



GEOTECHNICAL INVESTIGATION

**PROPOSED SUBDIVISION
109 OLD PETERBOROUGH ROAD
PETERBOROUGH**

REPORT NO: 122818

WESTROCK PTY LTD
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17 April 2024



A.S.JAMES PTY LTD

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SINCE 1963

Table of Contents

1. INTRODUCTION	1
1.1 Investigation Requested by.....	1
1.2 Purpose of Investigation	1
1.3 Geology.....	1
1.4 Field Methods	2
2. RESULTS	2
2.1 Site Description	2
2.2 Borehole Drilling	3
2.3 Subsurface Soil Profile	3
2.4 Ground Water.....	3
3. DISCUSSION.....	4

List of Tables

Table 1: Summary of Subsurface Profile	3
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List of Figures

Figure 1: Geological Map	2
Figure 2: Ground Water Table	4

1. INTRODUCTION

1.1 Investigation Requested by

The geotechnical investigation was commissioned by [REDACTED] via a signed authorisation of engagement in response to our fee proposal CO22376 dated 15 March 2024.

1.2 Purpose of Investigation

It is proposed to subdivide land at 109 Peterborough Road, Peterborough. It was required to supplement a resistivity imaging survey with selected boreholes to investigate the likelihood of cavities (casts).

The goals of the geotechnical investigation are outlined as follows:

- Review the available information such as geological maps.
- Establish the subsurface profile, including groundwater condition from boreholes at six (6) sites.
- Provide comments in relation to the likelihood of cavities.

