

T. L. P. Ground Investigations Ltd.

Site Investigation Report

Site: Proposed Residential Development, 11, Badgate, Donington, Lincolnshire.
Client: Peter & Sandra Hilton.
Engineer: TaC Architects.
Date: 25th May 2023.

Brief

A new residential dwelling is proposed on land at 11, Badgate, Donington, Lincolnshire. In order to evaluate the soakaway potential of the near surface deposits, TLP Ground Investigations Ltd. were requested to undertake a ground investigation at the site which was to include the following:-

- The sinking of 2 No. sampling boreholes using dynamic sampling equipment.
- Identification of the prevailing soil and groundwater conditions.
- Performing 'falling head' (variable head) permeability trials in all the completed boreholes in order to establish the relative permeability of the near surface stratum.
- The provision of a report with borehole records and laboratory test results.

Site and Geology

The site of the proposed new dwelling was previously occupied by a detached bungalow. This has now been demolished in order to make way for the proposed new structure. The remainder of the site has now been stripped down to bare earth as part of the enabling works, prior to commencement of construction. The site surface slopes slightly from roadside to its most south easterly point by approximately 500-600mm.

From data obtained during other surveys taken in the area, together with information shown on the British Geological Survey 1: 50 000 Series, the superficial deposits overlying the site were anticipated to be represented by Tidal Flat Deposits of clay, silt, sand and gravel. The underlying solid geology is represented by the Oxford Clay Formation (Mudstone) which is of Callovian / Oxfordian age.

Intrusive Investigation

The intrusive investigation was conducted in accordance with BS5930:2015+A1 2020 Code of Practice for Site Investigations and was completed on 18st May 2023.

The intrusive fieldwork included the following:-

- The sinking of 2 No. shallow sampling boreholes using windowless sampling equipment to depths of 3.10m beneath the ground surface. Soil samples were recovered as continuous cores reducing in size from 100mm to 63mm in diameter within rigid PVC core liner.
- Performing 'falling head' (variable head) permeability tests in each of the completed boreholes in order to establish the relative permeability of the near surface stratum *in situ*.

The approximate locations of the borings have been indicated on the enclosed Borehole Location Plan and details of the strata encountered have been recorded on the enclosed borehole record sheets.

Ground Conditions

Topsoil

At the surface, each of the borings penetrated deposits of dark brown, silty, sandy and clayey topsoil containing occasional fine to medium fragments of stone and broken pottery. These deposits extended to depths of between 0.22m and 0.40m and rested on deposits of made up / disturbed ground.

Made Up / Disturbed Ground

The deposits of made up / disturbed ground initially comprised mixed, brown and dark brown, silty soil. These silty deposits extended to depths of between 0.75m and 0.80m beneath the surface and rested on deposits of mixed, brown and buff brown, slightly clayey silt containing occasional fine fragments of coal and brick. These disturbed deposits extended to depths of between 1.35m and 1.43m beneath the surface and rested on the underlying natural strata.

Natural Stratum

At each of the borehole locations, the underlying natural deposits were initially represented by a sequence of Tidal Flat Deposits, represented by buff brown, mottled rust brown silt. Once penetrated, these deposits extended to the full depth of borehole penetration some 3.10m beneath the surface.

Groundwater

Perched groundwater seepages were encountered within the borings at depths of between 1.80m and 2.30m beneath the surface. Based on the soakaway test results, groundwater in BH1 should not rise higher than 1.88m below ground level and in BH2 1.50m below ground level. The difference in the perched groundwater level beneath the surface is likely a consequence of the observed difference in ground level, which was estimated at approximately 500mm.

Laboratory and In Situ Testing - Geotechnical

In order to establish the relative permeability of the near surface stratum in situ 'falling head' (variable head) permeability tests were performed within each of the completed borings. The test holes were approximately 103mm in diameter and extended to depths of approximately 3.10m beneath the surface, however, some collapse of the side walls was experienced prior to insertion of the pipe. To ensure the sidewalls of the borehole remained stable, a 50mm slotted standpipe was inserted into each of the test holes and surrounded by well screen gravel for the duration of the test.

