

APPENDIX G

THREE WATERS ASSESSMENT

4th April 2019

WE Ref: WE1919_01

Te Kowhai Estate Ltd
PO Box 5281
Frankton
Hamilton 3204

PROPOSED COMMERCIAL DEVELOPMENT, 561 HOROTIU ROAD, TE KOWHAI – THREE WATERS MANAGEMENT PLAN

1 INTRODUCTION

In accordance with your instructions Wainui Environmental Ltd have prepared a detailed Three Waters Management Plan for the proposed new commercial development to be located at the above address.

This report has been prepared to submit to Waikato District Council as part of the Resource Consent application.

1.1 Site Description

Street Address -	561 Horotiu Road, Te Kowhai
Legal Description -	Lot 28 DP 522977
Site Area -	5029m ²
Local Authority -	Waikato District Council [WDC]

The site is currently grassed and predominantly flat with a slight grade toward the east. There is an existing WRC managed stormwater drain that borders the north and north eastern boundaries of the site. The WRC drain was redirected as part of the recent subdivision works. The site has no other outstanding topographical features.

The site is generally elevated at RL26.2m adjacent to Horotiu Road (SH39), falling to RL25.6m adjacent to the drain extending along the eastern boundary.

1.2 Proposed Development

It is proposed to develop the site into a mixed commercial development consisting of a single building of approximately 1290m².

The site will be accessed from Horotiu road via a new entranceway. A carpark of approximately 1700m² will be constructed as part of the proposed development. Refer to the site plan attached for details of the proposed development.

1.3 Soil Conditions and Soakage Suitability

Soil investigations and percolation testing was undertaken by Wainui Environmental on the 16th January. Three boreholes were drilled to a maximum depth of 2.0m. Soils within the boreholes generally comprised of a layer of 200-400mm of dark brown topsoil followed by silts and silty loams overlying a mix of sand and silty loams to the base of the boreholes. Groundwater was encountered within BH/ST01 at 1.5m below the surface.

Falling head percolation tests were undertaken within each borehole generally in accordance with the NZBC E1 Method, outlined below;

- Auger 100mm diameter borehole to 2.0m depth.
- Pre-soak the soils within the borehole by filling with water and allowing a single cycle of water drainage from the borehole.
- Refill the borehole with water and record the level of water drop over time.

Preliminary results of the falling head permeability tests indicate soakage rates of 563, 445 and 513mm/hr in boreholes ST01, ST02 and ST03 respectively. These results are above the minimum soakage threshold of 150mm/hr as specified in the Waikato RITS. Accordingly, soakage is considered a viable method of site stormwater disposal for the site.

The recommended location for the soakage system is adjacent to BH/ST01, therefore a design rate of 281mm/hr has been adopted for the subsequent soakage design calculations (reduced by 50% for loss of performance overtime in accordance with the Waikato RITS).

2 ONSITE STORMWATER MANAGEMENT

The stormwater management methodology for the development has been developed in accordance with the Stormwater Management Plan prepared by Wainui Environmental¹ for the original 30 lot subdivision undertaken by Te Kowhai Estate Ltd.

In accordance with the SWMP, individual lots shall provide onsite stormwater management measures to achieve the following objectives:

- Rainwater tanks and associate reuse.
- Ground soakage to be utilised to discharge the 10 year ARI event to ground where conditions permit
- Hydraulic Neutrality for the all events up to the 10 year ARI event
- Water Quality Treatment of all runoff hardstand areas shall be achieved prior to discharge to the road network.

Based on the above, the following Stormwater Management Plan is proposed for the proposed commercial development:

- All roof water and runoff from the proposed carpark area and other hardstand areas shall be conveyed to an underground soakage system. The soakage system will be designed to soak the runoff for events up to and including the 10-year ARI event, including climate change. The soakage system shall be generally shallow, located above the winter ground water table
- In the event the capacity of the soakage system is exceeded, stormwater will discharge via the lowest catch pit. Consideration will need to be given at engineering design stage to the site levels and provision of suitable overland flow conveyance from the carpark area to Horotiu Road and/or the existing WRC drain located along the northern and north-eastern boundaries

2.1 Preliminary Soakage System Design

Rainfall runoff was determined using the Rational Method. Proposed roof and carpark/hardstand areas were taken from DDL Architecture plans dated 11/10/2018. Runoff co-efficients were adopted from the NZBC Clause E1.