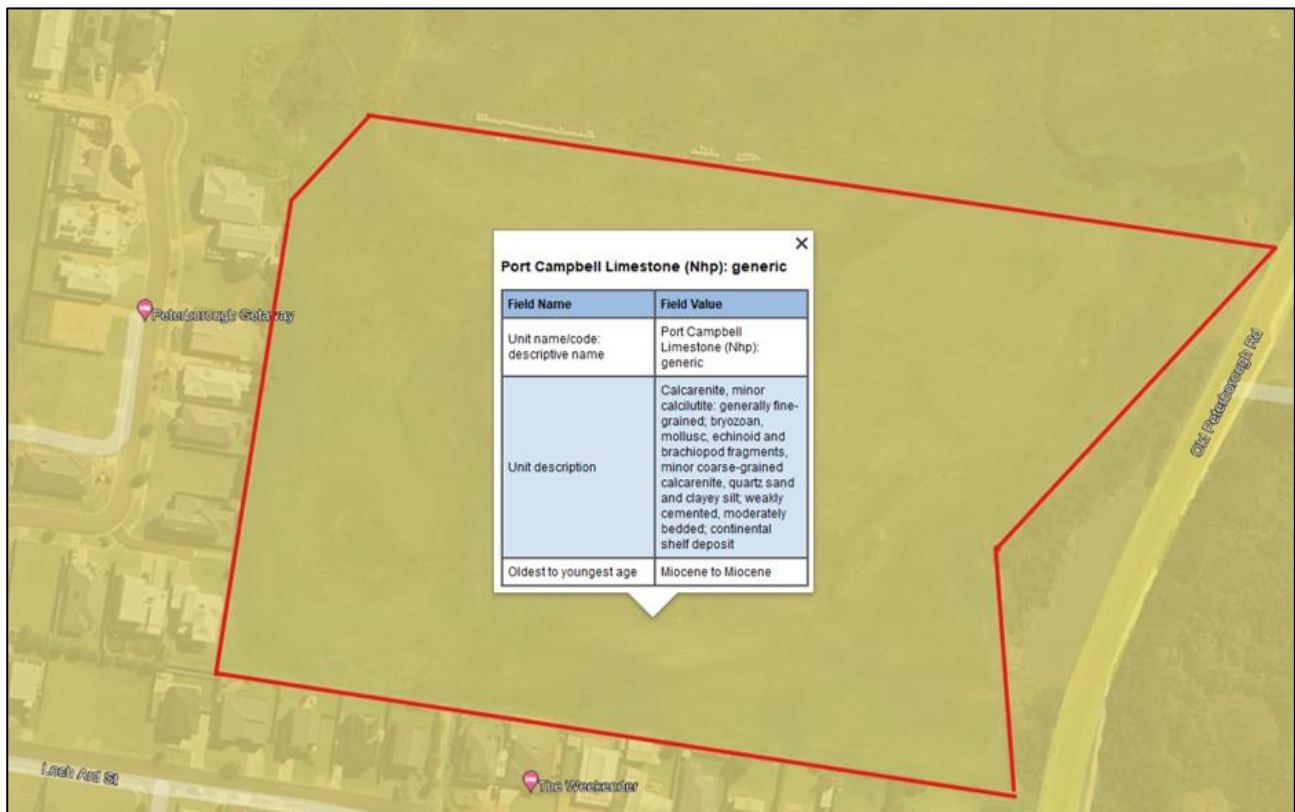
1.3 Geology

The seamless Geology 250,000 map indicates the subject site to be underlain by Miocene deposits known as Port Campbell limestone. Typically, these deposits comprise sands and silt underlain by moderate strength clays. The clays, which are generally of a moderate to high plasticity, grade to medium dense sands. The sedimentary deposits are interbedded clays and sands.

Cavities or casts are expected to develop along with a description.

The geology map is depicted below.

Figure 1: Geological Map



Geological Map – 250k Seamless Geology of Melbourne

1.4 Field Methods

As part of our geotechnical investigation the following field methods were incorporated:

- i) **Auger Drilling:** The boreholes were drilled using a truck mounted Gemco HP7 rotary drilling rig and equipped with continuous flight 90-millimetre diameter augers fitted with a tungsten carbide drill bit.
- ii) **In-situ Vane Shear Strength Testing:** In-situ vane shear strength testing was carried out within the cohesive soils at shallow depths using a Pilcon hand vane tester. The tests were conducted in accordance with the test procedure outlined in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes". Test Method 6.2.1.
- iii) **Standard Penetration Testing:** Standard penetration testing was conducted within the boreholes in accordance with the test procedure outlined in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes," Test Method 6.3.1.
- iv) **Logging of Soil Profiles:** The subsurface profile encountered in the borehole was logged in accordance with Australian Standard AS 1726 - 2017, "Geotechnical Site Investigations."

2. RESULTS

2.1 Site Description

At the time of the investigation the following site features were noted.

- The site is slightly sloping and at times essentially flat.
- The drainage of the site is considered to be moderate.

- No boulders or rock are visible on the ground surface level, and none could be expected below ground level at shallow depth.
- The site has a moderate cover of grass.
- The site is vacant.

2.2 Borehole Drilling

Six (6) boreholes were drilled at the approximate locations as indicated on **Figure 1**, with these locations nominated by GPS ordinates. The logs of the boreholes, together with the result of in-situ vane shear strength and Standard Penetration testing carried out within the boreholes, are given on **Figures 2 - 7**.

2.3 Subsurface Soil Profile

The following table summarises the sub-surface profile.

Table 1: Summary of Subsurface Profile

Bore No.	Fill (m)	Silt (SM/ML) (m)	Clay (CL/CH) (m)	Sand (SM/SC) (m)
1	-	0 – 0.6	0.6 – 4.5	4.5 – 6.5
2	-	0 – 0.2	0.2 – 3.5	3.5 – 6.5
3	-	0 – 0.3	0.3 – 5.5	5.5 – 6.5
4	-	0 – 1.1	1.1 – 6.5	-
5	-	0 – 0.6	0.6 – 6.5	-
6	-	0 – 0.7	0.7 – 6.5	-

Borehole logs are provided on **Figures 2 - 7** and should be referred to for details. A Summary of the geological units encountered are provided below:

Fill: Not encountered, but the surface of the silt appeared, at times, to have been disturbed.

Silt (SM/ML): Medium dense sandy silt.

Clay (CH/CL): In all the boreholes, underlying the silt, layers of clay were encountered. The clays encountered were silty and sandy, and of moderate to high plasticity. The clay, at times, was gravelly and stiff.

Sand (SC/SM): In boreholes 1, 2 and 3 the clay layer is underlain by a layer of medium dense silty sand.

Considering the logs of the boreholes the following should be noted:

- In bores 1 and 6 at depths of 4.5m and 6.5m respectively extremely loose/soft material was encountered.

