

**A REPORT  
ON THE  
GEOTECHNICAL  
INVESTIGATION**

**FOR THE PROPOSED  
OUYEN RECREATIONAL LAKE  
VIA NORTH WEST ROAD  
OUYEN**

**Report N<sup>o</sup>: 3120155**

**CLIENT** : Mr Simon Grigg  
Baring North Road  
PATCHEWOLLOCK VIC 3441

**AUTHORISED BY** : Mr Simon Grigg

**PROJECT** : Ouyen Recreational Lake  
OUYEN

**COMMISSION** : Carry out appropriate soil observations at five (5)  
locations as shown on the attached site plan.

Make appropriate recommendations for the  
proposed construction of the recreational lake  
including cut & fill batter slopes, suitability of site  
derived material

## **1. INTRODUCTION:**

### **Aim**

This report discusses the field investigation carried out on 23 October 2012 for the proposed Ouyen Recreational Lake.

## **2 SOURCE OF INFORMATION:**

Civiltest Pty Ltd - field & laboratory data collected and recorded.

### **3 GEOLOGY:**

Available geological maps of the area indicate that the site is within an area of Quaternary sediments – SANDS, SILTS and CLAYS. The site investigation confirmed this.

### **4 SURFACE TOPOGRAPHY**

The site is undulating. The ground cover consists of natural grasses.

### **5 INVESTIGATION:**

The fieldwork was carried out on 23 October 2012 by mechanically augering five bore holes at the approximate locations as shown on the attached site plan.

Selected disturbed and undisturbed samples were retrieved from the substrata and were taken back to the laboratory for further examination.

All the field data is presented in the logs of boring.

### **6 FINDINGS:**

#### **6.1 Fieldwork:**

The bore holes revealed that the natural soil profile consists of silty CLAY and sandy SILT underlain by stiff silty CLAY.

Free ground water table was not encountered within the depths drilled during the investigation.

## 6.2 Laboratory Work

Representative samples of the onsite materials likely to be used in the construction of the proposed recreational lake were subjected to the following tests:

- Permeability
- Emerson Class Number
- Compaction testing
- Sieve analysis

The above tests returned the following values:

**Permeability:** BH4:  $1 \times 10^{-9}$  m/sec

**Emersion Class Number:** BH4: 5  
BH5: 4

**Compaction Testing:** BH4: Maximum Dry Density  $1.50\text{t/m}^3$   
Optimum Moisture Content 20.5%

BH3: Maximum Dry Density  $1.47\text{t/m}^3$   
Optimum Moisture Content 24.5%

**Plasticity Index (%):** BH1: 48  
BH2: 27  
BH3: 40  
BH4: 32  
BH5: 17

The laboratory test results are appended to this report.

## 7 DISCUSSION:

The test results indicate that the site derived CLAY soils are generally suitable for use in the construction of the recreational lake, however the upper soils in the vicinity of BH5 are likely to be more permeable and should not be used in the lining of the lake.

## **8 RECOMMENDATIONS:**

### **8.1 Excavations and batters**

Excavations in the materials encountered during this investigation can be undertaken using conventional excavation equipment.

Temporary excavation batters in the natural silty CLAY soils should be profiled to 1V:1H. Permanent slope batters should be profiled to not steeper than 1V:2H in the site derived silty CLAY.

The upper vegetation zone and the SILT units should be excavated and stockpiled for use in landscaping purposes, if and where required.

### **8.2 Ground Preparation for Base of Lake**

The exposed surface of the base should be compacted to not less than 95% of AS1289 5.1.1 (Standard Compaction) at moisture contents between 85% and 110% of optimum value.

If it is required to line the base and sides of the lake with geotextile, then it is recommended that no less than 250mm of clay cover should be placed over the geotextile liner and pinned at the top ends.

### **8.3 Provision for overflows**

The provision for overflow structures should be provided to account for any excess volume of water that can enter the lake. For this to be installed, it is recommended that a freeboard of 300mm should be allowed for.

## 9 CONCLUSION:

This report has been compiled and recommendations made based on information supplied in the brief to Civiltest Pty Ltd and from the field investigation and observations made including the extent of, if any, site filling. Every care has been taken within the terms of the brief to ensure that the field investigation is representative of the site. Therefore, if it is found that for any reason information received by Civiltest Pty Ltd is incorrect or conditions on site vary considerably during construction to those described in this report then CIVILTEST P/L should be contacted and the comments and recommendations made in this report may need to be amended. It should be noted that site conditions between boreholes can vary considerably.