Table 1 below presents the associated impervious areas and C factors used in the preliminary soakage system design.

Table 1: Adopted catchment Areas and C-factors for soakage system design

Sub-Catchment	Area (m2)	C Value
Proposed roof	1290	0.90
Proposed paths	295	0.85
Proposed carpark	1700	0.85
Total	3285	0.87

Rainfall intensities were taken from HIRDS V4 rainfall data for the specific site location. Post development analysis was undertaken using a 2.1 degrees rainfall. For completeness, storm durations from 10 minutes to 72 hours were simulated for the 10-year ARI event. Results show that soakage system design is governed by the 60-minute event.

Preliminary design of the soakage system has been undertaken adopting Cirtex Rainsmart modules to provide an indication of the required system size and layout. Refer to the design calculations attached for further details.

A summary of the required soakage system dimensions is presented below;

- 52 units long (37.18m) x 10 units wide (4.0m)
- Single layer (0.44m deep)
- Effective storage volume of 62.16m³.

¹ Proposed Rural Residential Subdivision – 714 Te Kowhai Road, Te Kowhai – Stormwater Management Plan – Revision 2, Wainui Environmental Ltd, dated 23 August 2017.

- Linear Access system for sediment removal/protection

The soakage system will need to have a suitable pre-treatment device to prevent ingress of silts and sediments into the soakage system and ensure continued performance over time. As a minimum, catch pit filters (Flofast or similar) should be installed in the catch pits to capture coarse sediments.

Based on the proposed site layout a suitable place for the soakage system would be in the grass adjacent the drain on the northern boundary.

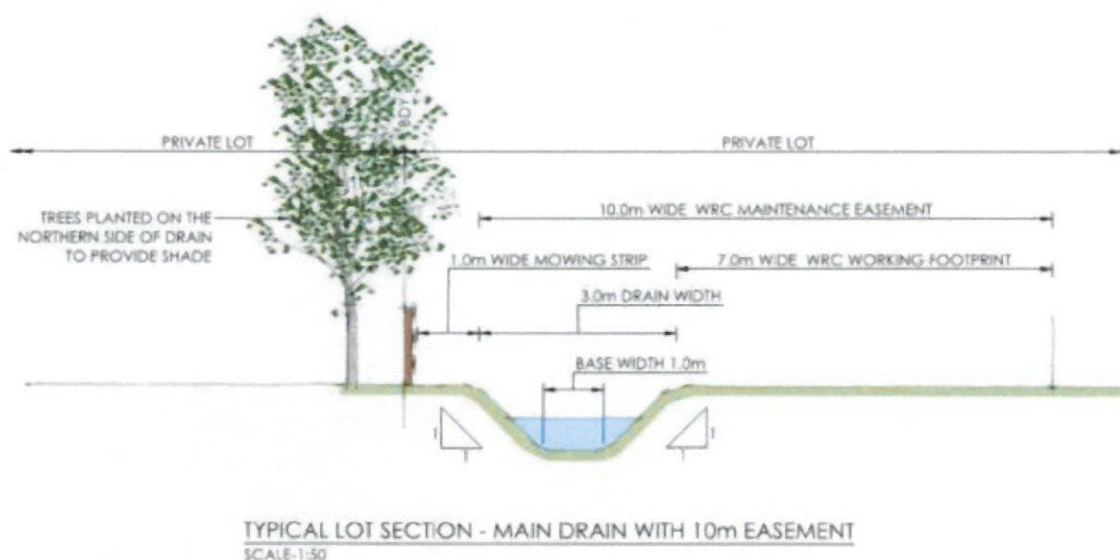
Refer to the attached site plan for details of indicative soakage system location. Detailed Engineering Design of the system will be required, and drainage plans submitted to Waikato District Council for approval prior to commencing works.

By adopting the proposed stormwater management system outlined above, it is expected that the proposed development will result in no adverse effects on drainage conditions either upstream or downstream of the site.

2.2 WRC Drainage

A 10 metre wide easement is located over the existing drain to enable ongoing maintenance of the drains by WRC. The easement restricts any buildings, fences or other improvements being constructed without the prior written consent of WRC. No consent is however required for the erection of a fence which is less than 1.2m high and which includes a gate or gates such that enable access to the drain for maintenance. Refer image below of typical drain and easement arrangement.

The proposed development will need to ensure unrestricted access to the WRC drain at the rear of the proposed building.