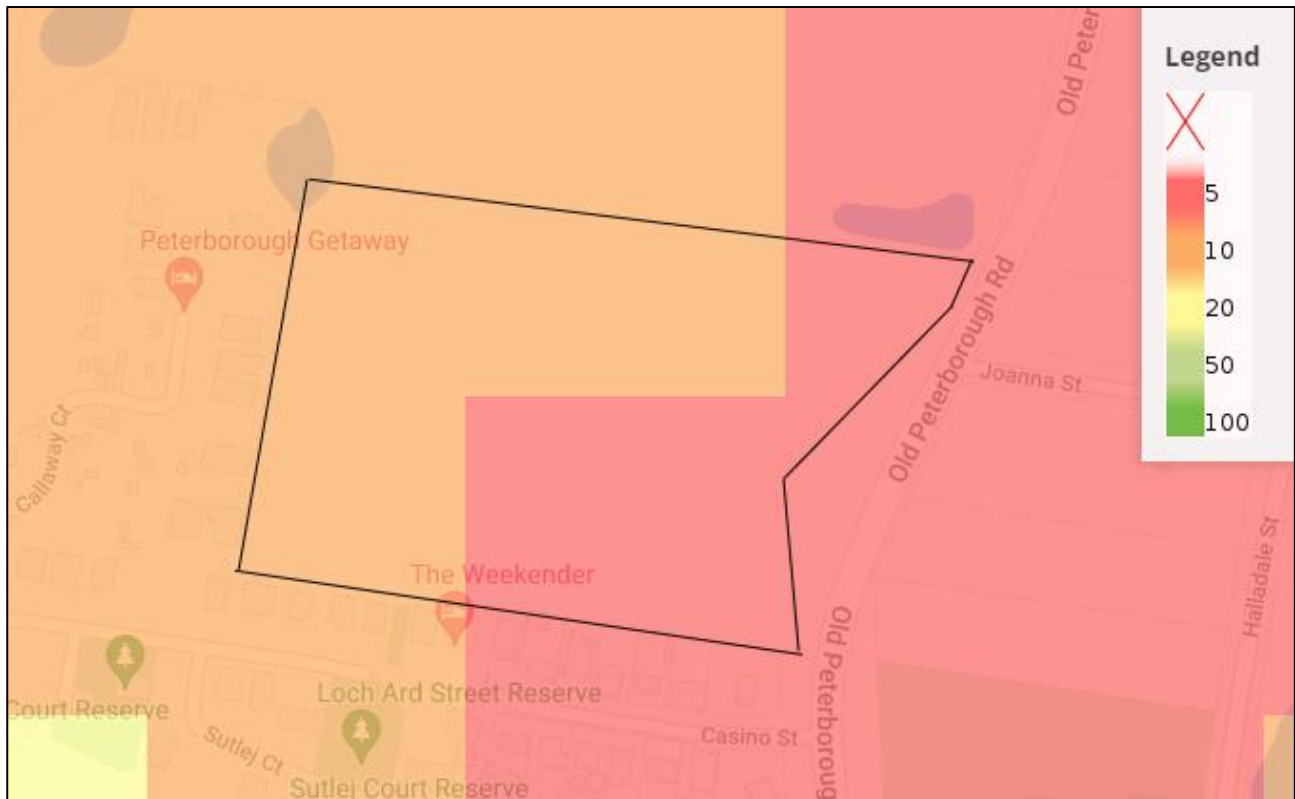
2.4 Ground Water

Groundwater was encountered at the time of the site investigation at 4.5-5.8m in bores 1, 2 and 6. It should also be noted that it is likely for a temporary perched water table to develop within the surface silt overlying the relatively impermeable clays.

It should also be noted, that following prolonged periods of rainfall the surface granular silt and shallow clays will be susceptible to moisture ingress, thereby significantly reducing the workability and strength of both the surface soils and the underlying clays at shallow depths.

Visualising Victoria's Groundwater map portal was checked and reveals an approximate groundwater level is in the order of 5.0 – 10.0 metres below the ground surface level at the subject site and this appears in line with our borehole drilling results. Some variation could, however, be expected.

Figure 2: Ground Water Table



Visualising Victoria's Groundwater

3. DISCUSSION

The logs of the bores should be referred to the author of the resistivity imaging survey (Ander Guinea) for correlation with his results

The following points are made.

