

High permeability, sloppy
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Drilling Method</th>
<th>Sample ID</th>
<th>Well Details</th>
<th>Lithological Description</th>
<th>Consistency</th>
<th>Moisture</th>
<th>Comments/Contaminant Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4</td>
<td></td>
<td>ID18-BH11</td>
<td>(NATURAL - SOIL)</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Termination Depth at 5.80 m</td>
</tr>
<tr>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.


**Moisture Abbreviations** D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

**Consistency Abbreviations** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense

**Granular Soils** VL- Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand

**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand
**Client:** LXRA  
**Project:** LXRA Level Crossing  
**Project No:** 3133036  
**Site:** LXRA ID18  
**Location:**  
**Date Drilled:** 03/08/2017 - 03/08/2017  
**Drill Co.:**  
**Driller:**  
**Rig Type:**  
**Drill Method:**  
**Total Depth (m):** 5.00  
**Elevation:**  
**Collar RL:** 0.76  
**Logged By:** Alan Wilson  
**Checked By:**  

**B.C.L No.:** N/A  
**Casing:** 50 mm PVC (Class 18)  
**Screen:** 0.5mm Slotted PVC (Class 18)  
**Surface Completion:** Monument  

### Table: Borehole Log

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Drilling Method</th>
<th>Sample ID</th>
<th>Well Details</th>
<th>Graphic Log</th>
<th>Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components</th>
<th>Moisture</th>
<th>Consistency</th>
<th>Comments/Contaminant Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>HA</td>
<td>ID18-B17</td>
<td></td>
<td></td>
<td>Silty SAND fine, dark grey-brown (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td>Odours, staining, waste materials, separate phase liquids, imported fill, ash.</td>
</tr>
<tr>
<td>1.6</td>
<td>SFA</td>
<td></td>
<td></td>
<td></td>
<td>CLAY high plasticity, dark grey (NATURAL - SOIL)</td>
<td>ST</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Termination Depth at:** 5.00 m

### Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**

**Moisture Abbreviations**
- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

**Consistency Abbreviations**
- D-Dry, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense

**Granular Soils**
- VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense

**Cohesive Soils**
- VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand
### BOREHOLE LOG

#### ENVIRONMENTAL-GROUNDWATER

**Client**: LXRA  
**Project**: LXRA Level Crossing  
**Project No.**: 3133036  
**Site**: LXRA ID18  
**Location**:  
**Date Drilled**: 03/08/2017 - 03/08/2017  
**Drill Co.**:  
**Driller**:  
**Rig Type**:  
**Drill Method**:  
**Total Depth (m)**: 3.00  
**Diameter (mm)**:  
**Easting, Northing**: 334833, 5789358  
**Grid Ref**: GDA94_MGA_zone_55  
**Elevation**:  
**Collar RL**: 0.325  
**Logged By**: Alan Wilson  
**Checked By**:  

#### B.C.L No. N/A  
**Casing**: 50 mm PVC (Class 18)  
**Screen**: 0.5mm Slotted PVC (Class 18)  
**Surface Completion**: Monument

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Drilling Method</th>
<th>Sample ID</th>
<th>Well Details</th>
<th>Graphic Log</th>
<th>Lithological Description</th>
<th>Moisture</th>
<th>Consistency</th>
<th>Comments/Contaminant Indicators</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td>Silty SAND fine, dark brown (NATURAL - SOIL)</td>
<td>M</td>
<td>S</td>
<td>Odours, staining, waste materials, separate phase liquids, imported fill, ash.</td>
<td>-0.6</td>
</tr>
<tr>
<td>0.2</td>
<td></td>
<td></td>
<td>Grout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.2</td>
</tr>
<tr>
<td>0.4</td>
<td></td>
<td></td>
<td>Bentonite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.4</td>
</tr>
<tr>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.6</td>
</tr>
<tr>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1.8</td>
</tr>
<tr>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.0</td>
</tr>
<tr>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.2</td>
</tr>
<tr>
<td>1.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.4</td>
</tr>
<tr>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.6</td>
</tr>
<tr>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2.8</td>
</tr>
<tr>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.0</td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.2</td>
</tr>
<tr>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.4</td>
</tr>
<tr>
<td>2.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.6</td>
</tr>
<tr>
<td>2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3.8</td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Termination Depth at: 3.00 m. Target depth achieved.</td>
<td>-4.0</td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.2</td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.4</td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.6</td>
</tr>
<tr>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4.8</td>
</tr>
</tbody>
</table>

**Notes**

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**

**Moisture Abbreviations**
- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

**Consistency Abbreviations**
- Granular Soils VL-Very Loose, L-Loose, M-Medium Dense, D-Dense, VD- Very Dense
- Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand
### BOREHOLE LOG

**CLIENT** LXRA

**PROJECT** LXRA Level Crossing

**PROJECT NO.** 3133036

**SITE** LXRA ID18

**LOCATION**

**DATE DRILLED** 01/08/2017 - 01/08/2017

**DRILLER**

**RIG TYPE**

**DRILL METHOD**

**TOTAL DEPTH (m)** 12.00

**DIAMETER (mm)**

**EASTING, NORTHING** 335866, 5788585

**GRID REF** GDA94_MGA_zone_55

**ELEVATION**

**COLLAR RL** 1.828

**LOGGED BY** Alan Wilson

**CHECKED BY**

---

**B.C.L No.** N/A

**CASING** 50 mm PVC (Class 18)

**SCREEN** 0.5mm Slotted PVC (Class 18)

**SURFACE COMPLETION** Monument

### LITHOLOGICAL DESCRIPTION

- **Soil Type (Classification Group Symbol):**
  - CLAY medium plasticity, very fine, dark brown with mottled orange, trace rootlets, trace sand (NATURAL - SOIL)
- **Particle Size:**
- **Colour:**
- **Secondary / Minor Components:**

### COMMENTS/ CONTAMINANT INDICATORS
- Odours, staining, waste materials, separate phase liquids, imported fill, ash.

### Notes

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**

**Moisture Abbreviations**
- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist

**Consistency Abbreviations**
- W-Wet, S-Saturated, VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense, VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hand
### BOREHOLE LOG

**ENVIRONMENTAL-GROUNDWATER**

**MONITORING WELL ID18-BH12**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Sample ID</th>
<th>Drilling Method</th>
<th>LITHOLOGICAL DESCRIPTION</th>
<th>Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.</th>
<th>Moisture</th>
<th>Consistency</th>
<th>COMMENTS/ CONTAMINANT INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td></td>
<td></td>
<td></td>
<td>CLAY high plasticity, very fine, pale brown- grey (NATURAL - SOIL)</td>
<td>W</td>
<td>ST</td>
<td>Odours, staining, waste materials, separate phase liquids, imported fill, ash.</td>
</tr>
<tr>
<td>5.4</td>
<td></td>
<td></td>
<td></td>
<td>Sandy CLAY high plasticity, very fine, blue- grey (NATURAL - SOIL)</td>
<td>W</td>
<td>ST</td>
<td></td>
</tr>
<tr>
<td>5.6</td>
<td></td>
<td></td>
<td></td>
<td>Sandy CLAY high plasticity, very fine, blue- grey (NATURAL - SOIL)</td>
<td>W</td>
<td>ST</td>
<td></td>
</tr>
<tr>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale blue- grey, trace clay (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>6.4</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>6.6</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>6.8</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>7.6</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>7.8</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>8.2</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>8.4</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>8.6</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>8.8</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>9.0</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>9.4</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>9.6</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>9.8</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>10.2</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>10.4</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>10.6</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>10.8</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>11.0</td>
<td></td>
<td></td>
<td></td>
<td>SAND fine to medium, pale grey- green (NATURAL - SOIL)</td>
<td>W</td>
<td>F</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**
- AH-Air Hammer
- AR-Air Rotary
- BE-Bucket Excavation
- CC-Concrete Coring
- DC-Diamond Core
- FH-Foam Hammer
- HA-Hand Auger
- HE-Hand Excavation
- HFA-Hollow Flight Auger
- NDD-Non Destructive Drilling
- PT-Pushtube
- SD-Sonic Drilling
- SFA-Solid Flight Auger
- SS-Split Spoon
- WB-Wash Bore
- WS-Window Sampler

**Moisture Abbreviations**
- D-Dry
- SM-Slightly Moist
- M-Moist
- VL-Very Loos
- L-Loose
- MD-Medium Dense
- D-Dense
- VD-Very Dense

**Consistency Abbreviations**
- VL-Very Loose
- L-Loose
- MD-Medium Dense
- D-Dense
- VD-Very Dense
- S-Fluid
- SL-Slippery
- WM-Wet
- SM-Slightly Moist
- M-Moist
- VL-Very Loose
- L-Loose
- MD-Medium Dense
- D-Dense
- VD-Very Dense
- S-Fluid
# BOREHOLE LOG

## ENVIRONMENTAL-GROUNDWATER

## MONITORING WELL ID18-BH12

### LITHOLOGICAL DESCRIPTION

Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.

### COMMENTS/

CONTAMINANT INDICATORS

Odours, staining, waste materials, separate phase liquids, imported fill, ash.

### Depth (m)  |  Sample ID  |  Drilling method  |  Well Details  |  Graphic Log  |  Soil Type (Classification Group Symbol)  |  Particle Size  |  Colour  |  Secondary / Minor Components  |  Moisture  |  Consistency  |  Elevation (m)  
---|---|---|---|---|---|---|---|---|---|---|---|---
11 |
11.2 |  |  |  |  |  |  |  |  |  |  |  |  |
11.4 |  |  |  |  |  |  |  |  |  |  |  |  |
11.6 |  |  |  |  |  |  |  |  |  |  |  |  |
11.8 |  |  |  |  |  |  |  |  |  |  |  |  |
12 |  |  |  |  |  |  |  |  |  |  |  |  |
12.2 |  |  |  |  |  |  |  |  |  |  |  |  |
12.4 |  |  |  |  |  |  |  |  |  |  |  |  |
12.6 |  |  |  |  |  |  |  |  |  |  |  |  |
12.8 |  |  |  |  |  |  |  |  |  |  |  |  |
13 |  |  |  |  |  |  |  |  |  |  |  |  |
13.2 |  |  |  |  |  |  |  |  |  |  |  |  |
13.4 |  |  |  |  |  |  |  |  |  |  |  |  |
13.6 |  |  |  |  |  |  |  |  |  |  |  |  |
13.8 |  |  |  |  |  |  |  |  |  |  |  |  |
14 |  |  |  |  |  |  |  |  |  |  |  |  |
14.2 |  |  |  |  |  |  |  |  |  |  |  |  |
14.4 |  |  |  |  |  |  |  |  |  |  |  |  |
14.6 |  |  |  |  |  |  |  |  |  |  |  |  |
14.8 |  |  |  |  |  |  |  |  |  |  |  |  |
15 |  |  |  |  |  |  |  |  |  |  |  |  |
15.2 |  |  |  |  |  |  |  |  |  |  |  |  |
15.4 |  |  |  |  |  |  |  |  |  |  |  |  |
15.6 |  |  |  |  |  |  |  |  |  |  |  |  |
15.8 |  |  |  |  |  |  |  |  |  |  |  |  |
16 |  |  |  |  |  |  |  |  |  |  |  |  |
16.2 |  |  |  |  |  |  |  |  |  |  |  |  |
16.4 |  |  |  |  |  |  |  |  |  |  |  |  |
16.6 |  |  |  |  |  |  |  |  |  |  |  |  |
16.8 |  |  |  |  |  |  |  |  |  |  |  |  |
17 |  |  |  |  |  |  |  |  |  |  |  |  |
17.2 |  |  |  |  |  |  |  |  |  |  |  |  |
17.4 |  |  |  |  |  |  |  |  |  |  |  |  |
17.6 |  |  |  |  |  |  |  |  |  |  |  |  |
17.8 |  |  |  |  |  |  |  |  |  |  |  |  |
18 |  |  |  |  |  |  |  |  |  |  |  |  |
18.2 |  |  |  |  |  |  |  |  |  |  |  |  |
18.4 |  |  |  |  |  |  |  |  |  |  |  |  |
18.6 |  |  |  |  |  |  |  |  |  |  |  |  |
18.8 |  |  |  |  |  |  |  |  |  |  |  |  |
19 |  |  |  |  |  |  |  |  |  |  |  |  |
19.2 |  |  |  |  |  |  |  |  |  |  |  |  |
19.4 |  |  |  |  |  |  |  |  |  |  |  |  |
19.6 |  |  |  |  |  |  |  |  |  |  |  |  |
19.8 |  |  |  |  |  |  |  |  |  |  |  |  |
20 |  |  |  |  |  |  |  |  |  |  |  |  |

**Notes**

The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**GHD Soil Classifications**

- AH-Air Hammer
- AR-Air Rotary
- BE-Bucket Excavation
- CC-Concrete Coring
- DC-Diamond Core
- FH-Foam Hammer
- HA-Hand Auger
- HE-Hand Excavation (shovel)
- HFA-Hollow Flight Auger
- NDD-Non Destructive Drilling
- PT-Pushtube
- SD-Sonic Drilling
- SFA-Solid Flight Auger
- SS-Split Spoon
- WB-Wash Bore
- WS-Window Sampler

**Drilling Abbreviations**

- D-Dry
- SM-Slightly Moist
- M-Moist
- VM-Very Moist
- W-Wet
- S-Saturated

**Moisture Abbreviations**

- VL-Very Loose
- L-Loose
- MD-Medium Dense
- D-Dense
- VD - Very Dense

**Consistency Abbreviations**

- VS-Very Soft
- S-Soft
- F-Firm
- ST-Stiff
- VST-Very Stiff
- H-Hard

**Granular Soils**

- VL-Very Loose
- L-Loose
- MD-Medium Dense
- D-Dense
- VD - Very Dense

**Cohesive Soils**

- VS-Very Soft
- S-Soft
- F-Firm
- ST-Stiff
- VST-Very Stiff
- H-Hard

Termination Depth at: 12.00 m. Target depth achieved.
### BOREHOLE LOG

**ENVIRONMENTAL-GROUNDWATER**

**MONITORING WELL ID18-BH15**

**Client** LXRA  
**Project** LXRA Level Crossing  
**Project No.** 3133036  
**Site** LXRA ID18  
**Location** LXRA  
**Date Drilled** 03/08/2017 - 03/08/2017  
**Drill Co.**  
**Driller**  
**Easting, Northing** 334995, 5789167  
**Grid Ref** GDA94_MGA_zone_55  
**Total Depth (m)** 4.00  
**Collar RL** 0.707  
**Logged By** Alan Wilson  
**Checked By**  

<table>
<thead>
<tr>
<th>B.C.L No.</th>
<th>Casing</th>
<th>Screen</th>
<th>Surface Completion</th>
<th>Monument</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>50 mm PVC (Class 18)</td>
<td>0.5mm Slotted PVC (Class 18)</td>
<td>Monument</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Sample ID</th>
<th>ID18-BH15</th>
<th>Well Details</th>
<th>Graphic Log</th>
<th>Lithological Description</th>
<th>Moisture</th>
<th>Consistency</th>
<th>Comments/Contaminant Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td>Silty SAND fine, dark grey (NATURAL - SOIL)</td>
<td>M</td>
<td>S</td>
<td>Odours, staining, waste materials, separate phase liquids, imported fill, ash.</td>
</tr>
<tr>
<td>0.4</td>
<td></td>
<td>3.18</td>
<td></td>
<td></td>
<td>Silty SAND fine, pale grey, with shells (NATURAL - SOIL)</td>
<td>M</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td></td>
<td>3.20</td>
<td></td>
<td></td>
<td>SAND fine, uniform, white (NATURAL - SOIL)</td>
<td>M</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td></td>
<td>3.21</td>
<td></td>
<td></td>
<td>SAND fine, uniform, white (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td></td>
<td>3.22</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td></td>
<td>3.23</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td></td>
<td>3.24</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td></td>
<td>3.25</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td></td>
<td>3.26</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td></td>
<td>3.27</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td></td>
<td>3.28</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td></td>
<td>3.29</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>2.8</td>
<td></td>
<td>3.30</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td>3.31</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td></td>
<td>3.32</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td></td>
<td>3.33</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td></td>
<td>3.34</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>3.8</td>
<td></td>
<td>3.35</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td></td>
<td>3.36</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>4.2</td>
<td></td>
<td>3.37</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td></td>
<td>3.38</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>4.6</td>
<td></td>
<td>3.39</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>4.8</td>
<td></td>
<td>3.40</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td></td>
<td>3.41</td>
<td></td>
<td></td>
<td>SAND fine, uniform, pale grey (NATURAL - SOIL)</td>
<td>W</td>
<td>S</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

**GHD Soil Classifications** The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

**Drilling Abbreviations**

**Moisture Abbreviations**
- D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

**Consistency Abbreviations**
- Granular Soils: VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense
COPY OF RECORD IN THE VICTORIAN WATER REGISTER

LICENCE TO CONSTRUCT WORKS

under Section 67 of the Water Act 1989

The information in this copy of record is as recorded at the time of printing. Current information should be obtained by a search of the register. The State of Victoria does not warrant the accuracy or completeness of this information and accepts no responsibility for any subsequent release, publication or reproduction of this information.