2.3 Flooding

In accordance with the subdivision SWMP, previous Rapid Flood Hazard Assessments (RFHA) have shown a flood hazard extending across the subject site. The report recommends a 100 year ARI flood Level at **RL25.61m**.

Freeboard requirements:

In accordance with NZS4404:2010, Section 4.3.5.2, the minimum freeboard height additional to the computed top water level of the 1% AEP design storm, should be as follows:

- Habitable dwellings (including attached garaged) = 0.5m
- Commercial and Industrial Building = 0.3m

- Non-habitable residential building and detached garages = 0.2m

The minimum freeboard shall be measured from the top water level to the building platform level, or underside of the floor joists, or underside of the floor slab, whichever is applicable.

3 ONSITE WASTEWATER MANAGEMENT

Waikato Regional Council Rule 3.5.7.6: Discharge of Sewerage from Improved On-Site Domestic Sewage Treatment and Disposal Systems is a permitted activity providing the volume of effluent does not exceed 3m³ per day.

Onsite wastewater treatment system and disposal field has been designed in accordance with NZS1547:2012 On-Site Domestic Wastewater Management.

3.1 Wastewater Loadings

Wastewater loadings for the proposed development have been calculated based on the proposed building uses and in accordance with NZS1547:2012.

An estimate of the expected wastewater load from the development (for preliminary design purposes only) is presented in Table 1 below. Refer to Appendix C for a detailed breakdown of the estimated loads.

Table 1 Wastewater Generation per Building Use

Proposed Use/Type	Gross Floor Area (m ²)	Estimated Average Daily Flow (l/day)
Pizza (Restaurant & Takeaway)	120	600
Retail Shop	100	120
Retail Shop	100	120
Retail Shop	100	120
Hairdressers	80	720
Retail Shop	120	160
Superette	450	160
Total	1070	2000

3.2 On-Site Wastewater Management Details

The existing site is not currently serviced by a reticulated wastewater network. Accordingly, all wastewater generated by the proposed development will need to be treated and disposed onsite.

3.2.1 Soil Conditions

Based on the soil investigations undertaken across the site the soils have been classified as Category 3 for the subsequent effluent disposal field design.

Refer to the attached borehole logs for further details.

3.2.2 Wastewater Treatment plant

Based on the soil conditions and the site layout an advanced secondary treatment system is recommended for the site with disposal to ground via a conventional bed. Minimum requirements of the system in accordance with NZS1547:2012 are provided below:

- 4,500 minimum primary treatment chamber volume (Table J1).
- Secondary treated shall produce effluent 20/20 ppm BOD5/TSS minimum standard
- The plant shall be capable of treating a minimum of **2000 L/D** domestic wastewater flow.

Grease traps shall be provided for the proposed restaurant and hairdressers to buffer flows and prevent excess fats and oils and harsh chemicals reaching the treatment plant.

3.2.3 Land application system

Due to the soil types found on the site and the flat contour of the land, disposal of secondary treated effluent to ground via a pumped dosed conventional bed is recommended for the site. Design details are summarised below. Refer to the attached 3 Waters Plan for the proposed location of the treatment system and land application area.

- From NZS1547:2012 Table L1 the Design Irrigation Rate, DIR for beds is 50mm/day.
- Land application area = Flow rate / Design Irrigation Rate = $Q / \text{DIR} = 2000\text{L/day} / (50\text{mm/hr}) = 40\text{m}^2$
- The effluent field shall consist of **5m wide x 8m long** bed (or equivalent area)
- The bed shall be constructed along a level contour.
- Effluent shall be distributed within the bed by 25mm lines with 3.0mm perforations at 1.0m centres, inside 80mm distribution pipes. The distribution pipes shall be 2.0m apart.
- Bed to be constructed in accordance with NZS1547:2012 Figure L5 (attached). Automatic sequencing valves shall be used to ensure even distribution of effluent in each distribution pipe.
- A 130-micron disc filter or approved alternative shall be installed on the pump delivery line at the pump vault.
- The bed shall be setback a minimum 1.5 metres from the site boundaries, 10 metres from any drain and 30 metres from any Natural State or Fisheries Class water course, or potable water source.

The above wastewater loadings, wastewater treatment plant and effluent field design and location will need to be confirmed during detailed design.