- There is a significant cover of stiff clay existing on the site and this will serve as significant bridging and localised cavities within the underlying limestone of a small nature, will be bridged.
- We have encountered two (2) soft zones in boreholes 1 and 6 at depths of 4.5m and 6.5m respectively, where more caverns may have been encountered in the lower sand profile.

These are of little concern in that they did not appear to be caverns as such, but may have been old caverns with water resulting in them being filled in a loose manner with sand.

These minor pockets appear to be associated with the presence of moisture or water.

- The development of this site should concentrate on good surface run-off and good surface drainage to minimise the ingress of water into the underlying materials.

-
- Allied to this previous bullet point is the fact that a perched water table will develop on this site in the more silty materials overlying the clay, and good drainage will help mitigate this issue.
 - Further shallow bores have been carried out and are reported in our report reference 122818/A, and they have encountered similar profiles to those encountered in this report.

Should any point remain in doubt please do not hesitate to contact this office.

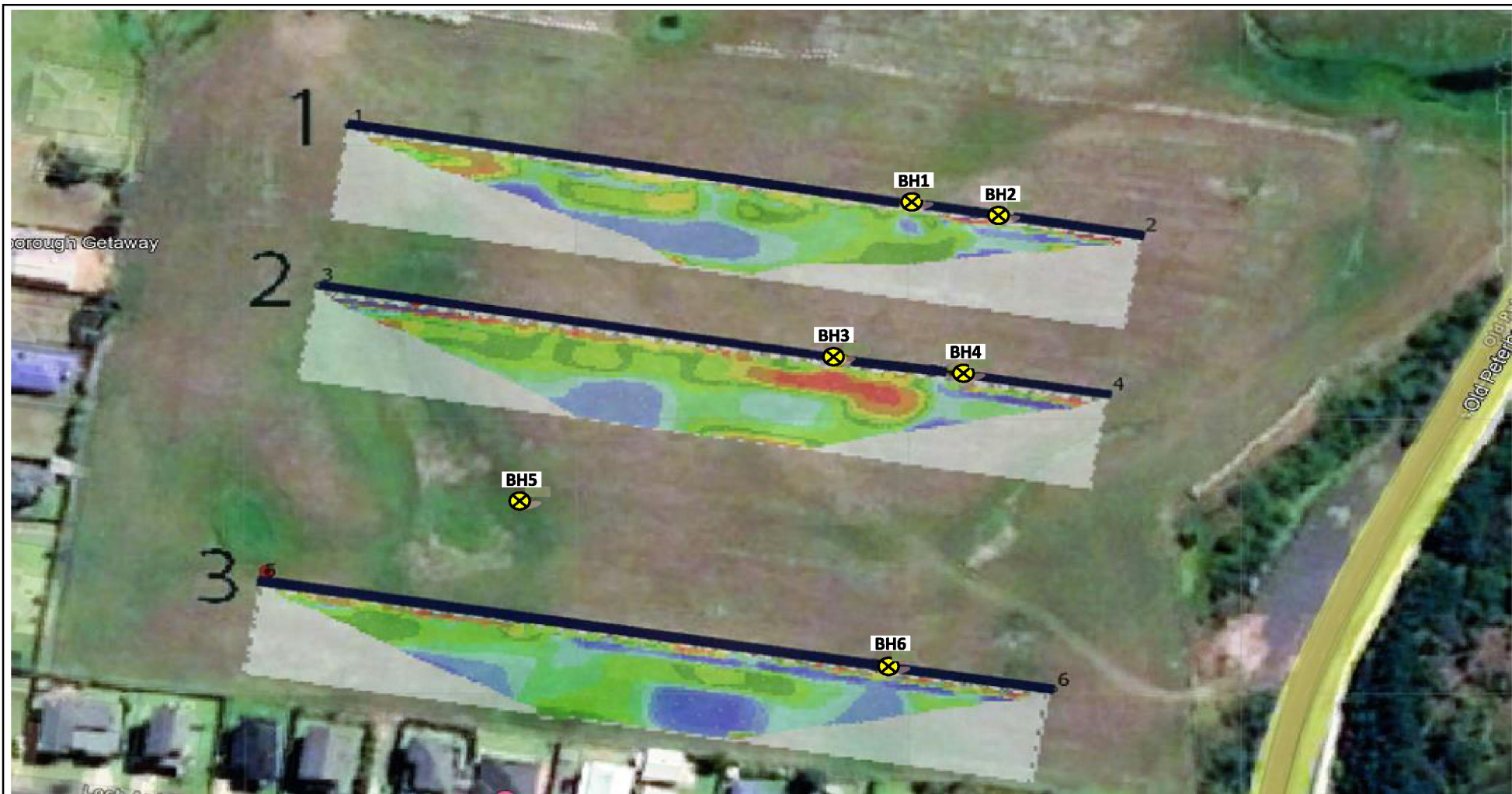
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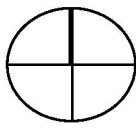