This licence does not remove the need to apply for any authorisation or permission necessary under any other Act of Parliament with respect to anything authorised by the works licence.

Water used under this licence is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.

This licence is not to be interpreted as an endorsement of the design and/or construction of any works (including dams). The Authority does not accept any responsibility or liability for any suits or actions arising from injury, loss, damage or death to person or property which may arise from the maintenance, existence or use of the works.

Each person named as a licence holder is responsible for ensuring all the conditions of this licence are complied with.

This licence authorises its holders to construct the described works, subject to the conditions.

Licence Holder(s)
DALE SCOTT MCKENZIE of LEVEL 1, 436 JOHNSTON STREET ABBOTSFORD VIC 3067

Licence Contact Details
DS MCKENZIE LEVEL 1, 436 JOHNSTON STREET ABBOTSFORD VIC 3067

Licence Details
Expiry date 10 Feb 2018
Status Active
Authority Southern Rural Water
Name of waterway or aquifer NA for construct/decommission
Water system Unincorporated (GMU)

Summary of Licensed Works
The details in this section are a summary only. They are subject to the conditions specified in this licence.

<table>
<thead>
<tr>
<th>Works ID</th>
<th>Works type</th>
<th>Use of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRK098877</td>
<td>Bore</td>
<td>Investigation</td>
</tr>
<tr>
<td>WRK098878</td>
<td>Bore</td>
<td>Investigation</td>
</tr>
<tr>
<td>WRK098879</td>
<td>Bore</td>
<td>Investigation</td>
</tr>
<tr>
<td>WRK098880</td>
<td>Bore</td>
<td>Investigation</td>
</tr>
<tr>
<td>WRK098881</td>
<td>Bore</td>
<td>Investigation</td>
</tr>
<tr>
<td>WRK098882</td>
<td>Bore</td>
<td>Investigation</td>
</tr>
<tr>
<td>WRK098883</td>
<td>Bore</td>
<td>Investigation</td>
</tr>
</tbody>
</table>
Description of Licensed Works

WORKS ID WRK098877
- Works type: Bore
- Works subtype: Drilled bore
- Proposed maximum depth: Unrestricted

Works location

<table>
<thead>
<tr>
<th>Easting</th>
<th>Northing</th>
<th>Zone MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>334853.420</td>
<td>5786207.099</td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

Other land description

95 C2

Property address

Location(s) in or near CHELSEA, Parish: Lyndhurst

Description of Licensed Works

WORKS ID WRK098878
- Works type: Bore
- Works subtype: Drilled bore
- Proposed maximum depth: Unrestricted

Works location

<table>
<thead>
<tr>
<th>Easting</th>
<th>Northing</th>
<th>Zone MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>334786.573</td>
<td>5786571.717</td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

Land description

Property address

STATION STREET CHELSEA 3196

Description of Licensed Works

WORKS ID WRK098879
- Works type: Bore
- Works subtype: Drilled bore
- Proposed maximum depth: Unrestricted

Works location

<table>
<thead>
<tr>
<th>Easting</th>
<th>Northing</th>
<th>Zone MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>334691.810</td>
<td>5786792.714</td>
<td>Zone 55</td>
</tr>
</tbody>
</table>

Land description
Property address
STATION STREET CHELSEA 3196

Description of Licensed Works

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>WRK098880</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works type</td>
<td>Bore</td>
</tr>
<tr>
<td>Works subtype</td>
<td>Drilled bore</td>
</tr>
<tr>
<td>Proposed maximum depth</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Works location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easting</td>
</tr>
<tr>
<td>334523.899</td>
</tr>
</tbody>
</table>

Land description

Property address
STATION STREET CHELSEA 3196

Description of Licensed Works

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>WRK098881</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works type</td>
<td>Bore</td>
</tr>
<tr>
<td>Works subtype</td>
<td>Drilled bore</td>
</tr>
<tr>
<td>Proposed maximum depth</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Works location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easting</td>
</tr>
<tr>
<td>333463.556</td>
</tr>
</tbody>
</table>

Land description

Property address
STATION STREET ASPENDEALE 3195

Description of Licensed Works

<table>
<thead>
<tr>
<th>WORKS ID</th>
<th>WRK098882</th>
</tr>
</thead>
<tbody>
<tr>
<td>Works type</td>
<td>Bore</td>
</tr>
<tr>
<td>Works subtype</td>
<td>Drilled bore</td>
</tr>
<tr>
<td>Proposed maximum depth</td>
<td>Unrestricted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Works location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easting</td>
</tr>
<tr>
<td>333370.330</td>
</tr>
</tbody>
</table>
Land description

Property address
STATION STREET ASPENDEALE 3195

Description of Licensed Works

WORKS ID WRK098883
- Works type: Bore
- Works subtype: Drilled bore
- Proposed maximum depth: Unrestricted

Works location
- Easting: 333582.506
- Northing: 5789172.252
- Zone MGA: Zone 55

Other land description
- 95 C2

Property address
- Location(s) in or near CHELSEA, Parish: Lyndhurst

Related Instruments
- Related entitlements: Nil
- Related water-use entities: Nil

Application History

<table>
<thead>
<tr>
<th>Reference</th>
<th>Type</th>
<th>Status</th>
<th>Lodged date</th>
<th>Approved date</th>
<th>Recorded date</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLI605559</td>
<td>Issue</td>
<td>Approved</td>
<td>10 Feb 2017</td>
<td>10 Feb 2017</td>
<td></td>
</tr>
</tbody>
</table>
Conditions
Licence WLE067645 is subject to the following conditions:

Siting and construction
1. The bore(s) must be drilled at the location specified in the application approved by the Authority.
2. If after drilling the bore is considered unsatisfactory a replacement bore may be drilled on the land specified in the licence.

Preventing pollution
3. All earthworks must be carried out, and all drilling fluids and waters produced during construction and development must be disposed of, in ways that avoid contaminating native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people’s property.
4. Construction must stop immediately if the Authority reasonably believes that fuel, lubricant, drilling fluid, soil or water produced during construction and development is at risk of being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people’s property.
5. The licence holder must construct and maintain bund walls, in accordance with the timeframe, specifications, guidelines or standards prescribed by the Authority, to prevent fuel, lubricant, drilling fluid, soil or water produced during construction and development from being spilled into native vegetation, waterways, aquifers, the riparian environment, the riverine environment or other people’s property.

Construction standards
6. The bore(s) must be constructed, and where relevant decommissioned, in accordance with the Minimum Construction Requirements for Water Bores in Australia, Edition 3 or its successor.

Drilling licence and supervision requirements
7. The bore(s) must be constructed by, or under the direct supervision of, a driller licensed under the Water Act 1989 and endorsed as a Class 1, 2, or 3 driller, with appropriate endorsements.
8. If artesian pressure is expected or encountered, then a driller licensed under the Water Act 1989, and endorsed as a class 3 driller, must install casing in the bore(s) to a suitable depth, and in a suitable manner, to prevent its outbreak. A suitable valve must also be fitted to the bore.

Bore completion report
9. A Bore Completion Report must be submitted to the Authority within 28 working days of the bore(s) being completed.

Protecting water resources
10. At the completion of drilling, and before the drilling rig leaves the site, all bore(s) must be decommissioned so as to eliminate physical hazards, conserve aquifer yield, prevent groundwater contamination and prevent the intermingling of desirable and undesirable waters.
11. The bore(s) must be located at least 30 metres from any authority's channel, reserve or easement unless authorised by the Authority.

Protecting water quality
12. Drilling must not exceed the maximum depth.
13. The bore(s) must be constructed so as to prevent aquifer contamination caused by vertical flow outside the casing.
14. If two or more aquifers are encountered, the bore(s) must be constructed to ensure that an impervious seal is made and maintained between each aquifer to prevent aquifer connection through vertical flow outside the casing; under no circumstances are two or more aquifers to be screened within the one bore or in any other manner to allow connection between them.
15. Boreheads must be constructed, to ensure that no flood water, surface runoff or potential subsurface contaminated soakage can enter the bore or bore annulus.
Fees and charges
16 The licence holder must, when requested by the Authority, pay all fees, costs and other charges under the Water Act 1989 in respect of this licence.
Engineering Log - Borehole

client: Metro Trains Melbourne Pty. Ltd.
principal: Level Crossing Removal Authority
project: Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
location: Station Street, Aspendale

Borehole ID: ASPEN-BH01
sheet: 1 of 6
project no. GEOTABTF10294AA
date started: 20 Feb 2017
date completed: 22 Feb 2017
logged by: BP
checked by: KJ

position: E:333471; N:5789390 (MGA94 )
surface elevation: 6.56 m (AHD)
angle from horizontal: 90°
drill model: Xplora 50, Truck mounted
drilling fluid: Polymer
casing diameter: HW

material substance

material description

SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components

SOIL TYPE

method & support

penetration

water

samples & field tests

material description

FILL

- ASPHALT: 100mm.
- CLAYEY GRAVEL: medium to coarse grained, dark grey, orange.
- SAND: fine to coarse grained, grey.

becoming pale grey

becoming brown, pale brown, grey

becoming brown, orange-brown, trace of fines

becoming grey, trace of quartz gravel, fine to coarse grained

sample & field tests

water inflow

water outflow

Soil samples & field tests

method & support

penetration

water

samples & field tests

classification symbol

material description

FILL: ASPHALT: 100mm.
- CLAYEY GRAVEL: medium to coarse grained, dark grey, orange.
- SAND: fine to coarse grained, grey.

becoming pale grey

becoming brown, pale brown, grey

becoming brown, orange-brown, trace of fines

becoming grey, trace of quartz gravel, fine to coarse grained

classification symbol & soil description

based on Unified Classification System

consistent / relative density

moisture

D dry
W wet

VS very soft
S soft
F firm
St stiff
VT very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense
SAND: fine to coarse grained, grey. (continued)

CLAY: high plasticity, green, grey, trace of sand.

CLAYEY SAND: fine to coarse grained, green-grey, mottled orange-brown, medium plasticity.

QUATERNARY SANDS

TERTIARY BRIGHTON GROUP

Moisture

Consistency / relative density

Classification symbol & soil description

Based on Unified Classification System

Method

Support

Samples & field tests

Classification symbol

Material description

Sample recovery

Consistency / relative density

Drilling information

Material substance

H: 333471; N: 5789390 (MGA94)
### Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.

**Principal:** Level Crossing Removal Authority

**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**Location:** Station Street, Aspendale

**Log Sheet:** GEOTABTF10294AA

**Borehole ID:** ASPEN-BH01

**Date Started:** 20 Feb 2017

**Date Completed:** 22 Feb 2017

**Logged By:** BP

**Checked By:** KJ

---

**Drilling Information**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Classification Symbol</th>
<th>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.8, 13</td>
<td>SPT</td>
<td>CLAYEY SAND: fine to course grained, green-grey, mottled orange-brown, medium plasticity. (continued)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>becoming yellow-brown, with some fine grained gravel</td>
</tr>
<tr>
<td>5, 9, 8</td>
<td>SPT</td>
<td>CLAYEY SAND: fine to medium grained, pale-grey, fine to medium grained sand.</td>
</tr>
<tr>
<td>7, 16, 18</td>
<td>SPT</td>
<td>CLAYEY SAND: fine to medium grained, pale-grey, mottled green-grey, brown, low plasticity, with some pockets of fine to grey medium grained gravel.</td>
</tr>
</tbody>
</table>

**Material Substance**

<table>
<thead>
<tr>
<th>Consistency / Relative Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
</tr>
<tr>
<td>VS</td>
</tr>
<tr>
<td>S</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>VH</td>
</tr>
<tr>
<td>VL</td>
</tr>
<tr>
<td>MD</td>
</tr>
<tr>
<td>Dense</td>
</tr>
</tbody>
</table>

---

**Method & Support**

- AD: auger drilling
- AS: auger screwing
- HA: hand auger
- W: wash bore
- NDD: non-destructive drilling

---

**Drilling Fluid**

- Polymer

---

**Casing Diameter**

- HW

---

**Position**

- E: 333471; N: 578930 (MGA94)

---

**Additional Observations**

- Tertiary Brighton Group

---

**Additional Notes**

- CLAYEY SAND: fine to coarse grained, green-grey, mottled orange-brown, medium plasticity. (continued)

---

**Sample Locations**

- 5, 8, 13
- 5, 9, 8
- 7, 16, 18

---

**Position:**

- E: 333471; N: 578930 (MGA94)

---

**Angle from Horizontal:**

- 90°

---

**Other Details**

- Truck mounted
- Xplora 50
- Casing Diameter: HW
### Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.