At the start of the test, the holes were quickly filled to the surface with water and then the time taken for the water to dissipate from the holes was subsequently monitored. **The results of the tests indicate soil infiltration rates of between 7.09×10^{-2} mm/s and 7.14×10^{-2} mm/s, which represent a moderate to good rate of soil infiltration, typical of fine sand or coarse silt.**

Engineering Comments - Geotechnical

Ground Conditions

The recent borings have revealed that beneath a superficial covering of silty, sandy and clayey topsoil, deposits of made or disturbed ground extend to depths of between 1.35m and 1.43m beneath the surface. These deposits rest on the underlying natural Tidal Flat Deposits, represented by buff brown, mottled rust brown, silt. These deposits became saturated at depths of between 1.50m and 1.88m beneath the surface. Deposits of silt were proved to a depth of at least 3.10m beneath the surface where each of the sampling boreholes terminated.

Soakaways

The results of the permeability tests indicate soil infiltration rates of between **7.09×10^{-2} mm/s and 7.14×10^{-2} mm/s**, which represents a moderate to good rate of soil infiltration, which are typical for deposits of fine sand or coarse silt.

The recorded rates of soil infiltration were moderate to good and therefore the deposits of silt which underlie the site could potentially provide a potential soakaway media in which to discharge surface water generated by the proposed residential development.

Depending on site levels, standing groundwater depths of between 1.50m and 1.88m beneath the surface should be anticipated. In order to exploit the more permeable natural deposits, excavations for soakaways should extend as deep as is practicable into the underlying saturated silt. However, in order to ensure that the base of the 'soakaway' remains dry throughout its operational lifetime, it is recommended that the excavations are then immediately up-filled to the required level (say 1.10m depth for the placement of storage crates) using free draining coarse clean gravel or rubble. This would ensure for safer / shallower installation of soakaways for ground workers, create a conduit to the more free draining deeper soils and also facilitate the installation of the storage media (drainage crates) on a dry base, clear of any ground water (*this design may need to be verified with local building control officer*). The side walls of the excavations in the silt may be only temporarily self supporting in open excavations and therefore it would be prudent have backfill rubble / gravel or trench supports on hand to ensure that construction can proceed under optimum conditions.