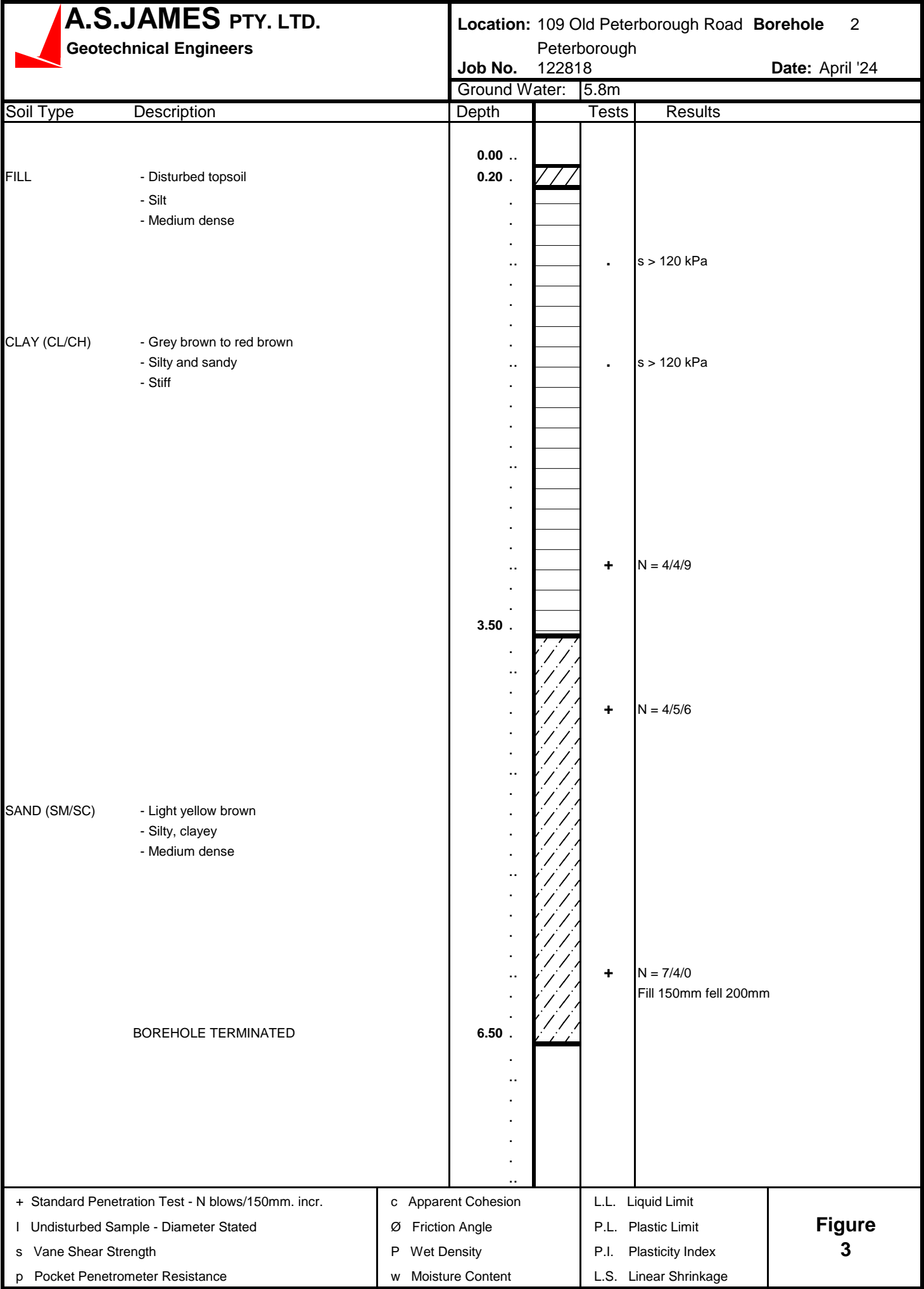

 A.S. JAMES PTY LTD Geotechnical Engineers	LEGEND  Denotes Approximate 6.0m Borehole Location (Boreholes 1 - 6)		BORE PLAN CHECKED:  DRAWN:  SOURCE: 
JOB: 109 OLD PETERBOROUGH ROAD PETERBOROUGH JOB No: 122818 DATE: APR '24			