**Principal:** Level Crossing Removal Authority

**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**Location:** Station Street, Aspendale

**Borehole ID:** ASPEN-BH01

**Date started:** 20 Feb 2017

**Date completed:** 22 Feb 2017

**Logged by:** BP

**Checked by:** KJ

**Drilling Information**

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Penetration</th>
<th>Water</th>
<th>Samples &amp; Field Tests</th>
<th>Soil Type</th>
<th>Classification Symbol</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HA</td>
<td>HW</td>
<td></td>
<td></td>
<td>CLAYEY SAND</td>
<td>SC</td>
<td>fine to medium grained, pale grey, mottled green-grey, brown, low plasticity, with some pockets of fine to medium grained gravel. (continued)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SILTY SAND</td>
<td>SM</td>
<td>fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets. becoming dark green-grey trace of shell fragments</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TERTIARY BRIGHTON GROUP</td>
<td></td>
<td>GELLIBRAND MARL</td>
</tr>
</tbody>
</table>

**Material Substance**

- **Clayey Sand:** Fine to medium grained, pale grey, mottled green-grey, brown, low plasticity, with some pockets of fine to medium grained gravel. (continued)
- **Silty Sand:** Fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets. Becoming dark green-grey. Trace of shell fragments.
- **Tertiary Brighton Group:**
  - **Gellibrand Marl:**
    - SPT refusal on gravel band.

### Additional Observations

- **Water:**
  - **Penetration:** No resistance ranging to refusal.
  - **10-Oct-12 water:** Level on date shown.
  - **19-Oct-12 water:** Level on date shown.

- **Supplies:**
  - **Casing:** HW diameter:
    - Surface elevation: 6.56 m (AHD)
    - Angle from horizontal: 90°
    - Casing diameter: HW

- **Equipment:**
  - **Drill:** Xplore 50, Truck mounted
  - **Drilling Fluid:** Polymer
  - **Casing:** HW

- **Position:**
  - E: 333471; N: 5789390 (MGA94)

- **Logging Equipment:**
  - CDF_0_9_06_LIBRARY.GLB rev:AU Log COF BOREHOLE: NON CORED GEOTABTF10294AA CHELSPEN.GPJ <<DrawingFile>> 05-07-2017 14:40
**Engineering Log - Borehole**

**client:** Metro Trains Melbourne Pty. Ltd.
**principal:** Level Crossing Removal Authority
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
**location:** Station Street, Aspendale

**Borehole ID:** ASPEN-BH01  
**date started:** 20 Feb 2017  
**date completed:** 22 Feb 2017  
**logged by:** BP  
**checked by:** KJ

**SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components

---

**method & support**

<table>
<thead>
<tr>
<th>Sample &amp; field tests</th>
<th>water</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT 12, 14, 17 N=31</td>
<td></td>
</tr>
<tr>
<td>SPT 11, 20, 18 N=38</td>
<td></td>
</tr>
<tr>
<td>SPT 20, 26, 23 N=49</td>
<td></td>
</tr>
<tr>
<td>SPT 9, 15, 22 N=37</td>
<td></td>
</tr>
</tbody>
</table>

**material description**

- **SPT:** Sample recovered
- **SPT with solid cone:** Standard penetration test
- **Vane shear:** Peak/remoulded (kPa)

---

**SOIL TYPE:** Silty Sand: fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets.

**additional observations**

- Becoming green-grey, mottled dark green
# Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Aspendale

<table>
<thead>
<tr>
<th>Borehole ID.</th>
<th>ASPEN-BH01</th>
</tr>
</thead>
<tbody>
<tr>
<td>date started:</td>
<td>20 Feb 2017</td>
</tr>
<tr>
<td>date completed:</td>
<td>22 Feb 2017</td>
</tr>
<tr>
<td>logged by:</td>
<td>BP</td>
</tr>
<tr>
<td>checked by:</td>
<td>KJ</td>
</tr>
</tbody>
</table>

## Drilling Information

| position: E: 333471; N: 5789390 (MGA94) | surface elevation: 6.56 m (AHD) |
| angle from horizontal: 90° |

| drill model: Xplora 50, Truck mounted | drilling fluid: Polymer |

## Casing Details

- Casing Diameter: HW
- Surface Elevation: 6.56 m (AHD)
- Drilling Fluid: Polymer
- Diagram File: CDF_0_9_06_LIBRARY.GLB rev:AU  Log  COF BOREHOLE: NON CORED  GEOTABTF10294AA CHELSPEN.GPJ

## Water Details

- 10-Oct-22 water level on date shown
- 15, 18, 25

## SOIL TYPE

**SILTY SAND**: fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets.

- Borehole ASPEN-BH01 terminated at 40.45 m
- Target depth
- Standpipe installation
- Backfill details
  - 0.0m-8.5m: grout
  - 8.5m-9.5m: bentonite
  - 9.5m-13.0m: sand
  - 13.0-40.45m: grout

- Standpipe details
  - 0.0m-10.0m: unslotted 50mm PVC, Class 18
  - 10.0m-13.0m: machine slotted, 50mm PVC, Class 18

- End caps and flush mounted gatic cover

## Material Substance

- **material description**: SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components

### Material Details

<table>
<thead>
<tr>
<th>samples &amp; field tests</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td>water</td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
</tr>
<tr>
<td>SPT</td>
<td>SM</td>
</tr>
<tr>
<td>15, 18, 25 N=43</td>
<td>SILTY SAND: fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets.</td>
</tr>
</tbody>
</table>

## Additional Observations

- (continued)

## Engineering Log - Borehole

**Drilling Information**

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>samples &amp; field tests</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td>water</td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
<td></td>
</tr>
<tr>
<td>SPT</td>
<td>SM</td>
<td></td>
</tr>
<tr>
<td>15, 18, 25</td>
<td>SILTY SAND: fine grained, brown, mottled orange-brown, with some pockets of fine to coarse grained gravel, trace of high plasticity clay pockets.</td>
<td></td>
</tr>
</tbody>
</table>

## Classification Symbol & Soil Description

- **classification symbol & soil description** based on Unified Classification System

## Consistency / Relative Density

- **moisture**
- **support**
- **penetration**

## Additional Observations

- **structure and additional observations**
## Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Aspendale  
**date started:** 02 Mar 2017  
**date completed:** 08 Mar 2017  
**logged by:** BP  
**checked by:** KJ

### Drilling Information

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Penetration</th>
<th>Water</th>
<th>Samples &amp; Field Tests</th>
<th>Soil Type</th>
<th>Material Description</th>
<th>Consistency / Relative Density</th>
<th>Structure and Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>auger drilling*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>auger screwing*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>hand auger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>wash bore</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>hand auger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDD</td>
<td>non destructive drilling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Material Substance

<table>
<thead>
<tr>
<th>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</th>
<th>Classification Symbol</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILL: ASPHALT: 150mm.</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>FILL: Sandy GRAVEL: fine to coarse grained, orange-brown.</td>
<td>VD</td>
<td></td>
</tr>
<tr>
<td>SAND: fine to coarse grained, dark grey, black, with some fines.</td>
<td>L - MD</td>
<td></td>
</tr>
<tr>
<td>becoming pale grey</td>
<td>MD</td>
<td></td>
</tr>
<tr>
<td>becoming pale brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>becoming fine to coarse grained, brown, trace of fines</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>becoming grey, pale grey, trace of fine grained quartz gravel</td>
<td>W</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Observations

- 10-Oct-12 water level on date shown
- VD: 150mm.
## Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Aspendale  
**Borehole ID:** ASPEN-BH02  
**project no.:** GEOTABTF10294AA  
**date started:** 02 Mar 2017  
**date completed:** 08 Mar 2017  
**logged by:** BP  
**checked by:** KJ

### drilling information

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>samples &amp; field tests</th>
<th>material description</th>
<th>material substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>method &amp; penetration</td>
<td>water</td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
<td>structure and additional observations</td>
</tr>
<tr>
<td>graphic log</td>
<td>classification symbol</td>
<td>soil description based on Unified Classification System</td>
<td>consistency / relative density</td>
</tr>
<tr>
<td>water</td>
<td>water level on date shown</td>
<td>hand penetrometer (kPa)</td>
<td>moisture</td>
</tr>
</tbody>
</table>

### material substance

**SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components

**classification symbol:**
- **SP:** fine to medium grained, dark grey, grey.
- **CH:** Sandy CLAY: high plasticity, dark grey, fine to coarse grained sand, grading to clayey sand, sulfitic colour.
- **SP:** fine to medium grained, brown, dark brown, with some fines.
- **CH:** Sandy CLAY: high plasticity, grey, mottled orange-brown, fine to medium grained sand.
- **CH:** becoming grey, mottled dark grey

**structure and additional observations**

- QUATERNARY SANDS
- TERTIARY BRIGHTON GROUP

**method & support**
- **AD:** auger drilling
- **AS:** auger screwing
- **HA:** hand auger
- **W:** washbore
- **NDD:** non-destructive drilling

**samples & field tests**
- **B:** bulk disturbed sample
- **D:** disturbed sample
- **E:** environmental sample
- **SS:** split spoon sample
- **U##:** undisturbed sample #mm diameter
- **HP:** hand penetrometer (kPa)
- **N:** standard penetration test (SPT)
- **N*:** SPT - sample recovered
- **Nc:** SPT with solid cone
- **VS:** vane shear; peak/remoulded (kPa)
- **R:** refusal
- **HB:** hammer bouncing

**classification symbol & soil description based on Unified Classification System**

**consistency / relative density**
- **VS:** very soft
- **S:** soft
- **F:** firm
- **ST:** stiff
- **VS:** very stiff
- **H:** hard
- **Fb:** frail
- **VL:** very loose
- **L:** loose
- **MD:** medium dense
- **D:** dense
- **VD:** very dense

**additional observations**

- hand penetrometer (kPa)
- standard penetration test (SPT)
- refusal
- hammer bouncing
- hand auger
- washbore
- B: blank bit
- TC: TC bit
- V: V bit
- water level on date shown
- no resistance ranging to refusal
- dry
- moist
- wet
- liquid limit
- very loose
- loose
- medium dense
- dense
- very dense
### Sandy CLAY

- plasticiy: high
- colour: orange-brown
- grain size: fine to medium

### CLAYEY SAND

- plasticiy: low
- colour: green-brown
- grain size: fine

---

**Additional Information**

- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Surface Elevation:** 6.72 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Diameter:** 150 mm
- **Position:** E: 333586; N: 5789170 (MGA94)
- **Logging Method:** Hand Auger

---

**SOIL TYPE:** Sandy CLAY and CLAYEY SAND

**Material Description:**
- Sandy CLAY: high plasticity, grey, mottled orange-brown, fine to medium grained sand.
- CLAYEY SAND: fine grained, pale grey, mottled green-brown, low plasticity.

---

**Consistency / Relative Density**

- **Moisture:**
  - **Dry:** D
  - **Moist:** M
  - **Wet:** W

- **Penetration:**
  - **No Resistance:** NR
  - **Hand Penetrometer:** HP
  - **Standard Penetration Test:** SPT

- **Soil Description:**
  - **Undisturbed Sample:** US
  - **Disturbed Sample:** D
  - **Environmental Sample:** E

---

**Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea**

---

**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

---

**Location:** Station Street, Aspendale

---

**Client:** Metro Trains Melbourne Pty. Ltd.

---

**Date Started:** 02 Mar 2017

---

**Date Completed:** 08 Mar 2017

---

**Logged by:** BP

---

**Checked by:** KJ
### Engineering Log - Borehole

**Position:** Station Street, Aspendale

**Date Started:** 02 Mar 2017

**Date Completed:** 08 Mar 2017

#### Additional Observations

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Temperature (°C)</th>
<th>Pressure (kPa)</th>
<th>Water Level (m AHD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Geological Description

- **Sandy Clay:** fine to coarse grained, brown, low plasticity, with some pockets of fine to medium grained gravel.

- **Sandy Sand:** fine to coarse grained, dark green-grey, with some pockets of sandy clay and fine grained gravel, trace of shell fragments.

- **Silty Sand:** fine grained, green-grey, with some pockets of sandy clay and fine grained gravel, trace of shell fragments.

#### Tertiary Brighton Group

- **HP > 600 kPa**
- **Gellibrand Marl**

#### Site Information

- **Drill Model:** Xplora 50, Truck mounted
- **Angle from Horizontal:** 90°
- **Surface Elevation:** 6.72 m (AHD)
- **Drilling Fluid:** Polymer

---

**Note:** This log provides a detailed geological analysis of the borehole, including soil types, depth measurements, and additional observations.
# Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Aspendale  
**position:** E: 333586; N: 5789170 (MGA94)  
**drill model:** Xplora 50, Truck mounted  
**drilling fluid:** Polymer

## Drilling Information

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>SOIL TYPE</th>
<th>material description</th>
<th>support</th>
<th>стью</th>
<th>samples &amp; field tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT 11, 12, 14</td>
<td>SM</td>
<td>SILT SAND: fine to coarse grained, green-grey, mottled yellow-brown, low plasticity.</td>
<td>M</td>
<td>WD</td>
<td>N=26</td>
</tr>
<tr>
<td>SPT 5, 5, 6</td>
<td>N*</td>
<td>becoming grey, mottled yellow-brown, with some pockets of sandy clay, medium plasticity</td>
<td>M</td>
<td>WD</td>
<td>N=11</td>
</tr>
<tr>
<td>SPT 8, 9, 16</td>
<td>N*</td>
<td>trace of shell fragments</td>
<td>M</td>
<td>WD</td>
<td>N=25</td>
</tr>
<tr>
<td>SPT 11, 13, 20</td>
<td>N*</td>
<td></td>
<td>M</td>
<td>WD</td>
<td>N=33</td>
</tr>
</tbody>
</table>

**Position:** E: 333586; N: 5789170 (MGA94)  
**Surface Elevation:** 6.72 m (AHD)  
**Angle from horizontal:** 90°  
**Hole Diameter:** 150 mm  
**Drill Model:** Xplora 50, Truck mounted  
**Drilling Fluid:** Polymer  

**Classification:**
- SM: SILT SAND

**Additional Observations:**
- trace of shell fragments

---

**Method:**
- HA: Hand auger
- AD: Auger drilling
- AS: Auger screwing
- NDD: Non destructive drilling

**Support:**
- M: Mud
- N: Nil
- C: Casing

**Consistency:**
- VS: Very soft
- S: Soft
- F: Firm
- ST: Stiff
- VST: Very stiff
- H: Hard
- Fb: Frical
- VL: Very loose
- L: Loose
- MD: Medium dense
- D: Dense
- VD: Very dense

**Hand Penetrometer:**
- (kPa)

---

**Project Details:**
- **Client:** Metro Trains Melbourne Pty. Ltd.
- **Principal:** Level Crossing Removal Authority
- **Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
- **Location:** Station Street, Aspendale
- **Position:** E: 333586; N: 5789170 (MGA94)
- **Date Started:** 02 Mar 2017
- **Date Completed:** 08 Mar 2017
- **Logged by:** BP
- **Checked by:** KJ
Borehole ID. ASPEN-BH02

client: Metro Trains Melbourne Pty. Ltd.
principal: Level Crossing Removal Authority
project: Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
location: Station Street, Aspendale

position: E: 333586; N: 5789170 (MGA94 )
surface elevation: 6.72 m (AHD)
angle from horizontal: 90°
drill model: Xplora 50, Truck mounted
drilling fluid: Polymer
hole diameter: 150 mm