4 WATER SUPPLY

There is currently no reticulated water supply on Horotiu Road, adjacent to the proposed commercial site. Accordingly, it is proposed to collect and store rainwater to supply the proposed commercial development.

Preliminary wastewater calculations in Section 3 of this report indicate that the development will produce approximately 2000L/day of wastewater. Accordingly, it is estimated that the development will require approximately 2000L/day of potable water, when operating at full capacity.

It is recommended that 2 x 25kL water tanks are proposed, providing approximately 25 days' supply to the commercial development. Regarding the WDC Engineering Standards B4.1 d) it is expected that 25 days' supply is sufficient to provide for the expected demands, considering that a) it is considered unlikely the development will operate at peak capacity for 20 days in a row and, b) It is generally expected there will be a rainfall event within the 25 days², extending the expected duration of supply. However, to further guarantee 'adequate supply' it is recommended an agreement be made with a local water contractor to provide water to the development if required.

As part of detailed design, the above assumptions will need to be confirmed along with the proposed no. of water tanks.

4.1 Fire Supply

The proposed development will need to be assessed by a Fire Engineer and subsequent Fire Hazard Classification determined. If required, opportunity exists to share the fire supply which is proposed within the neighbouring café development.

The café has 180m³ of permanent fire water supply provided in above ground water tanks. In accordance with NZS4509, the furthest edge of the proposed building is within 90m of the fire water supply tanks on the adjacent café development. Unimpeded access to the fire supply water tanks will also need to be provided.

² The Climate and Weather of Waikato, P.R Chappell (NIWA)- Table 8 Average monthly rain days and wet days for Waikato region

We trust the above is to your satisfaction. Should you require any further information please do not hesitate to contact the undersigned.

Yours faithfully

WAINUI ENVIRONMENTAL LTD

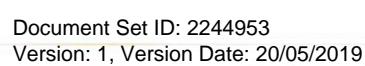


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calculation sheet

Wastewater Flow calculations

Client: Te Kowhai Estate Ltd
Project: 561 Horotiu Road
Job No: WE1919

Computed: CB
Date: 3/04/2019
Revision: A

Wastewater use	(L/p/day)	
Take-away	10	{From Auckland Council TP58-Onsite WW systems Design and Management manual, Table 6.2}
Bar/café lunch	20	{From NZS1547:2012 Table H4}
Office	40	{From Auckland Council TP58-Onsite WW systems Design and Management manual, Table 6.2}
Retail day staff	40	{From Auckland Council TP58-Onsite WW systems Design and Management manual, Table 6.2}
Residential	200	{From HCC ITS Section 5: Wastewater}

notes:

1. For Takeaways: Assumed 1 table per 20m² floor area

Building	Use	Floor area (m ²)	no. patrons/staff	WW use (l/day)	
	Pizza Shop	120	4	160	estimate staff No.
	Eat in	60 (est. dining area)	12	240	2 sittings (lunch and dinner) @ 50% occupancy
	Take-away		20	200	Approx 20/day
	Retail Shop	100	3	120	estimate staff No.
	Retail Shop	100	3	120	estimate staff No.
	Retail Shop	100	3	120	estimate staff No.
	Hairdresser	80	3	120	estimate staff No.
	Hair wash		24	480	8 Customers per staff member per day
	Customers		6	120	1/4 of customers use the bathroom
	Retail Shop	120	4	160	estimate staff No.
	Superette	450	4	160	estimate staff No.
Total				2000	

SOAKAGE DESIGN - CIRTEX SMARTSOAK

Client: Te Kowhai Estate Ltd
Project: 561 Horotiu Road
Job No: WE1829

Computed: CB
Date: 18/01/2019
Revision: A

Notes:

1. Sizing of soakage systems based on NZBC Verification method E1/VM1 - Surface Water, Section 9, using various storm durations.