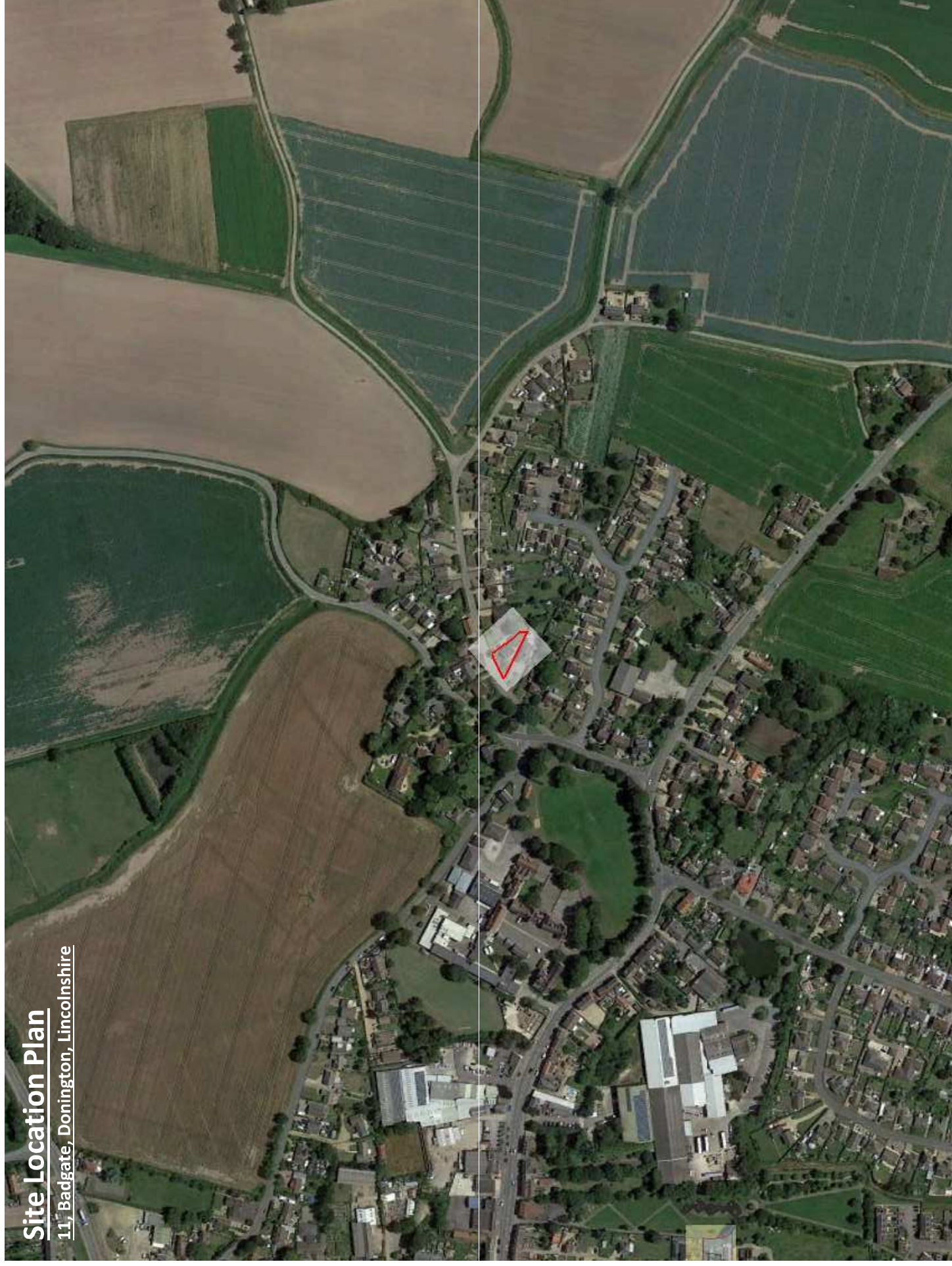
Depending on the location of the individual soakaway chambers, the design engineer may wish to adopt the infiltration rate from the nearest borehole for design purposes or adopt the lowest figure of **7.09×10^{-2} mm/s**.

The opinions expressed in this report assume that the ground conditions do not vary beyond the range revealed by the scope of the investigation. There may, however, be conditions at the site, which have not been identified by the investigation and therefore will not have been considered in this report. Accordingly a careful watch should be maintained during any future ground works and this report and its conclusions reviewed and /or modified accordingly.