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>method &amp; support</th>
<th>water</th>
<th>samples &amp; field tests</th>
<th>material substance</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</td>
</tr>
</tbody>
</table>

Borehole ASPEN-BH02 terminated at 40.25 m
Target depth
Standpipe installation
Backfill details
0.0m-9.5m: grout
9.5m-10.5m: bentonite
10.5m-14.0m: sand
14.0-40.25m: grout

Standpipe details
0.0m-11.0m: unslotted 50mm PVC, Class 18
11.0m-14.0m: machine slotted, 50mm PVC, Class 18

End caps and flush mounted gatic cover

method & support
- AD: auger drilling
- AS: auger screwing
- HA: hand auger
- W: washbore
- H: hand auger
- NDD: non destructive drilling

samples & field tests
- B: bulk disturbed sample
- D: disturbed sample
- E: environmental sample
- SS: split spoon sample
- U#: undisturbed sample #2mm diameter
- HP: hand penetrometer (kPa)
- N: standard penetration test (SPT)
- N*: SPT - sample recovered
- Nc: SPT with solid cone
- VS: vane shear; peak/remouded (kPa)
- R: refusal
- HB: hammer bouncing
- V: V bit
- B: B or T bit
- T: T or B bit
- C: C or T bit
- S: S or C bit

classification symbol & soil description
- based on Unified Classification System
- moisture
- D: dry
- W: wet
- M: moist
- H: hard
- V: very hard
- S: soft
- St: stiff
- VS: very stiff
- L: loose
- MD: medium dense
- D: dense
- LD: very dense

consistency / relative density
- VS: very soft
- V: very soft
- S: soft
- St: stiff
- VSt: very stiff
- H: hard
- L: loose
- MD: medium dense
- D: dense
- LD: very dense
### Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.  
**Principal:** Level Crossing Removal Authority  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea

|----------------------------------|----------------------------------|---------------------------|--------------------------------------|------------------------|

**Borehole ID:** CHEL-BH01  
**Date Started:** 06 Feb 2017  
**Date Completed:** 08 Feb 2017  
**Logged by:** BP  
**Checked by:** KJ

#### Drilling Information

<table>
<thead>
<tr>
<th>Penetration Method</th>
<th>Support</th>
<th>Samples &amp; Field Tests</th>
<th>Material Description</th>
<th>Soil Type: Plasticity or Particle Characteristic, Colour, Secondary and Minor Components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Material Substance

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Classification Symbol &amp; Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Additional Observations

<table>
<thead>
<tr>
<th>Moisture</th>
<th>Consistency / Relative Density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Graphical Log:**

- **SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components
- **Material Description:**
  - FILL: ASPHALT: 100mm.
  - FILL: Sandy GRAVEL: medium to coarse grained, sub-angular to angular, grey.
  - FILL: CLAYEY SAND: medium to coarse grained, grey, mottled orange.
  - SAND: fine to coarse grained, grey, dark grey.
  - SAND: fine to coarse grained, grey, dark grey.
  - FILL: QUATERNARY SANDS

**Consistency / Relative Density:**

- **MOISTURE:**
  - VS = very soft
  - S = soft
  - F = firm
  - ST = stiff
  - VST = very stiff

- **CONSISTENCY / RELATIVE DENSITY:**
  - H = hard
  - Fb = friable
  - W = wet
  - VL = very loose
  - L = loose
  - MD = medium dense
  - D = dense
  - VD = very dense
**Engineering Log - Borehole**

Client: Metro Trains Melbourne Pty. Ltd.
Principal: Level Crossing Removal Authority
Project: Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
Location: Station Street, Chelsea

<table>
<thead>
<tr>
<th>Sample and Field Tests</th>
<th>Material Description</th>
<th>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.9, 9, N=18</td>
<td>SP</td>
<td>SAND: fine to coarse grained, grey, dark grey. (continued) becoming grey, mottled black</td>
</tr>
<tr>
<td>10.17, 18, N=35</td>
<td>SP</td>
<td>SAND: fine to coarse grained, grey, trace of shell fragments</td>
</tr>
<tr>
<td>15.16, 13, N=29</td>
<td>SP</td>
<td>SAND: fine to medium grained, pale grey, trace of fines.</td>
</tr>
<tr>
<td>15.27, 5/25mm</td>
<td>CL</td>
<td>Sandy CLAY: medium to high plasticity, dark grey, with some sand, with some pockets of sandy clay.</td>
</tr>
<tr>
<td>N=R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Observations:**
- **Sandy CLAY:** low plasticity, grey, fine to coarse grained sand, trace of sand pockets.
- **CLAY:** medium to high plasticity, dark grey, with some sand, with some pockets of sandy clay.
- **QUATERNARY SANDS:**
- **TERTIARY BRIGHTON GROUP:**
  - HP 300 - 375 kPa

**Consistency / Relative Density:**
- VS: very soft
- S: soft
- F: firm
- St: stiff
- VS: very stiff
- H: hard
- Fb: brittle
- W: wet
- VL: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense
## Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.

**principal:** Level Crossing Removal Authority

**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**location:** Station Street, Chelsea

---

### Borehole ID:

- **CHEL-BH01**

- **sheet:** 3 of 6

- **project no.** GEOTABTF10294AA

---

### Drilling Information

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>penetration</th>
<th>water</th>
<th>samples &amp; field tests</th>
<th>SOIL TYPE</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD auger drilling</td>
<td>NH non destructive driving</td>
<td>water</td>
<td>SPT 2; 1, 3 N&gt;4 U&lt;3</td>
<td>M F</td>
<td>TERTIARY BRIGHTON GROUP</td>
</tr>
<tr>
<td>AS auger screwing</td>
<td>NH non destructive driving</td>
<td>water</td>
<td>SPT 13/90mm HB N=R</td>
<td>M F</td>
<td>HP 150 - 250 kPa</td>
</tr>
<tr>
<td>HA hand auger</td>
<td>NH non destructive driving</td>
<td>water</td>
<td>SPT 4; 5, 7 N=12</td>
<td>M F</td>
<td>inferred clay band, 300mm thick</td>
</tr>
<tr>
<td>W washbore</td>
<td>NH non destructive driving</td>
<td>water</td>
<td>SPT 6; 10mm HB N=R</td>
<td>M F</td>
<td></td>
</tr>
</tbody>
</table>

### Material Substance

<table>
<thead>
<tr>
<th>SPT</th>
<th>CI-CH CLAY: medium to high plasticity, dark grey, with some sand, with some pockets of sandy clay. (continued) becoming pale grey, with some pockets of green, low plasticity fines</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP</td>
<td>SAND: medium to coarse grained, grey, with some fines.</td>
</tr>
<tr>
<td>SP</td>
<td>SAND: medium to coarse grained, grey, with some fines.</td>
</tr>
<tr>
<td>CH</td>
<td>CLAY: high plasticity, grey, trace of fine to medium grained sand.</td>
</tr>
<tr>
<td>CI-CH</td>
<td>CLAY: medium to high plasticity, pale grey, with some fine grained sand.</td>
</tr>
<tr>
<td>SP</td>
<td>SAND: medium to coarse grained, brown, trace of shell fragments, layer of iron cemented sand</td>
</tr>
</tbody>
</table>

### Drilling Fluid

- **Polymer**

### Drilling Equipment

- **Xplora 50, Truck mounted**
- **Surface elevation:** 6.63 m (AHD)
- **Angle from horizontal:** 90°
- **Hole diameter:** 100 mm
- **Drill model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer

---

### Additional Observations

- **Position:** E: 334777; N: 5786594 (MGA94)
- **Depth:** 17.0 to 23.0 m
- **Soil description:** SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components
- **Samples & Tests:** water, samples, field tests, standard penetration test (SPT), hammer bouncing, hand penetrometer (kPa)

---

### Notes

- **Moisture:** dry, moist, wet
- **Consistency / Relative Density:** very soft, soft, firm, very firm, stiff, very stiff, hard, friable, very friable, loose, very loose, dense, very dense
### Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.

**principal:** Level Crossing Removal Authority

**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**location:** Station Street, Chelsea

**Borehole ID:** CHEL-BH01

**date started:** 06 Feb 2017

**date completed:** 08 Feb 2017

<table>
<thead>
<tr>
<th>SOIL TYPE</th>
<th>material description</th>
<th>classifcation symbol &amp; soil description based on Unified Classification System</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLAYEY SAND</td>
<td>fine to medium grained, pale grey, pale red, brown, low plasticity, with some cemented sand recovered as medium to coarse grained gravel. (continued)</td>
<td>based on Unified Classification System</td>
</tr>
<tr>
<td>SILTY SAND</td>
<td>fine to coarse grained, green-grey, low plasticity, with some pockets of fine to medium grained gravel &amp; high plasticity clay.</td>
<td>based on Unified Classification System</td>
</tr>
</tbody>
</table>

### Drilling Information

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>material substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>CLAYEY SAND</td>
</tr>
<tr>
<td>18</td>
<td>becoming pale green-brown, motiled pale red, trace of fine grained gravel</td>
</tr>
<tr>
<td>22</td>
<td>becoming pale green-brown, bands of pale grey, motiled pale red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>material substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>material substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>TERTIARY BRIGHTON GROUP</td>
</tr>
<tr>
<td>26</td>
<td>No recovery in U63</td>
</tr>
</tbody>
</table>

### Soil Type

- **CLAYEY SAND:** fine to medium grained, pale grey, pale red, brown, low plasticity, with some cemented sand recovered as medium to coarse grained gravel. (continued)
- **SILTY SAND:** fine to coarse grained, green-grey, low plasticity, with some pockets of fine to medium grained gravel & high plasticity clay.

### Additional Observations

- **structure and additional observations:**
  -  | TERTIARY BRIGHTON GROUP
  -  | No recovery in U63

### Drilling Information

- **support:** M: mud, N: nil, C: casing
- **penetration:** no resistance ranging to refusal
- **water:** 10-Oct-12 water level on date shown
- **samples & field tests:**
  - B: bulk disturbed sample
  - D: disturbed sample
  - E: environmental sample
  - SS: split spoon sample
  - U##: undisturbed sample #mm diameter
  - HP: hand penetrometer (kPa)
  - N: standard penetration test (SPT)
  - N*: SPT - sample recovered
  - Nc: SPT with solid cone
  - VS: vane shear; peak/remoulded (kPa)
  - R: refusal
  - HB: hammer bouncing
- **classification symbol & consistency / relative density:**
  - VS: very soft
  - S: soft
  - F: firm
  - St: stiff
  - VSt: very stiff
  - H: hard
  - Fb: friable
  - VL: very loose
  - L: loose
  - MD: medium dense
  - D: dense
  - VD: very dense
**SPT**
8, 10, 15/70 mm
HB
N* = R

**SPT**
7, 11, 3
N* = 14

**SPT**
4, 6, 26
N* = 32

**SPT**
3, 3, 7
N* = 10

---

**SILTY SAND**: fine to coarse grained, green-grey, low plasticity, with some pockets of fine to medium grained gravel & high plasticity clay.

**CLAYEY SAND**: fine to coarse grained, grey, low plasticity, with some pockets of fine to medium grained gravel, becoming green-grey trace of clay bands, <20mm thick

**SILTY SAND**: fine to coarse grained, green-grey, medium plasticity.
**Engineering Log - Borehole**

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea

**Borehole ID:** CHEL-BH01  
**date started:** 06 Feb 2017  
**date completed:** 08 Feb 2017  
**logged by:** BP  
**checked by:** KJ

**position:** E: 334777; N: 5786594 (MGA94)  
**surface elevation:** 6.63 m (AHD)  
**angle from horizontal:** 90°  
**drill model:** Xplora 50, Truck mounted  
**drilling fluid:** Polymer  
**hole diameter:** 100 mm

### Drilling Information

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Sample &amp; Field Tests</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-9.5m</td>
<td>grout</td>
<td>GELLIBRAND MARL</td>
</tr>
<tr>
<td>9.5-10.5m</td>
<td>bentonite</td>
<td></td>
</tr>
<tr>
<td>10.5-14.0m</td>
<td>sand</td>
<td></td>
</tr>
<tr>
<td>14.0-40.75m</td>
<td>grout</td>
<td></td>
</tr>
</tbody>
</table>

**Standpipe Installation**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Material &amp; Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-11.0m</td>
<td>unslotted 50mm PVC, Class 18</td>
</tr>
<tr>
<td>11.0-14.0m</td>
<td>machine slotted, 50mm PVC, Class 18</td>
</tr>
</tbody>
</table>

**End caps and flush mounted gatic cover**

**Consistency / Relative Density**

<table>
<thead>
<tr>
<th>Moisture</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS</td>
<td>very soft</td>
</tr>
<tr>
<td>S</td>
<td>soft</td>
</tr>
<tr>
<td>F</td>
<td>firm</td>
</tr>
<tr>
<td>ST</td>
<td>stiff</td>
</tr>
<tr>
<td>VST</td>
<td>very stiff</td>
</tr>
<tr>
<td>H</td>
<td>hard</td>
</tr>
<tr>
<td>Fb</td>
<td>friable</td>
</tr>
<tr>
<td>VL</td>
<td>very loose</td>
</tr>
<tr>
<td>L</td>
<td>loose</td>
</tr>
<tr>
<td>MD</td>
<td>medium dense</td>
</tr>
<tr>
<td>D</td>
<td>dense</td>
</tr>
<tr>
<td>VD</td>
<td>very dense</td>
</tr>
</tbody>
</table>

**Method & Support**

<table>
<thead>
<tr>
<th>Method</th>
<th>Support</th>
<th>Samples &amp; Field Tests</th>
<th>Classification Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>M mud</td>
<td>B bulk disturbed sample</td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>C casing</td>
<td>D disturbed sample</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>N nil</td>
<td>E environmental sample</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>E washore</td>
<td>SS split spoon sample</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>U# undisturbed sample #1mm diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDD</td>
<td>N* SPT - sample recovered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD/T</td>
<td>HP hand penetrometer (kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Nc SPT with solid cone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>VS vane shear; peak/remoulded (kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V/V</td>
<td>R refusal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>HB hammer bouncing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Classification Symbol & Soil Description**

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM</td>
<td>SILTY SAND: fine to coarse grained, green-grey, medium plasticity. (continued) becoming green-grey, mottled green-brown</td>
</tr>
</tbody>
</table>

**Additional Observations**

Borehole CHEL-BH01 terminated at 40.75 m

Target depth

Standpipe installation

Backfill details

- 0.0m-3.5m: grout
- 3.5m-10.5m: bentonite
- 10.5m-14.0m: sand
- 14.0-40.75m: grout

Standpipe details

- 0.0m-11.0m: unslotted 50mm PVC, Class 18
- 11.0-14.0m: machine slotted, 50mm PVC, Class 18

End caps and flush mounted gatic cover
### Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea

<table>
<thead>
<tr>
<th>Position</th>
<th>Surface Elevation</th>
<th>Angle from horizontal</th>
<th>Drill Model</th>
<th>Drilling Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>E: 334685; N: 576811 (MGA94)</td>
<td>6.58 m (AHD)</td>
<td>90°</td>
<td>Xplora 50, Truck mounted</td>
<td>Polymer</td>
</tr>
</tbody>
</table>

#### Drilling Information

- **Method & Support:**  
- **Penetration:**  
- **Water:**  
- **Samples & Field Tests:**

#### Material Substance

- **SOIL TYPE:** Plasticity or particle characteristic, colour, secondary and minor components, structure and additional observations.