User Input

Catchment Area m²
Volumetric Runoff Coefficient
Soil K_n mm/hr (Reduced by 50%)

Catchment Data

	Area	C-Factor
Roof	1290	0.90
Paths	295	0.85
Carpark	1700	0.85
Totals	3285	0.87

RAINSOAK SYSTEM DIMENSIONS

	Unit Dimensions	No. of Units	Total Dimensions
Length	0.715	52	37.18
Width	0.4	10	4.00
Depth	0.44	1	0.44
TOTAL			65.44 m ³

Porosity
Base Area m²

Area Calculation

Base Infiltration Area Include m²
Effective Side Infiltration Area m²

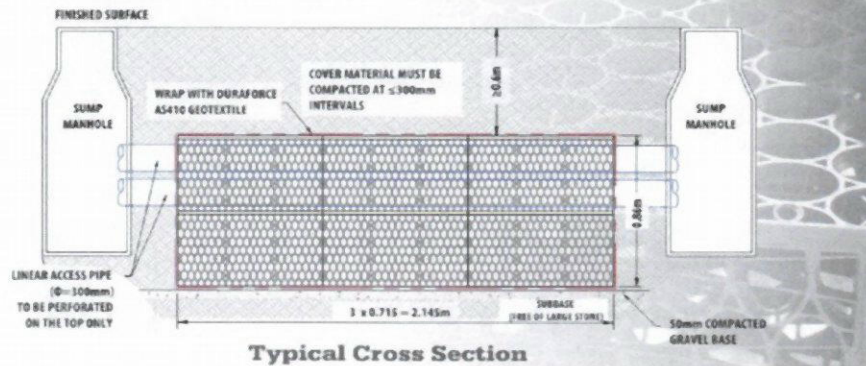
Infiltration Requirements

Effective Side Area Factor
Total Effective Infiltration Area m²
Effective Volume m³

Storm Duration	Rainfall Intensity (10yr)	Volume in	Volume out (during storm duration period)	Storage Volume Required	Percentage of Storage provided	Test	Actual Depth	Emptying Time (hrs)	Check
(minutes)	(mm/hr)	(m ³)	(m ³)	(m ³)	%				
10	104.9	49.928	7.814	42.115	148%	OK	0.30	1.06	OK
20	71.7	68.265	15.627	52.638	118%	OK	0.37	1.46	OK
30	57.0	81.355	23.441	57.914	107%	OK	0.41	1.74	OK
60	37.9	108.362	46.882	61.480	101%	OK	0.44	2.31	OK
120	24.8	141.832	93.764	48.068	129%	OK	0.34	3.03	OK
360	12.2	208.771	208.771	0.000		OK	0.00		
720	7.6	261.660	261.660	0.000		OK	0.00		
1440	4.7	322.104	322.104	0.000		OK	0.00		
2880	2.8	389.706	389.706	0.000		OK	0.00		
4320	2.1	431.858	431.858	0.000		OK	0.00		

Max Volume m³

SmartSoak™ - Linear Access



PERCOLATION TEST RESULTS

Client: Te Kowhai Estate Ltd
Project: 561 Hororua road
Job No: WJ1919

Tested by: CB
Date Tested: 15/01/2019
Revision: A

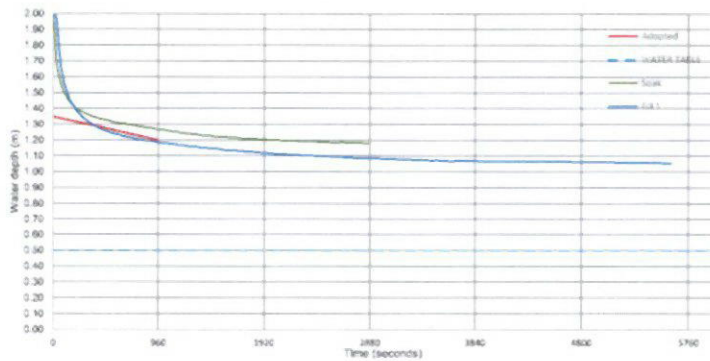
Test No: **ST-01**

Test carried out in accordance with NZBC Clause E1: Surface Water

Field Notes:

Bottom of hole collapsed approx 200-300mm due to water table

Depth of hole: 2.00 m
Water table depth: 1.50 m



Percolation Rate Calculation:

Time (s)	Water Depth (m)	
0	1.350	Minimum Slope - Lower
990	1.200	Minimum Slope - Upper

Soakage Rate

NZBC Method	
Soakage Rate	563 mm/hr
Adjusted Rate	281 mm/hr
Minimum Soakage Threshold = 150mm/hr (HCC ITS)	
Reduced by 50% (HCC RITS)	

Soil Log

Depth (m)	Soil Description	WT
0.0m	Dark brown, Silty, Topsoil, moist	
	Brown Silty, moist	
0.5m	Orangey brown, Sand, minor silt, decreasing with depth, moist	
1.0m	Moisture increasing with depth	
1.5m	Water Table @ 1.5m Unable to continue auguring due to wet sandy soils	
2.0m		