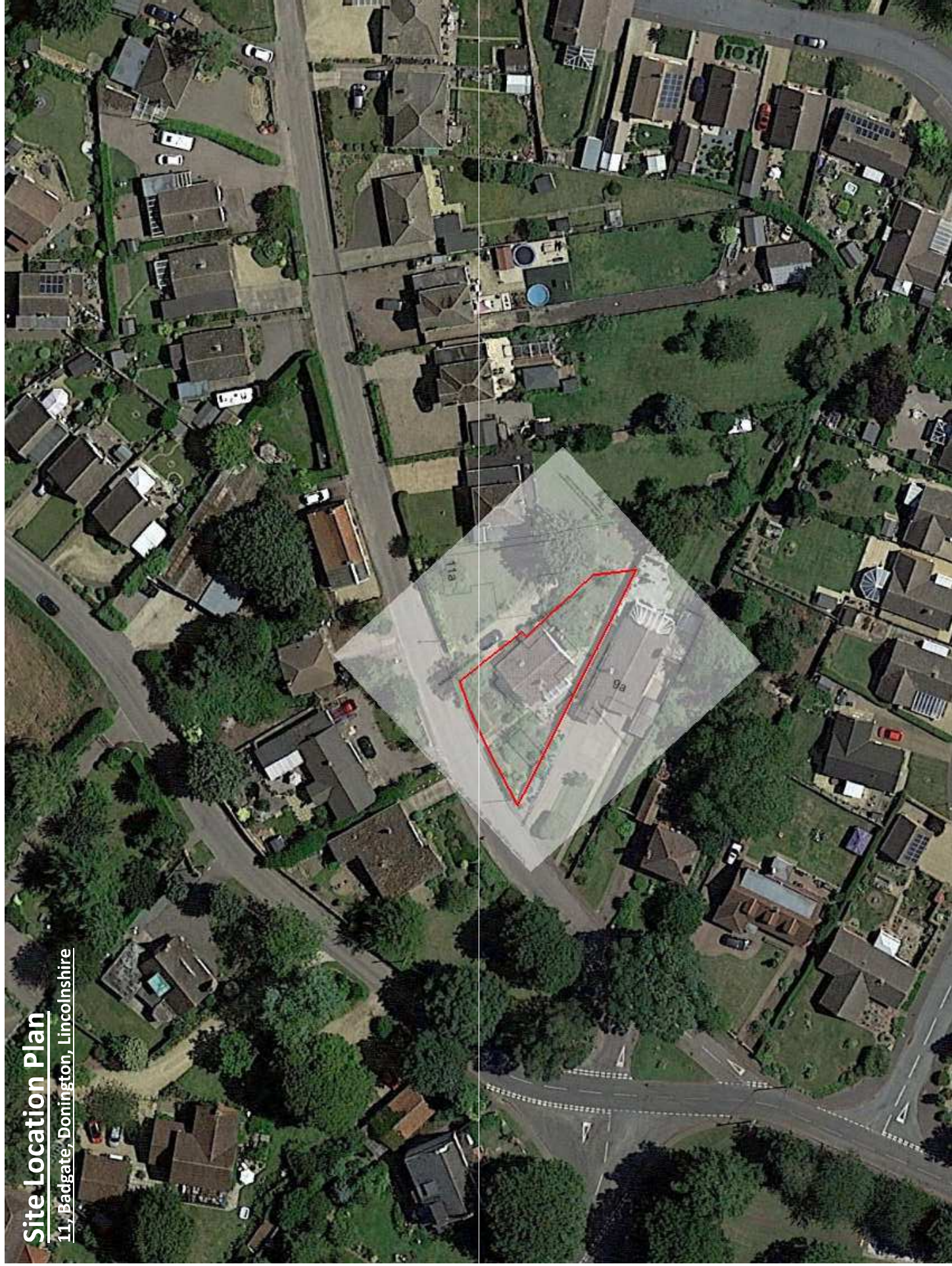
TLP Ground Investigations Ltd

Site Location Plan

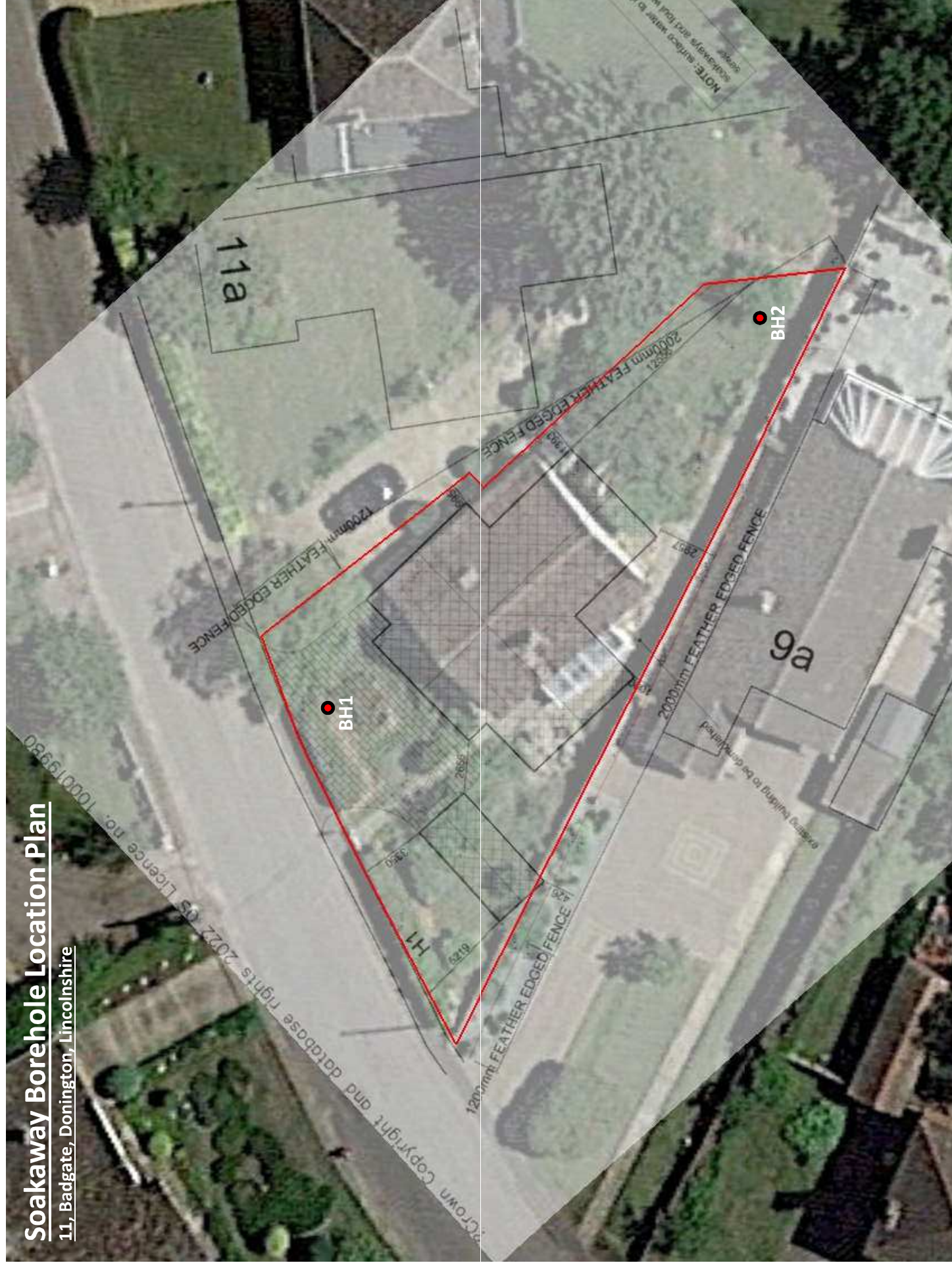
11 Badgate, Donington, Lincolnshire



Site Location Plan
11, Badgate, Donington, Lincolnshire



11, Badgate, Donington, Lincolnshire



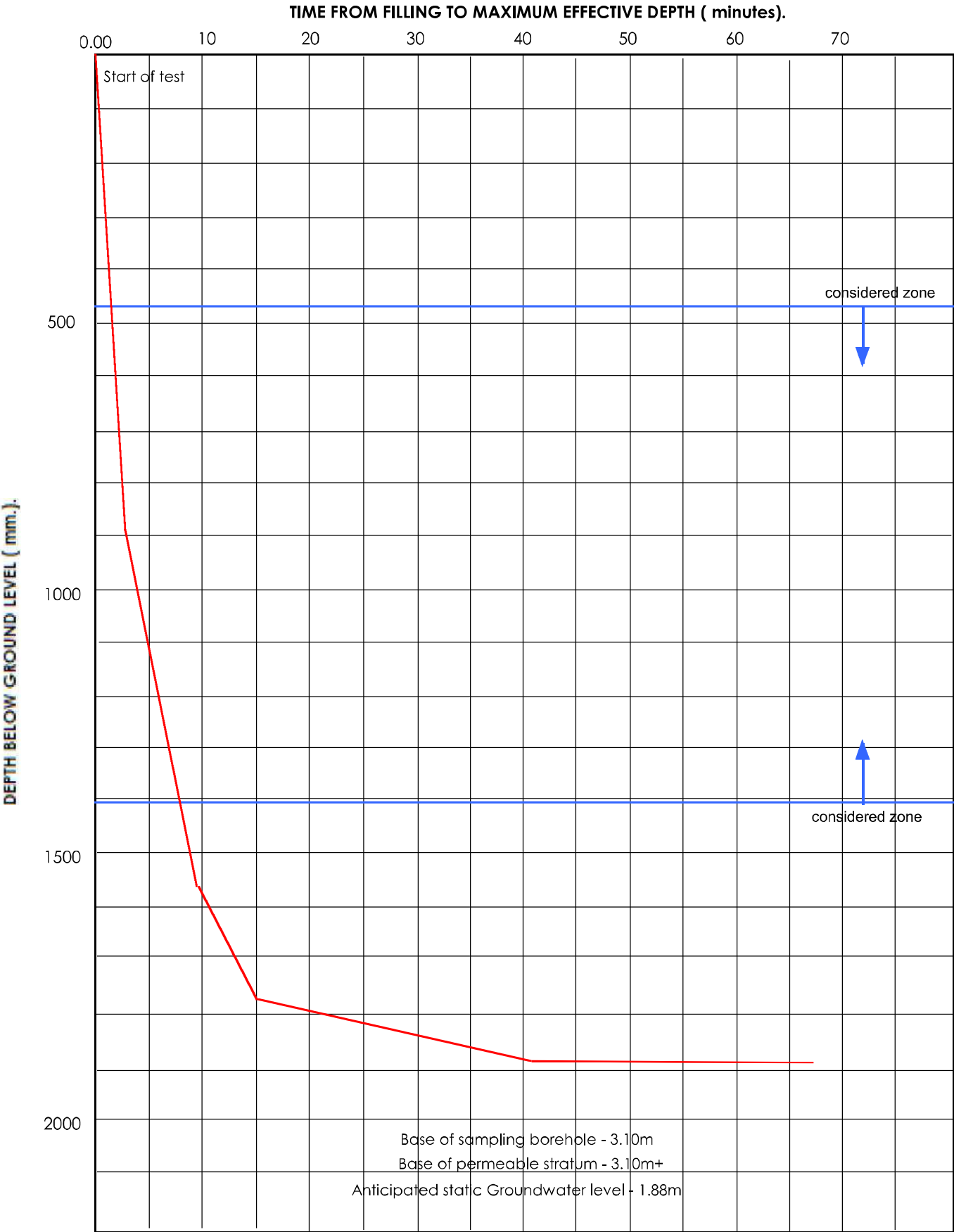
T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, 11, Badgate, Donington.		Borehole No. BH1.								
Carried out For Peter & Sandra Hilton.				Ground Level		Co-ordinates		Date : 18.05.23.						
Description				Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records				
							Depth	samples			Test			
Type	No.													
Dark brown, silty, sandy Topsoil containing very occasional fine fragments of stone.						(0.22)	0.00 - 1.10	U	1	S N7				
Mixed buff brown and dark brown, silty soil.						0.22								
						(0.20)								
Buff brown silt.						0.42								
Topsoil / Disturbed Ground						(0.38)								
Mixed, brown and buff brown, slightly clayey silt containing very occasional fine fragments of coal and brick.				0.80	1.10 - 2.10	U	2	S N7						
				(0.55)										
				1.35										
Buff brown, mottled rust brown Silt .										2.10 - 3.10	U	3	S N4	
Tidal Flat Deposits														

Percolation Graph

Falling Head Test

Soak BH1

Project Location : 11 Badgate, Donnington.
Client : Peter and Sandra Hilton.
Date of SI : 18/05/23