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>FILL: SILTY SAND: fine to coarse grained, dark brown.</td>
</tr>
<tr>
<td>2.0</td>
<td>SAND: fine to medium grained, brown, grey.</td>
</tr>
</tbody>
</table>

#### Classification Symbol

- **NDDAD/VW:** FILL:  
- **MDD:** QUATERNARY SANDS

#### Support

- **M:** mud  
- **N:** nil  
- **H:** casing  
- **W:** washbore  
- **SS:** non-destructive drilling

#### Water

- **10-Oct-12 water level on date shown**
- **Water inflow**
- **Water outflow**

#### Consistency / Relative Density

- **VS:** very soft  
- **S:** soft  
- **F:** firm  
- **ST:** stiff  
- **VST:** very stiff  
- **H:** hard  
- **Fb:** friable  
- **VL:** very loose  
- **L:** loose  
- **MD:** medium dense  
- **D:** dense  
- **VD:** very dense
### Engineering Log - Borehole

**Borehole ID:** CHEL-BH02  
**Client:** Metro Trains Melbourne Pty. Ltd.  
**Principal:** Level Crossing Removal Authority  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Penetration &amp; Water</th>
<th>Samples &amp; Field Tests</th>
<th>Material Substance</th>
<th>Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD auger drilling*</td>
<td>M mud N nil</td>
<td>SP SAND: fine to medium grained, brown, grey. (continued)</td>
<td>W D QUATERNARY SANDS</td>
<td></td>
</tr>
<tr>
<td>AS auger screwing*</td>
<td>C casing</td>
<td>becoming grey-brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA hand auger</td>
<td>SPT 7, 12, 9 N=21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W washbore</td>
<td>SPT 5, 4, 6 N=10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA hand auger</td>
<td>SPT 2, 3, 5 N=8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDD non destructive drilling</td>
<td>SPT 17, 32, 36 N=68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U3</td>
<td>SPT 3, 2, 4 N=7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCL</td>
<td>SPT 17, 32, 36 N=68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td>SPT 3, 2, 4 N=7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Position:** E: 334685; N: 5786811 (MGA94)  
**Surface Elevation:** 6.58 m (AHD)  
**Angle from Horizontal:** 90°  
**Drill Model:** Xplora 50, Truck mounted  
**Drilling Fluid:** Polymer  
**Hole Diameter:** 100 mm

---

**SOIL TYPE:** Plasticity or particle characteristic, colour, secondary and minor components  
**Material Description:** Structure and additional observations

---

**Classification Symbol & Soil Description:** Based on Unified Classification System  
**Consistency / Relative Density:**

- **Water:**
  - **Moisture:**
    - **Hand Penetrometer:**
      - **Hand Penetration (kPa):**
        - **Hard:** 150 - 200 kPa
  - **Hand Penetration:**
    - **Material:**
      - **Moisture:**
        - **Hand Penetrometer:**
          - **Hand Penetration (kPa):**
            - **Hard:** 150 - 200 kPa

---

**Material Substance & Additional Observations:**

- **Sandy CLAY:** Low plasticity, grey-green, fine grained sand.
- **CLAY:** High plasticity, grey-green.
### Engineering Log - Borehole

**Borehole ID:** CHEL-BH02  
**Client:** Metro Trains Melbourne Pty. Ltd.  
**Principal:** Level Crossing Removal Authority  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea  
**Date Started:** 16 Mar 2017  
**Date Completed:** 20 Mar 2017  
**Logged by:** SS/LW  
**Checked by:** KJ  

**Position:** E: 334685; N: 5768111 (MGA94)  
**Surface Elevation:** 6.58 m (AHD)  
**Angle from Horizontal:** 90°  
**Drill Model:** Xplora 50, Truck mounted  
**Drilling Fluid:** Polymer  
**Hole Diameter:** 100 mm  

<table>
<thead>
<tr>
<th>Drilling Information</th>
<th>Material Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method &amp; Support</td>
<td>Material Description</td>
</tr>
<tr>
<td>AD</td>
<td>CH: Clay, high plasticity, grey-green. (continued)</td>
</tr>
<tr>
<td>AS</td>
<td>W: St - VSt</td>
</tr>
<tr>
<td>HA</td>
<td>HP 150 - 200 kPa</td>
</tr>
<tr>
<td>W</td>
<td>SAND: Fine to medium grained, pale brown.</td>
</tr>
<tr>
<td>HA</td>
<td>CLAYEY SAND: Fine to coarse grained, pale grey, mottled orange-brown, medium plasticity.</td>
</tr>
</tbody>
</table>

**Materials Description:** SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components  
**Additional Observations:** SPT sank 370mm under self weight.
# Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.

**principal:** Level Crossing Removal Authority

**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**location:** Station Street, Chelsea

**date started:** 16 Mar 2017

**date completed:** 20 Mar 2017

---

### Drilling Information

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>samples &amp; field tests</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>graphic log</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>classification symbol</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>soil description</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>method</strong> &amp; support</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>penetration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>water</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SPT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em><em>N</em> = 0</em>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SPT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em><em>N</em> = 10</em>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SPT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em><em>N</em> = 20</em>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Material Substance

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>samples &amp; field tests</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SOIL TYPE</strong></td>
<td></td>
<td>plasticity or particle characteristic, colour, secondary and minor components</td>
</tr>
<tr>
<td><strong>classification symbol</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>material description</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**graphic log**

- SC: CLAYEY SAND: fine to coarse grained, pale grey, mottled orange-brown, medium plasticity, (continued) hand or fragmented cemented sands
- SC: CLAYEY SAND: fine to medium grained, pale grey, with some brown, low plasticity, becoming fine grained, orange-brown
- gravel band, fine to coarse grained
- with some cemented sand nodules

---

**log:**

- **SPT sank 500mm under self weight, possibly disturbed during drilling**
- **SPT refusal on gravel band**

---

**additional observations**

- **TERTIARY BRIGHTON GROUP**
- **GELLIBRAND MARL**

---

**support:**

- M: mud
- N: nil
- C: casing

**penetration:**

- no resistance to refusal

**water:**

- 10-Oct-12 water level on date shown
- water inflow
- water outflow

**classification symbol & soil description:**

- based on Unified Classification System
- VS: very soft
- S: soft
- F: firm
- St: stiff
- VSf: very stiff
- H: hard
- Fb: friable
- WL: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense
### Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea

| Borehole ID. | CHEL-BH02  
|---|---
| date started: | 16 Mar 2017  
| date completed: | 20 Mar 2017  
| logged by: | SS/LW  
| checked by: | KJ  
| Borehole ID. | CHEL-BH02  
| sheet: | 5 of 6  
| project no. | GEOTABTF10294AA

#### Drilling Information

<table>
<thead>
<tr>
<th>method</th>
<th>support</th>
<th>penetration</th>
<th>samples &amp; field tests</th>
<th>water</th>
<th>soil description</th>
<th>classification symbol &amp; soil description</th>
<th>classification symbol &amp; soil description</th>
<th>material description</th>
<th>water</th>
<th>soil description</th>
<th>classification symbol &amp; soil description</th>
<th>classification symbol &amp; soil description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HA</td>
<td>mud</td>
<td>no resistance</td>
<td>bulk disturbed sample</td>
<td>10-Oct-12 water level on date shown</td>
<td>water inflow</td>
<td>VS</td>
<td>very soft</td>
<td>B</td>
<td>bulk disturbed sample</td>
<td>VS</td>
<td>very soft</td>
<td></td>
</tr>
<tr>
<td>AD</td>
<td>clay</td>
<td>no resistance</td>
<td>disturbed sample</td>
<td>10-Oct-12 water level on date shown</td>
<td>water inflow</td>
<td>S</td>
<td>soft</td>
<td>D</td>
<td>dry</td>
<td>S</td>
<td>soft</td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>sand</td>
<td>no resistance</td>
<td>environmental sample</td>
<td>10-Oct-12 water level on date shown</td>
<td>water inflow</td>
<td>F</td>
<td>firm</td>
<td>M</td>
<td>moist</td>
<td>F</td>
<td>firm</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>soil</td>
<td>no resistance</td>
<td>standard penetration test (SPT)</td>
<td>10-Oct-12 water level on date shown</td>
<td>water inflow</td>
<td>St</td>
<td>stiff</td>
<td>W</td>
<td>wet</td>
<td>St</td>
<td>stiff</td>
<td></td>
</tr>
<tr>
<td>NDD</td>
<td>water</td>
<td>no resistance</td>
<td>standard penetration test (SPT)</td>
<td>10-Oct-12 water level on date shown</td>
<td>water inflow</td>
<td>V</td>
<td>very stiff</td>
<td>H</td>
<td>hard</td>
<td>V</td>
<td>very stiff</td>
<td></td>
</tr>
</tbody>
</table>

#### Material Substance

<table>
<thead>
<tr>
<th>SOIL TYPE</th>
<th>plasticity or particle characteristic, colour, secondary and minor components</th>
<th>moisture condition</th>
<th>consistency / relative density</th>
<th>soil description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SILTY SAND</td>
<td>fine to medium grained, grey, green, low plasticity. (continued)</td>
<td>W</td>
<td>MD</td>
<td>GELLIBRAN MARL</td>
</tr>
<tr>
<td>CLAYEY SAND</td>
<td>dark green-grey, medium plasticity, trace of fine grained gravel &amp; shell fragments.</td>
<td>L</td>
<td>MD</td>
<td></td>
</tr>
<tr>
<td>SILTY SAND</td>
<td>fine to medium grained, dark green, grey, green-brown, low plasticity, trace of shell fragments and bands of cemented sand.</td>
<td>M</td>
<td>MD</td>
<td></td>
</tr>
</tbody>
</table>

#### Notes

- **SPT:** Standard penetration test
- **U63:** Hand penetrometer
- **N:** Non destructive drilling
- **HA:** Hand auger
- **AD:** Auger drilling
- **AS:** Auger screwing
- **W:** Wash bore
- **TC:** Torque control
- **BL:** Blank bit
- **V:** V bit
- **N:** Normal density
- **Nc:** Neutrons
- **D:** Density
- **St:** Standard penetration test
- **SS:** Split spoon sample
- **U63:** Hand penetrometer
- **B:** Bulky disturbed sample
- **C:** Casing
- **DA:** Hand auger
- **D:** Disturbed sample
- **T:** Torque control
- **EB:** Hammer bouncing
- **E:** Environmental sample
- **F:** Faint
- **Fb:** Hammer bouncing
- **EB:** Hammer bouncing
- **F:** Faint
- **G:** Garwood
- **Fb:** Hammer bouncing
- **G:** Garwood
- **H:** Hard
- **G:** Garwood
- **H:** Hard
- **G:** Garwood
- **H:** Hard
- **G:** Garwood

---

**Soil Type:** Plasticity or particle characteristic, colour, secondary and minor components.

**Material Description:**
- **GELLIBRAN MARL:** Dark green-grey, medium plasticity, trace of fine grained gravel & shell fragments.
- **SILTY SAND:** Fine to medium grained, grey, green, low plasticity. (continued)
- **CLAYEY SAND:** Dark green-grey, medium plasticity, trace of fine grained gravel & shell fragments.

---

**Additional Observations:**

- With some medium grained gravel
- With some cemented sand nodules
- With some medium grained gravel
- With some cemented sand nodules

---

**Drilling Information:**

- **Method:** Auger drilling
- **Support:** Mud
- **Penetration:** No resistance
- **Samples & Field Tests:** Bulk disturbed sample
- **Water:** 10-October water level on date shown
- **Soil Description:** VS = very soft
- **Consistency / Relative Density:** VS = very soft

---

**Material Substance:**

- **SILTY SAND:** Fine to medium grained, grey, green, low plasticity.
- **CLAYEY SAND:** Dark green-grey, medium plasticity, trace of fine grained gravel & shell fragments.
- **SILTY SAND:** Fine to medium grained, dark green, grey, green-brown, low plasticity, trace of shell fragments and bands of cemented sand.

---

**Structure and Additional Observations:**

- GELLIBRAN MARL
- SILTY SAND
- CLAYEY SAND

---

**Drill Information:**

- **Borehole ID:** CHEL-BH02
- **Date Started:** 16 Mar 2017
- **Date Completed:** 20 Mar 2017
- **Logged By:** SS/LW
- **Checked By:** KJ
- **Client:** Metro Trains Melbourne Pty. Ltd.
- **Principal:** Level Crossing Removal Authority
- **Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
- **Location:** Station Street, Chelsea

---

**Material Description:**

- **GELLIBRAN MARL:** Dark green-grey, medium plasticity, trace of fine grained gravel & shell fragments.
- **SILTY SAND:** Fine to medium grained, grey, green, low plasticity. (continued)
- **CLAYEY SAND:** Dark green-grey, medium plasticity, trace of fine grained gravel & shell fragments.
## Engineering Log - Borehole

**Borehole ID.** CHEL-BH02

**Client:** Metro Trains Melbourne Pty. Ltd.

**Principal:** Level Crossing Removal Authority

**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**Location:** Station Street, Chelsea

**Date started:** 16 Mar 2017

**Date completed:** 20 Mar 2017

**Logged by:** SS/LW

**Checked by:** KJ

### Drilling Information

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Water</th>
<th>Samples &amp; Field Tests</th>
<th>Material Description</th>
<th>Soil Type: Plasticity or particle characteristic, colour, secondary and minor components</th>
<th>Structure and Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD auger drilling</td>
<td>N=18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Material Substance

- Borehole CHEL-BH02 terminated at 40.15 m
- Target depth
- Standpipe installation
- Backfill details:
  - 0.0m-5.0m: grout
  - 5.0m-7.4m: bentonite
  - 7.4m-11.0m: sand
  - 11.0-40.15m: grout
- Standpipe details:
  - 0.0m-8.0m: unslotted 50mm PVC, Class 18
  - 8.0m-11.0m: machine slotted, 50mm PVC, Class 18
- End caps and flush mounted galvanized cover

### Drilling Information

- **Position:** E: 334685; N: 5786811 (MGA94)
- **Surface elevation:** 6.58 m (AHD)
- **Angle from horizontal:** 90°
- **Drill model:** Xplora 50, Truck mounted
- **Drilling fluid:** Polymer
- **Hole diameter:** 100 mm

---

**Consistency / Relative Density**

- VS: Very Soft
- S: Soft
- F: Firm
- ST: Stiff
- VST: Very Stiff
- H: Hard
- Fb: Frangible
- WL: Very Loose
- L: Loose
- MD: Medium Dense
- D: Dense
- VD: Very Dense

---

**SOIL TYPE:** Plasticity or particle characteristic, colour, secondary and minor components

**Classification Symbol:**

- HP: No resistance ranging to refusal
- N: Standard penetration test (SPT)
- N* SPT - sample recovered
- NC: SPT with solid cone
- VS: Vane shear; peak/ remoulded (kPa)
- R: Refusal
- HB: Hammer bouncing

---

**Support:**

- M: Mud
- N:Nil
- C: casing

**Samples & Field Tests:**

- B: Bulk disturbed sample
- D: Disturbed sample
- E: Environmental sample
- SS: Split spoon sample
- UC: Undisturbed sample 4mm diameter
- HP: Hand penetrometer (kPa)
- NC: SPT with solid cone
- VS: Vane shear; peak/ remoulded (kPa)
- R: Refusal
- HB: Hammer bouncing

---

**Classification System:**

- Moisture:
  - M: Moist
  - W: Wet

- Wet Limit:
  - Wp: Plastic limit

---

**Additional Observations:**

- No resistance ranging to refusal
### Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.  
**Principal:** Level Crossing Removal Authority  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Support</th>
<th>Penetration</th>
<th>Water</th>
<th>Classification Symbol</th>
<th>Description</th>
<th>Moisture</th>
<th>Consistency</th>
<th>Soil Description</th>
<th>Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>M</td>
<td>N</td>
<td></td>
<td>SP</td>
<td>FILL</td>
<td>M</td>
<td>MD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>E</td>
<td></td>
<td></td>
<td>SP</td>
<td>SAND</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>E</td>
<td></td>
<td></td>
<td>SPT</td>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>E</td>
<td></td>
<td></td>
<td>SPT</td>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td>E</td>
<td></td>
<td></td>
<td>SPT</td>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>E</td>
<td></td>
<td></td>
<td>SPT</td>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td>E</td>
<td></td>
<td></td>
<td>SPT</td>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FILL:** SAND: fine to coarse grained, dark brown, with some fines, trace of concrete, trace of rootlets.