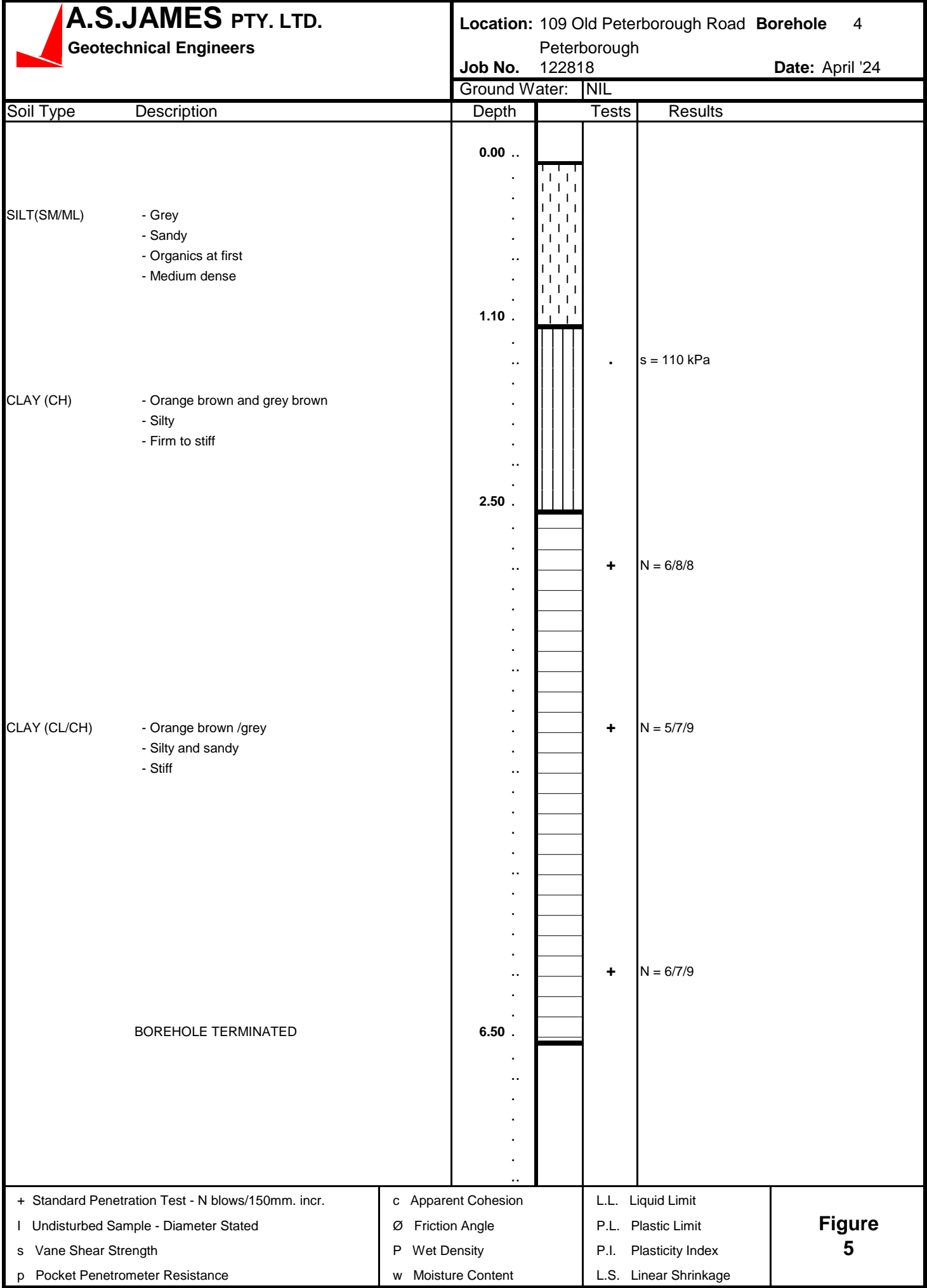
FIGURE 1



Soil Type	Description	Depth	Tests	Results
SILT(SM/ML)	<ul style="list-style-type: none">- Grey brown- Trace organics- Loose to medium dense	0.00 ..		
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		0.60 .		
		..	.	s > 120 kPa
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		.	.	s > 120 kPa
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CLAY (CL/CH)	<ul style="list-style-type: none">- Grey brown to orange and red brown- Silty and sandy- Stiff	.		
		..	+	N = 4/5/7
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SAND (SM/SC)	<ul style="list-style-type: none">- Light yellow brown- Silty- Medium dense	.		
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		4.50 ..	+	N = 1/1/1
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	BOREHOLE TERMINATED	6.50 .		
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		..	+	N = 2/3/5
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+ Standard Penetration Test - N blows/150mm. incr.		c Apparent Cohesion	L.L. Liquid Limit	Figure 2
I Undisturbed Sample - Diameter Stated		Ø Friction Angle	P.L. Plastic Limit	
s Vane Shear Strength		P Wet Density	P.I. Plasticity Index	
p Pocket Penetrometer Resistance		w Moisture Content	L.S. Linear Shrinkage	




<div> A.S.JAMES PTY. LTD. Geotechnical Engineers</div>		Location: 109 Old Peterborough Road Borehole 3 Peterborough Job No. 122818 Date: April '24			
		Ground Water:	Moist Only in Sand		
Soil Type	Description	Depth	Tests	Results	
SILT(SM/ML)	<div>- Grey</div> <div>- Sandy</div> <div>- Medium dense</div> <div>- Trace organics</div>	0.00 ..			
		.			
		0.30 .			
		.	.	s > 120 kPa	
		.	.	s > 120 kPa	
		..	.	s > 120 kPa	
		.	.	s > 120 kPa	
		.	.		
		..	+	N = 6/8/9	
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CLAY (CL/CH)	<div>- Grey brown to red and orange brown</div> <div>- Trace gravel</div> <div>- Stiff</div>	.	.		
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		..	+	N = 2/3/3	