PERCOLATION TEST RESULTS

Client: Ta Kowhai Estate Ltd
Project: 561 Horobu road
Job No: WR1919

Tested by: CB
Date Tested: 15/01/2019
Revision: A



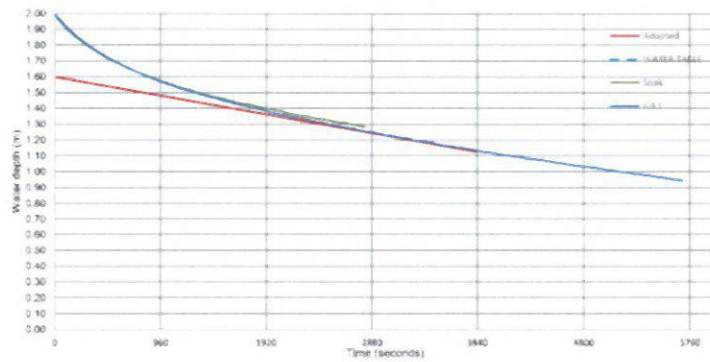
Test No: **ST-02**

Test carried out in accordance with NZBC Clause E1: Surface Water

Field Notes:

Very difficult to remove material at the bottom of the hole (very sticky, wet clayey silts)

Depth of hole: 2.00 m
Water table depth: 0.00 m



Percolation Rate Calculation:

Time (s)	Water Depth (m)	
0	1.800	Minimum Slope - Lower
3540	1.125	Minimum Slope - Upper

Soakage Rate

NZBC Method	
Soakage Rate	445 mm/hr
Adopted Rate	223 mm/hr
Minimum Soakage Threshold = 150mm/hr (HCC (TS))	

Soil Log

Depth (m)	Soil Description	WT
0.0m	Dark brown, SIL, Tropical moist	
	Dark brown, organic materials (Peat?), moist	
0.5m		
	Brown SIL, fine, dry	
1.0m		
	Grey/light brown Clayey SIL, moist	
1.5m		
	Moisture increasing with depth	
2.0m	End of log 2.0m	



PERCOLATION TEST RESULTS

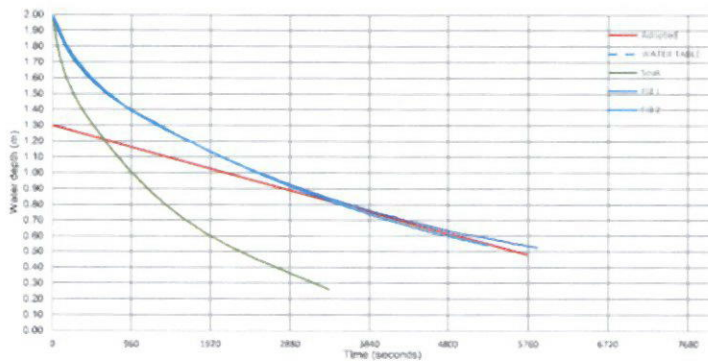


Client: Te Kowhai Estate Ltd
Project: 561 Horotiu road
Job No: WTS1819

Tested by: CB
Date Tested: 15/01/2019
Revision: A

Test No: **ST-03**

Test carried out in accordance with NZBC Clause E1: Surface Water



Percolation Rate Calculation

Time (s)	Water Depth (m)	
0	1.300	Minimum Slope - Lower
5750	0.480	Minimum Slope - Upper

Soakage Rate

NZBC Method	
Soakage Rate	513 mm/hr
Adjusted Rate	256 mm/hr
Minimum Soakage Threshold = 150mm/hr (400 l/s)	

Field Notes:

Bottom of hole collapsed approx 100-200mm due to sands becoming wet (once hole was filled with water)
Soak test 1 drained completely (no water left in hole)

Depth of hole: 2.00 m
Water table depth: 0.00 m

Soil Log

Depth (m)	Soil Description	WT
0.0m	Dark brown, Silty, Topsoil, moist	
0.5m	Dark brown Silty organic material, moist	
	Brown Silty, fine, dry	
1.0m	Greyish brown clayey Silty, moist	
1.5m	Brown/Light brown Silty, minor sand - sand increasing with depth	
	Light brown/gray Sand, dry	
2.0m	End of log 2.0m	