**SAND:** fine to coarse grained, pale grey, grey.

Becoming pale brown, pale grey

Becoming fine to medium grained, brown, mottled orange-brown

Becoming dark brown, trace of fines

**SAND:** fine to coarse grained, grey, with some pockets of clayey sand.
### Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea

| Borehole ID. | CHEL-BH03 |
| sheet: | 2 of 6 |
| project no. | GEOTABTF10294AA |
| date started: | 10 Mar 2017 |
| date completed: | 15 Mar 2017 |
| logged by: | BP |
| checked by: | KJ |

**Position:** E: 334538; N: 5787182 (MGA94)  
**Surface elevation:** 6.42 m (AHD)  
**Angle from horizontal:** 90°  
**Hole diameter:** 100 mm  
**Drill model:** Xplora 50, Truck mounted  
**Drilling fluid:** Polymer  
**Drill model:** Xplora 50, Truck mounted  
**Surface elevation:** 6.42 m (AHD)  
**Drilling fluid:** Polymer

<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>samples &amp; field tests</th>
<th>material substance</th>
<th>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</th>
<th>moisture condition</th>
<th>hand penetrometer (kPa)</th>
<th>structure and additional observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>graphic log classification symbol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>depth (m)</td>
<td>SPT 7, 9, 4 N=13</td>
<td>SAND: fine to coarse grained, grey, with some pockets of clayey sand. (continued)</td>
<td>W MD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3.0</td>
<td>becoming fine to medium grained</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10.0</td>
<td>SPT 3, 2, 5 N=7</td>
<td>CLAYEY SAND: fine to medium grained, grey, low plasticity.</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11.0</td>
<td>SPT 1, 1, 3 N=4</td>
<td>SAND: fine to coarse grained, grey, with some fines.</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12.0</td>
<td>SPT 20/120mm HB N=R</td>
<td>SAND: fine to coarse grained, grey.</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13.0</td>
<td>SPT 11, 21, 26 N=47</td>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Additional Observations:**
- Very soft
- Soft
- Firm
- Stiff
- Very stiff
- Hard
- Fairly
- Very loose
- Loose
- Medium dense
- Dense
- Very dense

**Material Substance:**
- **CLAYEY SAND:** fine to medium grained, grey, low plasticity.
- **SAND:** fine to coarse grained, grey, with some pockets of clayey sand. (continued)
- **CLAYEY SAND:** fine to coarse grained, grey, with some
- **SAND:** fine to coarse grained, grey.

**Material Description:**
- **SAND:** fine to coarse grained, grey, with some pockets of clayey sand. (continued)
- **CLAYEY SAND:** fine to medium grained, grey, low plasticity.
- **CLAYEY SAND:** fine to coarse grained, grey, with some fines.
- **SAND:** fine to coarse grained, grey.

**Notes:**
- No resistance ranging to refusal
- 10-Oct-12 water level on date shown
- Water inflow
- Water outflow
- No recorded water level

**Method & Support:**
- AD: auger drilling
- AS: auger screwing
- HA: hand auger
- W: wash hose
- NDD: non-destructive drilling
- MD: no resistance ranging to refusal
- VS: very soft
- S: soft
- F: firm
- ST: stiff
- VST: very stiff
- H: hard
- P: fairly
- V: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense

**Samples & Field Tests:**
- B: bulk disturbed sample
- D: disturbed sample
- E: environmental sample
- SS: split spoon sample
- U#: undisturbed sample #1mm diameter
- HP: hand penetrometer (kPa)
- N: standard penetration test (SPT)
- N*: SPT - sample recovered
- Nb: N with solid cone
- W: liquid limit
- Wp: plastic limit
- V: vane shear; peak/remoulded (kPa)
- R: refusal
- HB: hammer bouncing

**Consistency / Relative Density:**
- VS: very soft
- S: soft
- F: firm
- ST: stiff
- VST: very stiff
- H: hard
- P: fairly
- V: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense

**Classification Symbol & Soil Description:**
- Based on Unified Classification System

**Additional Observations:**
- CLAYEY SAND: fine to medium grained, grey, low plasticity.
- SAND: fine to coarse grained, grey, with some pores of clayey sand. (continued)
- CLAYEY SAND: fine to coarse grained, grey, with some
- SAND: fine to coarse grained, grey.
### Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea  
**Borehole ID:** CHEL-BH03  
**date started:** 10 Mar 2017  
**date completed:** 15 Mar 2017  
**logged by:** BP  
**checked by:** KJ

#### Drilling Information

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Penetration</th>
<th>Water</th>
<th>Samples &amp; Field Tests</th>
<th>Material Substance</th>
<th>Soil Type</th>
<th>Consistency/Relative Density</th>
<th>Hand Penetrometer (kPa)</th>
<th>Structure and Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT</td>
<td>SC</td>
<td>CLAYEY SAND: fine to coarse grained, grey. (continued)</td>
<td></td>
<td></td>
<td></td>
<td>M</td>
<td></td>
<td>TERTIARY BRIGHTON GROUP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with some pockets of grey, high plasticity clay</td>
<td></td>
<td></td>
<td></td>
<td>MD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPT</td>
<td>SP</td>
<td>SAND: fine to medium grained, brown-grey, with some fines.</td>
<td></td>
<td></td>
<td></td>
<td>VD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>with some pockets of grey, high plasticity clay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPT</td>
<td>CM</td>
<td>CLAY: high plasticity, grey, mottled brown.</td>
<td></td>
<td></td>
<td></td>
<td>VSt</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>trace of sand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPT</td>
<td>SC</td>
<td>CLAYEY SAND: medium to coarse grained, orange-brown.</td>
<td></td>
<td></td>
<td></td>
<td>MD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CLAYEY SAND: fine to medium grained, pale grey, orange-brown, bands of red, low plasticity.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Consistency / Relative Density**

- VS: very soft
- S: soft
- F: firm
- St: stiff
- VSt: very stiff
- H: hard
- Fb: brittle
- VL: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense

**Water**

- 10-Oct-12 water level on date shown
- Water inflow
- Water outflow
### Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea

**Borehole ID:** CHEL-BH03  
**date started:** 10 Mar 2017  
**date completed:** 15 Mar 2017

**logging information**

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0</td>
<td>CLAYEY SAND: fine to medium grained, pale grey, orange-brown, bands of red, low plasticity. (continued) becoming mottled red, mottled orange-brown</td>
</tr>
<tr>
<td>26.0</td>
<td>SILTY SAND: fine to coarse grained, dark green-grey, medium plasticity, grading to clayey sand in parts. becoming dark grey, dark green-grey</td>
</tr>
<tr>
<td>28.0</td>
<td>becoming fine grained, dark grey, black</td>
</tr>
<tr>
<td>30.0</td>
<td>becoming dark green-brown</td>
</tr>
</tbody>
</table>

**sample tests**

- **SPT**
  - 0, 1, 1  
  - 2, 0, 1  
  - 0, 0, 4

**classification symbol & soil description**

- **SC** CLAYEY SAND: fine to medium grained, pale grey, orange-brown, bands of red, low plasticity. (continued) becoming mottled red, mottled orange-brown
- **SM** SILTY SAND: fine to coarse grained, dark green-grey, medium plasticity, grading to clayey sand in parts. becoming dark grey, dark green-grey

**water inflow**

- 10-Oct-12 water level on date shown
- Water inflow
- Water outflow

**material description**

- **SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components
- **samples & field tests:**
  - B bulk disturbed sample
  - D disturbed sample
  - E environmental sample
  - SS split spoon sample
  - U# undisturbed sample #8mm diameter
  - HP hand penetrometer (kPa)
  - N standard penetration test (SPT)
  - NC SPT with solid cone
  - VS vane shear; peak/remoulded (kPa)
  - R refusal
  - HB hammer bouncing

**soil description**

- **based on Unified Classification System**
  - CDF_0_9_06_LIBRARY.GLB rev:AU  Log  COF BOREHOLE: NON CORED  GEOTABTF10294AA CHELSPEN.GPJ  <<DrawingFile>>  05-07-2017 14:40

**additional observations**

- **consistency / relative density**
  - VS very soft
  - S soft
  - F firm
  - FC stiff
  - ST very stiff
  - H hard
  - Fb friable
  - VL very loose
  - L loose
  - MD medium dense
  - D dense
  - VD very dense

**support & penetration**

- **method & support:**
  - AD auger drilling*
  - AS auger screwing*  
  - HA hand auger
  - W washbore
  - N non destructive drilling

**water**

- 10-Oct-12 water level on date shown
- Water inflow
- Water outflow

---

**Additional Data**

- **client:** Metro Trains Melbourne Pty. Ltd.
- **principal:** Level Crossing Removal Authority
- **project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
- **location:** Station Street, Chelsea
- **logging information:**
  - **method & support:**
    - AD auger drilling*
    - AS auger screwing*  
    - HA hand auger
    - W washbore
    - N non destructive drilling
  - **water:**
    - 10-Oct-12 water level on date shown
    - Water inflow
    - Water outflow
- **additional observations:**
  - **consistency / relative density**
    - VS very soft
    - S soft
    - F firm
    - FC stiff
    - ST very stiff
    - H hard
    - Fb friable
    - VL very loose
    - L loose
    - MD medium dense
    - D dense
    - VD very dense

---

**Drilling Information**

- **method & support:**
  - AD auger drilling*
  - AS auger screwing*  
  - HA hand auger
  - W washbore
  - N non destructive drilling
- **water:**
  - 10-Oct-12 water level on date shown
  - Water inflow
  - Water outflow
- **additional observations:**
  - **consistency / relative density**
    - VS very soft
    - S soft
    - F firm
    - FC stiff
    - ST very stiff
    - H hard
    - Fb friable
    - VL very loose
    - L loose
    - MD medium dense
    - D dense
    - VD very dense

---

**Classification Symbol & Soil Description**

- **SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components
- **samples & field tests:**
  - B bulk disturbed sample
  - D disturbed sample
  - E environmental sample
  - SS split spoon sample
  - U# undisturbed sample #8mm diameter
  - HP hand penetrometer (kPa)
  - N standard penetration test (SPT)
  - NC SPT with solid cone
  - VS vane shear; peak/remoulded (kPa)
  - R refusal
  - HB hammer bouncing

---

**Material Description**

- **SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components
- **samples & field tests:**
  - B bulk disturbed sample
  - D disturbed sample
  - E environmental sample
  - SS split spoon sample
  - U# undisturbed sample #8mm diameter
  - HP hand penetrometer (kPa)
  - N standard penetration test (SPT)
  - NC SPT with solid cone
  - VS vane shear; peak/remoulded (kPa)
  - R refusal
  - HB hammer bouncing

---

**Support & Penetration**

- **method & support:**
  - AD auger drilling*
  - AS auger screwing*  
  - HA hand auger
  - W washbore
  - N non destructive drilling
- **water:**
  - 10-Oct-12 water level on date shown
  - Water inflow
  - Water outflow
- **additional observations:**
  - **consistency / relative density**
    - VS very soft
    - S soft
    - F firm
    - FC stiff
    - ST very stiff
    - H hard
    - Fb friable
    - VL very loose
    - L loose
    - MD medium dense
    - D dense
    - VD very dense
### Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.