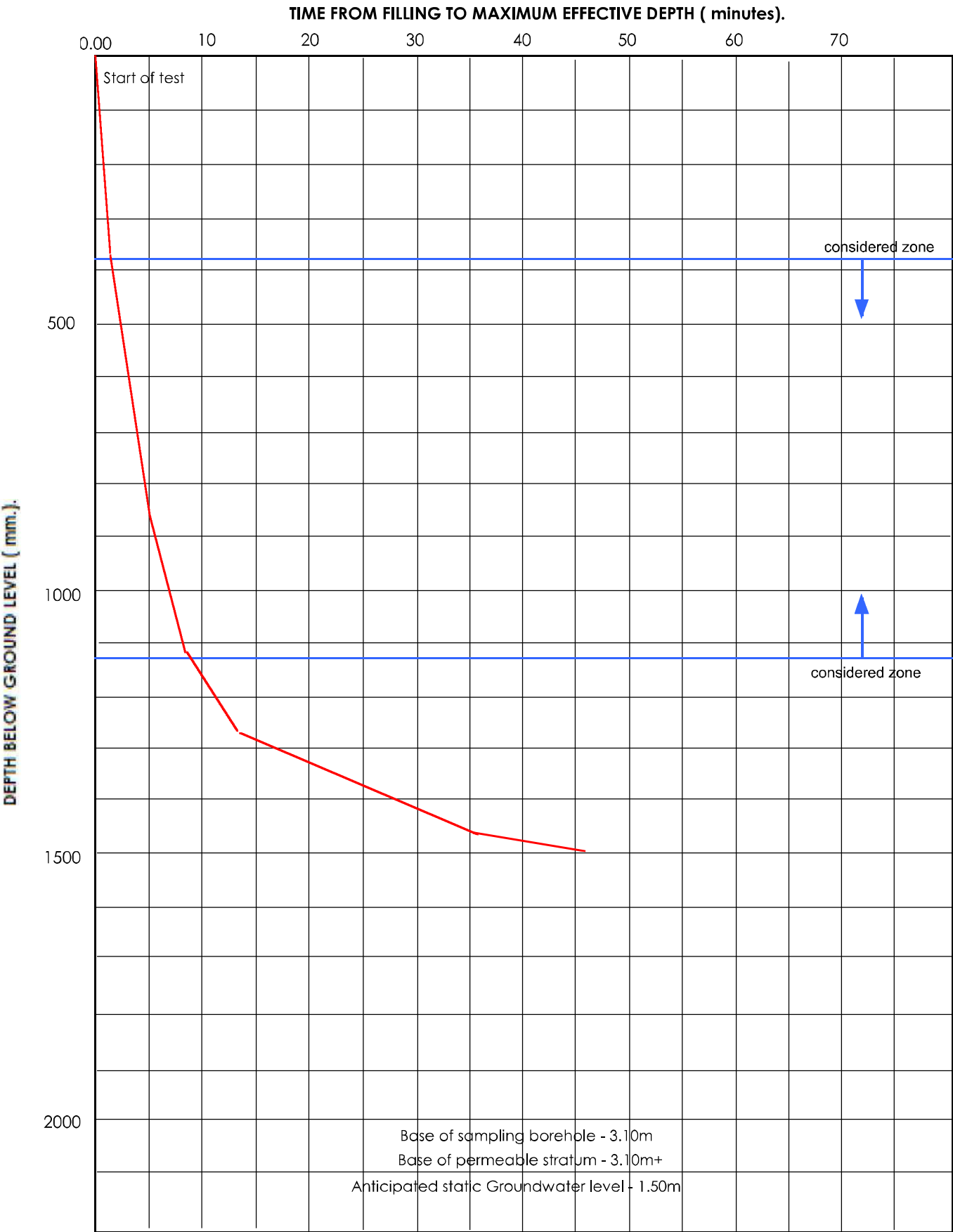
[illegible]

Percolation Graph

Falling Head Test

Soak BH2

Project Location : 11 Badgate, Donnington.
Client : Peter and Sandra Hilton.
Date of SI : 18/05/23



Calculation of Soil Infiltration Rate

11 Badgate, Donington

Parameter	BH1	BH2					
diameter of borehole	0.105	0.105					
Height of water at start of considered zone (m) H1	1.41	1.86					
Height of water at end of considered zone (m) H2	0.47	0.62					
Considered depth change (m) = H1 - H2	0.94	1.24					
Volume out flowing within considered depth	0.008139474	0.010737178					
Mean effective depth during outflow	0.94	1.24					
Mean surface area during outflow	0.318734214	0.417694384					
Time of considered outflow (mins)	6	6					
Soil infiltration rate m/s	7.09E-05	7.14E-05					
Soil infiltration rate mm/s	7.09E-02	7.14E-02					
Soil infiltration rate m/hour	0.2554	0.2571					

Calculations from BRE 365 1991

Typical Percolation Values	
Gravels	Value mm/s >10
Sands	1 to 1 x 10E-2
Fine Sands / Coarse Silts	1x10E-2 to 1 x 10E-4
Silts	1x10E-4 to 1 x 10E-6
Clays	< 1 x 10E-6

Table from - Elements of Soil Mechanics for Civil & Mining Engineers (G.N. Smith 1974)