BOREHOLE TERMINATED		.	.		
		5.50 .	+	N = 5/8/8	
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<div>+ Standard Penetration Test - N blows/150mm. incr.</div> <div>I Undisturbed Sample - Diameter Stated</div> <div>s Vane Shear Strength</div> <div>p Pocket Penetrometer Resistance</div>		<div>c Apparent Cohesion</div> <div>Ø Friction Angle</div> <div>P Wet Density</div> <div>w Moisture Content</div>		<div>L.L. Liquid Limit</div> <div>P.L. Plastic Limit</div> <div>P.I. Plasticity Index</div> <div>L.S. Linear Shrinkage</div>	<div>Figure</div> <div>4</div>





Soil Type	Description	Depth	Tests	Results
SILT(SM/ML)	<ul style="list-style-type: none">- Grey brown- Sandy- Trace organics- Medium dense	0.00 ..		
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		0.60 .		
		..	.	s > 120 kPa
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CLAY (CL/CH)	<ul style="list-style-type: none">- Grey brown red and orange brown- Silty, sandy and gravelly- Stiff	.		
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<div> A.S.JAMES PTY. LTD. Geotechnical Engineers</div>		Location: 109 Old Peterborough Road Borehole 6 Peterborough Job No. 122818 Date: April '24 Ground Water: Slight Seepage at 6.5m		
Soil Type	Description	Depth	Tests	Results
SILT(SM/ML)	<div>- Grey brown</div> <div>- Sandy and gravelly</div> <div>- Trace organics</div> <div>- Medium dense</div>	0.00 ..		
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		0.70 ..	.	s > 140 kPa
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CLAY (CL/CH)	<div>- Orange Grey and red brown</div> <div>- Silty, sandy and gravelly</div> <div>- Stiff</div> <div>- Likely cast or very loose zone from 5.8 - 6.5m</div>	.		
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		..	+	N = 6/8/10
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		.	+	N = 7/8/12
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		.	+	N = 1/1/1
BOREHOLE TERMINATED		6.50 .		
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