**principal:** Level Crossing Removal Authority

**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**location:** Station Street, Chelsea

**date started:** 10 Mar 2017

**date completed:** 15 Mar 2017

**logged by:** BP

**checked by:** KJ

---

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Penetration</th>
<th>Depth (m)</th>
<th>Graphic Log</th>
<th>Classification Symbol</th>
<th>Material Description</th>
<th>SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components</th>
<th>Consistency / Relative Density</th>
<th>Hand Penetro-meter (kPa)</th>
<th>Structure and Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD auger drilling</td>
<td>N nil</td>
<td>33.0</td>
<td>SM</td>
<td>SILTY SAND: fine to coarse grained, dark green-grey, medium plasticity, grading to clayey sand in parts. (continued)</td>
<td>M VL - L</td>
<td>GELLIBRAND MARL</td>
<td>no recovery in U63</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C casing</td>
<td>32.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B bulk disturbed sample</td>
<td>31.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D disturbed sample</td>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E environmental sample</td>
<td>29.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N undisturbed sample</td>
<td>28.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N* hand penetrometer (kPa)</td>
<td>27.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nc SPT with solid cone</td>
<td>26.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NC SPT - sample recovered</td>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VS vane shear; peak/remoulded (kPa)</td>
<td>24.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R refusal</td>
<td>23.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HB hammer bouncing</td>
<td>22.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Additional Observations:**
- With some pockets of fine to coarse grained gravel
- Becoming green-grey
- With some pockets of clayey sand
- CLAYEY SAND: fine to medium grained, dark green-grey, medium plasticity, becoming dark green-grey
- With some pockets of gravel

---

**Method & Support:**
- **AD** auger drilling
- **AS** auger screwing
- **HA** hand auger
- **W** wash bore
- **HA** hand auger
- **NDD** non-destructive drilling

**Penetration:**
- No resistance ranging to refusal

**Water:**
- 10-Oct-12 water level on date shown
- Water inflow
- Water outflow

---

**Samples & Field Tests:**
- **B** bulk disturbed sample
- **D** disturbed sample
- **E** environmental sample
- **SS** split spoon sample
- **U** undisturbed sample
- **N** undisturbed sample
- **N*** SPT - sample recovered
- **NC** SPT with solid cone
- **VS** vane shear; peak/remoulded
- **R** refusal
- **HB** hammer bouncing

---

**Classification Symbol & Soil Description:**
- Based on Unified Classification System

**Consistency / Relative Density:**
- **VS** very soft
- **S** soft
- **F** firm
- **St** stiff
- **VSt** very stiff
- **H** hard
- **Fb** fragile
- **VL** very loose
- **L** loose
- **MD** medium dense
- **D** dense
- **VD** very dense

---

**Material Description:**
- **SM:** SILTY SAND
- **SC:** CLAYEY SAND

---

**Additional Observations:**
- No recovery in U63
- No recovery in U63

---

**Position:** E: 334538; N: 5787182 (MGA94)

**Surface Elevation:** 6.42 m (AHD)

**Angle from Horizontal:** 90°

**Drill Model:** Xplora 50, Truck mounted

**Drilling Fluid:** Polymer

**Hole Diameter:** 100 mm

---

**Drilling Information:**
- **Method:** AD auger drilling
- **Support:** M mud
- **Penetration:** N nil
- **Samples & Field Tests:** B bulk disturbed sample
- **Classification Symbol:** SM
- **SOIL TYPE:** SILTY SAND
- **Consistency / Relative Density:**
  - **VS:** very soft
  - **S:** soft
  - **F:** firm
  - **St:** stiff
  - **VSt:** very stiff
  - **H:** hard
  - **Fb:** fragile
  - **VL:** very loose
  - **L:** loose
  - **MD:** medium dense
  - **D:** dense
  - **VD:** very dense

---

**Material Description:**
- **SM:** SILTY SAND
- **SC:** CLAYEY SAND
# Engineering Log - Borehole

**Borehole ID.** CHEL-BH03  
**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea

**Log Sheet Details:**  
**project no.:** GEOTABTF10294AA  
**date started:** 10 Mar 2017  
**date completed:** 15 Mar 2017  
**logged by:** BP  
**checked by:** KJ

### Drilling Information
- **Method & Support:**  
  - **Method:** HA (hand auger)  
  - **Support:** M (mud)  
  - **Penetration:** N
- **Samples & Field Tests:**  
  - **Water:** SC
- **Material Substance:**  
  - **SOIL TYPE:** CLAYEY SAND: fine to medium grained, dark green-grey, medium plasticity.
- **Consistency / Relative Density:** M L

### Borehole Details
- **Position:** E: 334538; N: 5787182 (MGA94)  
- **Surface Elevation:** 6.42 m (AHD)  
- **Angle from Horizontal:** 90°  
- **Hole Diameter:** 100 mm

### Standpipe Details
- **0.0m-5.5m:** grout  
- **5.5m-6.5m:** bentonite  
- **6.5m-10.0m:** sand  
- **10.0-40.35m:** grout

### Standpipe Installation
- **0.0m-7.0m:** unslotted 50mm PVC, Class 18  
- **7.0m-10.0m:** machine slotted, 50mm PVC, Class 18

### Additional Observations
- End caps and flush mounted galvanic cover

### Geotechnical Information
- **material description:**  
  - **CLAYEY SAND:** fine to medium grained, dark green-grey, medium plasticity.
- **additional observations:**  
  - Borehole CHEL-BH03 terminated at 40.35 m
  - Target depth
  - Standpipe installation
  - Backfill details
  - 0.0m-5.5m: grout
  - 5.5m-6.5m: bentonite
  - 6.5m-10.0m: sand
  - 10.0-40.35m: grout
  - Standpipe details
  - 0.0m-7.0m: unslotted 50mm PVC, Class 18
  - 7.0m-10.0m: machine slotted, 50mm PVC, Class 18

---

**method & support:**  
- **method:** AD (auger drilling)  
- **support:** M (mud)  
- **penetration:** N

**samples & field tests:**  
- **water:** SC

**material description:**  
- **SOIL TYPE:** CLAYEY SAND: fine to medium grained, dark green-grey, medium plasticity.

**consistency / relative density:** M L

**classification symbol & soil description:**  
- **CLAYEY SAND:** fine to medium grained, dark green-grey, medium plasticity.

**Additional Observations:**  
- Borehole CHEL-BH03 terminated at 40.35 m
- Target depth
- Standpipe installation
- Backfill details
- 0.0m-5.5m: grout
- 5.5m-6.5m: bentonite
- 6.5m-10.0m: sand
- 10.0-40.35m: grout
- Standpipe details
- 0.0m-7.0m: unslotted 50mm PVC, Class 18
- 7.0m-10.0m: machine slotted, 50mm PVC, Class 18

**Additional Observations:**  
- End caps and flush mounted galvanic cover

---

**date started:** 10 Mar 2017  
**date completed:** 15 Mar 2017  
**logged by:** BP  
**checked by:** KJ  
**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**location:** Station Street, Chelsea
### Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.  
**Principal:** Level Crossing Removal Authority  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea  

**Position:** E: 334853; N: 5786206 (MGA94)  
**Drill Model:** Xplora 50, Truck mounted  
**Drilling Fluid:** Polymer  
**Surface Elevation:** 5.80 m (AHD)  
**Angle from Horizontal:** 90°  
**Hole Diameter:** 100 mm

### Drilling Information

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Sampling &amp; Field Tests</th>
<th>Water</th>
<th>SOIL TYPE</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD auger drilling*</td>
<td>M mud</td>
<td>N nil</td>
<td>plasticity or particle characteristic, colour, secondary and minor components</td>
<td>FILL: ASPHALT: 50mm.</td>
</tr>
<tr>
<td>AS auger screwing*</td>
<td>C casing</td>
<td>E</td>
<td></td>
<td>FILL: Sandy GRAVEL: fine to coarse grained, angular, grey, brown, fine grained sand.</td>
</tr>
<tr>
<td>HA hand auger</td>
<td>SPT</td>
<td>N*8</td>
<td></td>
<td>SAND: fine to medium grained, grey, pale grey, pale brown-grey.</td>
</tr>
<tr>
<td>W washhoe</td>
<td>SPT 2, 3, 5</td>
<td>N*18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA hand auger</td>
<td>SPT 2, 8, 10</td>
<td>N*18</td>
<td></td>
<td>becoming fine to coarse grained, brown, pale brown</td>
</tr>
<tr>
<td>NDD non destructive drilling</td>
<td>SPT 12, 25, 30</td>
<td>N*55</td>
<td></td>
<td>becoming brown, trace of shell fragments</td>
</tr>
<tr>
<td>NDD non destructive drilling</td>
<td>SPT 15, 30, 140mm</td>
<td>HB N*4R</td>
<td></td>
<td>SP SAND: fine grained, pale grey, trace of fines, trace of shell fragments.</td>
</tr>
<tr>
<td>NDD non destructive drilling</td>
<td>SPT</td>
<td></td>
<td></td>
<td>SP SAND: fine to medium grained, pale grey, mottled pale brown, trace of fines, trace of shell fragments.</td>
</tr>
</tbody>
</table>

### Material Substance

- **SOIL TYPE:** plasticity or particle characteristic, colour, secondary and minor components

- **Material Description:**
  - **FILL:** ASPHALT: 50mm.
  - **FILL:** Sandy GRAVEL: fine to coarse grained, angular, grey, brown, fine grained sand.
  - **SAND:** fine to medium grained, grey, pale grey, pale brown-grey.
  - **SAND:** fine grained, pale grey, trace of fines, trace of shell fragments.
  - **SAND:** fine to medium grained, pale grey, mottled pale brown, trace of fines, trace of shell fragments.

### Additional Observations

- **penetration:**
  - no resistance ranging to refusal
  - 10-Oct-12 water level on date shown
  - water inflow
  - water outflow

- **classification symbol & soil description based on Unified Classification System**

- **consistency / relative density**
  - VS very soft
  - S soft
  - F firm
  - St stiff
  - Vst very stiff
  - H hard
  - Fb friable
  - VL very loose
  - L loose
  - MD medium dense
  - D dense
  - VD very dense

---

* bit shown by suffix
e.g. AD/T, B, TC bit, V V bit
<table>
<thead>
<tr>
<th>method &amp; support</th>
<th>penetration</th>
<th>samples &amp; field tests</th>
<th>material description</th>
<th>soil type: plasticity or particle characteristic, colour, secondary and minor components</th>
<th>clays content</th>
<th>consistency / relative density</th>
<th>structure and additional observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>auger drilling*</td>
<td>M mud</td>
<td>N nil</td>
<td>SAND: fine to medium grained, pale grey, mottled pale brown, trace of fines, trace of shell fragments. (continued)</td>
<td>SP</td>
<td>moisture condition:</td>
<td>QUATERNARY SANDS</td>
</tr>
<tr>
<td>AS</td>
<td>auger screwing*</td>
<td>C casing</td>
<td>HB</td>
<td>CLAYEY SAND: fine to medium grained, dark grey, high plasticity, trace of shell fragments.</td>
<td>SC</td>
<td>hand penetrometer (kPa)</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>washbore</td>
<td>HB</td>
<td>HB</td>
<td>CLAY: high plasticity, dark grey, black, trace of shell fragments.</td>
<td>CH</td>
<td>M - W</td>
<td>TERTIARY BRIGHTON GROUP</td>
</tr>
<tr>
<td>HA</td>
<td>hand auger</td>
<td>HB</td>
<td>HB</td>
<td>Clayey SILT: low liquid limit, dark grey, black, with some fine grained sand, trace of shell fragments.</td>
<td>ML</td>
<td>S - F</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>hand auger</td>
<td>HB</td>
<td>HB</td>
<td>SILTY SAND: fine to medium grained, grey, trace of fine to coarse grained, sub-angular gravel.</td>
<td>SM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDD</td>
<td>non destructive drilling</td>
<td></td>
<td>HB</td>
<td>SAND: fine to coarse grained, sub-rounded to sub-angular, pale grey.</td>
<td>SP</td>
<td>M VD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HB</td>
<td>HB</td>
<td>CLAY: high plasticity, pale grey, with some coarse grained sand.</td>
<td>CH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HB</td>
<td>HB</td>
<td>becoming grey, mottled orange</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Consistency / relative density**

- VS: very soft
- S: soft
- F: firm
- ST: stiff
- VST: very stiff
- H: hard
- Fb: friable
- VL: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense

**Sample Types**

- B: bulk disturbed sample
- D: disturbed sample
- E: environmental sample
- S: split spoon sample
- U#: undisturbed sample #mm diameter
- HP: hand penetrometer (kPa)
- N: standard penetration test (SPT)
- N*: SPT - sample recovered
- Nc: SPT with solid cone
- VS: vane shear, peak/remoulded (kPa)
- R: refusal
- HB: hammer bouncing

**Classification System**

- VS: very soft
- S: soft
- F: firm
- ST: stiff
- VST: very stiff
- H: hard
- Fb: friable
- VL: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense
## Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>material description</th>
<th>material description</th>
<th>material description</th>
<th>material description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0</td>
<td>SAND: fine to medium grained, grey, pale grey, with some fines.</td>
<td>SAND: fine to medium grained, grey, pale grey, with some fines.</td>
<td>SAND: fine to medium grained, grey, pale grey, with some fines.</td>
<td>SAND: fine to medium grained, grey, pale grey, with some fines.</td>
</tr>
<tr>
<td>12.0</td>
<td>CLAY: high plasticity, grey, mottled orange, with some pockets of coarse grained sand.</td>
<td>CLAY: high plasticity, grey, mottled orange, with some pockets of coarse grained sand.</td>
<td>CLAY: high plasticity, grey, mottled orange, with some pockets of coarse grained sand.</td>
<td>CLAY: high plasticity, grey, mottled orange, with some pockets of coarse grained sand.</td>
</tr>
<tr>
<td>15.0</td>
<td>CLAYEY SAND: fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.</td>
<td>CLAYEY SAND: fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.</td>
<td>CLAYEY SAND: fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.</td>
<td>CLAYEY SAND: fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.</td>
</tr>
<tr>
<td>18.0</td>
<td>becoming grey, mottled orange</td>
<td>becoming grey, mottled orange</td>
<td>becoming grey, mottled orange</td>
<td>becoming grey, mottled orange</td>
</tr>
<tr>
<td>21.0</td>
<td>becoming medium plasticity</td>
<td>becoming medium plasticity</td>
<td>becoming medium plasticity</td>
<td>becoming medium plasticity</td>
</tr>
<tr>
<td>24.0</td>
<td>becoming green-brown</td>
<td>becoming green-brown</td>
<td>becoming green-brown</td>
<td>becoming green-brown</td>
</tr>
</tbody>
</table>

**method & support:**
- AD: auger drilling
- AS: auger screwing
- W: wash boring
- HA: hand auger

**support:**
- M: mud
- C: casing
- N: nil

**samples & field tests:**
- B: bulk disturbed sample
- D: disturbed sample
- E: environmental sample
- SS: split spoon sample
- US: undisturbed sample

**classification symbol:**
- HP: hand penetrometer (kPa)
- N: standard penetration test (SPT)
- N*: SPT - sample recovered
- NC: SPT with solid cone
- VS: vane shear; peak/remoulded (kPa)
- R: refusal
- HB: hammer bouncing

**consistency / relative density:**
- VS: very soft
- S: soft
- F: firm
- ST: stiff
- VS: very stiff
- H: hard
- Fb: friable
- VL: very loose
- L: loose
- MD: medium dense
- D: dense
- VD: very dense

---

**CLAYEY SAND:** fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.

**CLAY:** high plasticity, grey, mottled orange, with some pockets of coarse grained sand.

**SAND:** fine to medium grained, grey, pale grey, with some fines.
### Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.

**Principal:** Level Crossing Removal Authority

**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**Location:** Station Street, Chelsea

**Borehole ID:** CHEL-BH04

**Date Started:** 09 Feb 2017

**Date Completed:** 14 Feb 2017

**Logged by:** AO/BP

**Checked by:** KJ

---

**Position:** E: 334853; N: 5786206 (MGA94)

**Surface Elevation:** 5.80 m (AHD)

**Angle from Horizontal:** 90°

**Drill Model:** Xplora 50, Truck mounted

**Drilling Fluid:** Polymer

**Hand Penetrometer (kPa):**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>M</th>
<th>VD</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Graphical Log:**

- **SOIL TYPE:** Plasticity or particle characteristic, colour, secondary and minor components
- **CLAYEY SAND:** fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.
- **CLAYEY SAND:** fine to medium grained, grey, green-grey, pale grey, low plasticity, trace of fine grained gravel.
- **TERTIARY BRIGHTON GROUP**
- **GELLIBRAND MARL**

---

**Drilling Information**

<table>
<thead>
<tr>
<th>Method &amp; Support</th>
<th>Sample &amp; Field Tests</th>
<th>Material Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD auger drilling</td>
<td>SC SPT 0,10,15/70mm HB N*=R</td>
<td>CLAYEY SAND: fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.</td>
</tr>
<tr>
<td>AS auger screwing</td>
<td>SC SPT 5/10mm HB N*=R</td>
<td>with some bands of cemented sand, up to 300mm thick, recovered as fine to coarse gravel</td>
</tr>
<tr>
<td>HA hand auger</td>
<td>SC SPT 10,15/130mm HB N=R</td>
<td>becoming mottled brown, mottled red, with some cemented sand, recovered as fine to medium grained gravel</td>
</tr>
<tr>
<td>W washbore</td>
<td>SC SPT 6,6,3 N=9</td>
<td>becoming green-brown, brown</td>
</tr>
<tr>
<td>HA hand auger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDD non destructive drilling</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Classification Symbol & Soil Description**

- **CLAYEY SAND:** plasticity or particle characteristic, colour, secondary and minor components
- **TERTIARY BRIGHTON GROUP**
- **GELLIBRAND MARL**

**Material Description**

- **CLAYEY SAND:** fine to medium grained, grey, green-grey, pale grey, low plasticity, trace of fine grained gravel.
- **CLAYEY SAND:** fine grained, pale grey, mottled brown, low, with some pockets of fine to medium grained gravel.

**Additional Observations**

- With some bands of cemented sand, up to 300mm thick, recovered as fine to coarse gravel.
- Becoming mottled brown, mottled red, with some cemented sand, recovered as fine to medium grained gravel.
- Becoming green-brown, brown.

---

**Consistency / Relative Density**

- **VS** very soft
- **S** soft
- **F** firm
- **St** stiff
- **VSt** very stiff
- **H** hard
- **Fb** friable
- **VL** very loose
- **L** loose
- **MD** medium dense
- **D** dense
- **VD** very dense

---

**Logging Information**

- **E: 334853; N: 5786206 (MGA94)**
- **Surface Elevation:** 5.80 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Hand Penetrometer (kPa):**
  - 25.0: M
  - 26.0: VD
  - 27.0: M
  - 28.0: VD
  - 29.0: M
  - 30.0: VD
  - 31.0: M

---

**Logging Information**

- **Surface Elevation:** 5.80 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Hand Penetrometer (kPa):**
  - 25.0: M
  - 26.0: VD
  - 27.0: M
  - 28.0: VD
  - 29.0: M
  - 30.0: VD
  - 31.0: M

---

**Logging Information**

- **Surface Elevation:** 5.80 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Hand Penetrometer (kPa):**
  - 25.0: M
  - 26.0: VD
  - 27.0: M
  - 28.0: VD
  - 29.0: M
  - 30.0: VD
  - 31.0: M

---

**Logging Information**

- **Surface Elevation:** 5.80 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Hand Penetrometer (kPa):**
  - 25.0: M
  - 26.0: VD
  - 27.0: M
  - 28.0: VD
  - 29.0: M
  - 30.0: VD
  - 31.0: M

---

**Logging Information**

- **Surface Elevation:** 5.80 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Hand Penetrometer (kPa):**
  - 25.0: M
  - 26.0: VD
  - 27.0: M
  - 28.0: VD
  - 29.0: M
  - 30.0: VD
  - 31.0: M

---

**Logging Information**

- **Surface Elevation:** 5.80 m (AHD)
- **Angle from Horizontal:** 90°
- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Hand Penetrometer (kPa):**
  - 25.0: M
  - 26.0: VD
  - 27.0: M
  - 28.0: VD
  - 29.0: M
  - 30.0: VD
  - 31.0: M
## Engineering Log - Borehole

**Client:** Metro Trains Melbourne Pty. Ltd.

**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**Location:** Station Street, Chelsea

**Borehole ID:** CHEL-BH04

**Date Started:** 09 Feb 2017

**Date Completed:** 14 Feb 2017

**Logged By:** AO/BP

**Checked By:** KJ

### Drilling Information

- **Method:** HA (Hand Auger)
- **Support:** M (Mud) N (Nl)
- **Penetration:** C (Casing)
- **Samples & Field Tests:** N (Nl)
- **Drill Model:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Surface Elevation:** 5.80 m (AHD)
- **Angle from Horizontal:** 90°
- **Hole Diameter:** 100 mm
- **Position:** E: 334853; N: 5786206 (MGA94)
- **Drill Model:** Xplora 50, Truck mounted
- **Angle from Horizontal:** 90°
- **Hole Diameter:** 100 mm

### Material Substance

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>M mud</td>
<td>N nl</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>C casing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SOIL TYPE

- **Silty Sand:** Fine to coarse grained, dark grey, low plasticity.

### Additional Observations

- Trace of fine grained
- Becoming green-grey, mottled green-brown, with some pockets of coarse grained sand

### Classification Symbol & Soil Description

- **Based on Unified Classification System**

### Moisture

- **VS:** Very soft
- **S:** Soft
- **F:** Firm
- **ST:** Stiff
- **VST:** Very stiff
- **H:** Hard
- **Fb:** Frangible
- **VL:** Very loose
- **L:** Loose
- **MD:** Medium dense
- **D:** Dense
- **VD:** Very dense
### Engineering Log - Borehole

**client:** Metro Trains Melbourne Pty. Ltd.  
**principal:** Level Crossing Removal Authority  
**project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**location:** Station Street, Chelsea

**Borehole ID:** CHEL-BH04  
**date started:** 09 Feb 2017  
**date completed:** 14 Feb 2017  
**logged by:** AO/BP  
**checked by:** KJ

**position:** E: 334853; N: 5786206 (MGA94)  
**surface elevation:** 5.80 m (AHD)  
**angle from horizontal:** 90°  
**drill model:** Xploa 50, Truck mounted  
**drilling fluid:** Polymer  
**hole diameter:** 100 mm

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>SOIL TYPE</th>
<th>material description</th>
<th>material substance</th>
<th>support</th>
<th>penetration</th>
<th>method &amp; support</th>
<th>samples &amp; field tests</th>
<th>water</th>
<th>classification &amp; symbol</th>
<th>soil description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-3.5</td>
<td>GELLIBRAND MARL</td>
<td>fine to coarse grained, dark grey, low plasticity. (continued)</td>
<td>SM</td>
<td>M VD</td>
<td>GELLIBRAND MARL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5-4.5</td>
<td>SILTY SAND</td>
<td>fine to coarse grained, dark grey, low plasticity. (continued)</td>
<td>SM</td>
<td>M VD</td>
<td>GELLIBRAND MARL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5-8.0</td>
<td>SILTY SAND</td>
<td>fine to coarse grained, dark grey, low plasticity. (continued)</td>
<td>SM</td>
<td>M VD</td>
<td>GELLIBRAND MARL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0-40.75</td>
<td>SILTY SAND</td>
<td>fine to coarse grained, dark grey, low plasticity. (continued)</td>
<td>SM</td>
<td>M VD</td>
<td>GELLIBRAND MARL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Observations:**
- Borehole CHEL-BH04 terminated at 40.75 m
- Target depth
- Standpipe installation
- Backfill details
- 0.0m-3.5m: grout
- 3.5-4.5m: bentonite
- 4.5-8.0m: sand
- 8.0-40.75m: grout
- Standpipe details
- 0.0-5.0m: unslotted 50mm PVC, Class 18
- 5.0-8.0m: machine slotted, 50mm PVC, Class 18
- End caps and flush mounted gatic cover

**Consistency / relative density:**
- VS: very soft
- V: soft
- Fb: firm
- ST: stiff
- VS: very stiff
- H: hard
- F: friable
- VL: very loose
- MD: medium dense
- dense
- VS: very dense
Piezometer Installation Log

client: Metro Trains Melbourne Pty. Ltd.
principal: Level Crossing Removal Authority
project: Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
location: Station Street, Aspendale

Hole ID: ASPEN-BH02

method & support
- water

graphic log
- material name
- material substance
- piezometer construction details

material name:
- FILL
- QUATERNARY SANDS
- TERTIARY BRIGHTON GROUP

10-Oct-12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
water pressure test result
- (lugeons) for depth
- interval shown

Relative Levels
- (AHD)
- water level

- 11.00 m
- 14.00 m

- 6.72 m (AHD)
- 7.28 m (AHD)

- 0.00 m
- 14.00 m
Piezometer Installation Log

client:  Metro Trains Melbourne Pty. Ltd.
principal:  Level Crossing Removal Authority
project:  Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea
location:  Station Street, Chelsea

position:  E: 334777; N: 5786594 (MGA94)
equipment type:  Xplora 50, Truck mounted
drilling fluid:  Polymer
hole diameter:  100 mm

method & support
water

<table>
<thead>
<tr>
<th>depth (m)</th>
<th>graphic log</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.00</td>
<td>FILL</td>
</tr>
<tr>
<td>14.00</td>
<td>QUATERNARY SANDS</td>
</tr>
<tr>
<td>17.00</td>
<td>TERTIARY BRIGHTON GROUP</td>
</tr>
</tbody>
</table>

piezometer construction details
bore construction license: WRK098878
drilling company: EARTHCORE
driller: L. Adolphson
driller’s permit no.: 738

material name
Grout
Bentonite
Gravel

Relative Levels (AHD)
6.63
7.37
-7.37
-6.63

graphic / core recovery
core recovered (graphic symbols indicate materials)
no core recovered

ID: CHEL-BH01

<table>
<thead>
<tr>
<th>ID</th>
<th>type</th>
<th>installation date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEL-BH01</td>
<td>standpipe piezo.</td>
<td>0.00 m 14.00 m</td>
</tr>
</tbody>
</table>
### Piezometer Installation Log

**Location:** Station Street, Chelsea

**Client:** Metro Trains Melbourne Pty. Ltd.
**Principal:** Level Crossing Removal Authority
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea

**Drilling Information**
- **Position:** E: 334685; N: 5786811 (MGA94)
- **Equipment Type:** Xplora 50, Truck mounted
- **Drilling Fluid:** Polymer
- **Surface Elevation:** 6.58 m (AHD)
- **Angle from Horizontal:** 90°
- **Hole Diameter:** 100 mm
- **Date Started:** 16 Mar 2017
- **Date Completed:** 20 Mar 2017

**Drilling Support**
- **Material Substances:**
  - **FILL**
  - **QUATERNARY SANDS**
  - **TERTIARY BRIGHTON GROUP**

**Piezometer Construction Details**
- **Hole ID.:** CHEL-BH02
- **Drilling Company:** EARTHCORE
- **Driller:** L. Adolphson
- **Driller’s Permit No.:** 738

**Relative Levels (AHD):**
- **Water Level:** 6.58 m
- **Stickup Tip:** -4.42 m

**Core Recovery**

<table>
<thead>
<tr>
<th>ID</th>
<th>Type</th>
<th>Installation Date</th>
<th>Stickup (m)</th>
<th>Tip Depth (m)</th>
<th>Water Level (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEL-BH02</td>
<td>Standpipe Piezo</td>
<td>0.00 m</td>
<td>11.00 m</td>
<td>6.58</td>
<td>-4.42</td>
</tr>
</tbody>
</table>

**Bore Construction License:** WRK098879

---

**Material Substances**
- **Grout**
- **Bentonite**
- **Sand**

**Drilling Fluid Pressure Test Result**
- **Lugeons for Depth Interval Shown**

**See Engineering Log for Details**
## Piezometer Installation Log

**Hole ID:** CHEL-BH03  
**Client:** Metro Trains Melbourne Pty. Ltd.  
**Principal:** Level Crossing Removal Authority  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea  
**Date Started:** 10 Mar 2017  
**Date Completed:** 15 Mar 2017  
**Logged by:** BP  
**Checked by:** KJ

### Drilling Information
- **Method & Support:** Water  
- **Distance (m):** 7.00 m  
- **Depth (m):** 10.00 m  
- **Material Name:** Quaternary Sands  
- **Material Substance:** Fill

### Piezometer Construction Details

<table>
<thead>
<tr>
<th>ID</th>
<th>Type</th>
<th>Installation Date</th>
<th>Stickup (m)</th>
<th>Tip Depth (m)</th>
<th>Water Level (m)</th>
<th>Relative Levels (AHD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEL-BH03</td>
<td>Standpipe Piezo.</td>
<td>0.00 m</td>
<td>10.00 m</td>
<td>6.42</td>
<td>-3.58</td>
<td></td>
</tr>
</tbody>
</table>

### Graphic Log / Core Recovery
- **Material:** Grout, Bentonite, Sand
- **Core Recovered:** No core recovered
- **Core Recovery:** Graphic symbols indicate materials

### Engineering Log
- **Position:** E 334538; N 5787182 (MGA94)  
- **Surface Elevation:** 6.42 m (AHD)  
- **Angle from Horizontal:** 90°  
- **Equipment Type:** Xplora 50, Truck mounted  
- **Drilling Fluid:** Polymer  
- **Drill Diameter:** 100 mm  
- **Surface Elevation:** 6.42 m (AHD)  

---

*See engineering log for details.*

---

*Note: The diagram shows a piezometer installation with a standpipe piezo at CHEL-BH03, with water levels and recovery details.*
### Piezometer Installation Log

**Client:** Metro Trains Melbourne Pty. Ltd.  
**Principal:** Level Crossing Removal Authority  
**Project:** Hydrogeological and Geotechnical Investigation, Aspendale and Chelsea  
**Location:** Station Street, Chelsea

<table>
<thead>
<tr>
<th>Hole ID.</th>
<th>CHEL-BH04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet no.</td>
<td>1 of 1</td>
</tr>
<tr>
<td>Project no.</td>
<td>GEOTABTF10294AA</td>
</tr>
</tbody>
</table>

**Position:** E 334853; N 5786206 (MGA94)  
**Surface Elevation:** 5.80 m (AHD)  
**Angle from Horizontal:** 90°  
**Equipment Type:** Xplora 50, Truck mounted  
**Drilling Fluid:** Polymer  
**Hole Diameter:** 100 mm

<table>
<thead>
<tr>
<th>Drilling Information</th>
<th>Material Substance</th>
<th>Piezometer Construction Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method &amp; Support</strong></td>
<td><strong>Material Name</strong></td>
<td><strong>Piezometer Construction Details</strong></td>
</tr>
</tbody>
</table>
| Water | Fill | **Bore Construction License:** WRK098877  
**Drilling Company:** EARTHCORE  
**Driller:** L. Adolphson  
**Driller’s Permit No.:** 738 |
| | Quaternary Sands | |
| | Grout | |
| | Bentonite | |
| | Gravel | |
| | Tertiary Brighton Group | |

**Drilling Information:**  
**Water Level:** -2.20  
**Relative Levels:** 5.80

**Graphic Log / Core Recovery:**  
- Core recovered (graphic symbols indicate materials)  
- No core recovered

**Core Recovered:** Standpipe piezo.