It is also assumed that the dam will be constructed during reasonable weather conditions using established sound engineering practices by a contractor experienced in this field of work using purpose built equipment.

Finally, no responsibility will be taken for this report if it is altered in any way or is not reproduced in full.

This report consists of twelve pages including a site plan. Appendix A – Laboratory Test Results – is attached.



**Patrick Oai**  
**Senior Geotechnical Engineer**  
**CIVILTEST PTY LTD**

Ref: VD/po/sb

11 December 2012

**LOCATION OF TEST SITES: RECREATIONAL LAKE, VIA NORTH WEST ROAD, OUYEN**



*Image by Google*

 **Denotes Test Holes**

THIS SKETCH IS NOT INTENDED TO BE AN ACCURATE DEPICTION OF THE NUMBER, SIZE OR LOCATION OF TREES AND/OR SHRUBS

**NOT TO SCALE**

Test Hole No 1 Depth (m)	Classification	Moisture Content (%)	Engineering Log
2.000	x --- x --- x --- x --- x --- x --- x --- x --- x --- x ---	19.1	Brown Silty CLAY Hard Dry  Becomes pale grey, stiff and dry to moist at 1.300  Becoming moist at 2.000
3.000	x ---		END OF BORE (23-10-12)





Test Hole No 3 Depth (m)	Classification	Moisture Content (%)	<b>Engineering Log</b>
0.700	x      x ∴ x ∴ x      x ∴ x		Pale grey Sandy SILT Medium dense Dry Becoming pale white and a trace of clay present at 0.300
2.500  3.000	x ——— x ——— x ——— x ——— x ——— x ——— x ——— x ——— x	21.3	Pale grey Silty CLAY Stiff Moist
END OF BORE (23-10-12)			



Test Hole No 5 Depth (m)	Classification	Moisture Content (%)	<b>Engineering Log</b>
1.000    1.500	x — x — x — x — x — x	9.3	Brown Silty CLAY Hard Dry
2.900	∴ — ∴ — ∴ — ∴ — ∴		Pale brown Sandy CLAY Stiff Dry to moist A trace of calcrete present
3.000	x — x — x — x		Pale grey Silty CLAY Stiff Moist
END OF BORE (23-10-12)			

# **APPENDIX A**

## **LABORATORY TEST RESULTS**

10 Latham Street (P O Box 537) Mornington 3931 Tel: (03) 5975 6644 Fax: (03) 5975 9589  
 also at: Mitcham (03) 9874 5844 Wonthaggi (03) 5672 3900 and Mildura (03) 5023 2870

### SIEVE ANALYSIS / PLASTICITY TESTS

PAGE 1 of 5

CLIENT:	Simon Grigg	REPORT N°:	3120155.0	DATE SAMPLED:	23/10/2012
ADDRESS:	Baring North Road Patchewollock VIC 3491	REPORT DATE:	8/11/2012	SAMPLED BY:	VD
PROJECT:	Recreational Lake	CHECKED BY:	TP	TESTED BY:	VD
LOCATION:	OUYEN	SAMPLING METHOD:	AS 1289.1.2.1.6.5.3 Power auger/Drill rig		

Sample Details:			SIEVE ANALYSIS											PLASTICITY INDEX				
			Percentage (%) Passing											LL	PL	PI	LS	SCC
Sample Number	Sampled From	MC %	63.0 mm	37.5 mm	26.5 mm	19.0 mm	13.2 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.425 mm	0.075 mm	%	%	%	%	-
1352123	BH 1 @ 2.0m	-	-	-	-	-	-	-	-	-	-	-	-	67	19	48	15.0	AB
1353123	BH 2 @ 1.0m	-	-	-	-	-	-	-	-	-	-	-	-	42	15	27.0	10.0	B
1354123	BH 3 @ 2.5m	-	-	-	-	-	-	-	-	-	-	-	-	59	19	40.0	15.5	AB
1355123	BH 4 @ 2.5m	-	-	-	-	-	-	-	-	-	-	-	-	54	22	32	13.0	AB
1356123	BH 5 @ 1.0m	-	-	-	-	-	-	-	-	-	-	-	-	28	11	17	5.0	B
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Accredited for compliance with ISO/IEC 17025  
 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.  
 This document shall be reproduced in full.

- CIVILTEST PTY LTD**
- Mornington Laboratory - Accreditation Number 1407  
10 Latham Street Mornington Vic. 3931
  - Mitcham Laboratory - Accreditation Number 790  
7/38 Thornton Crescent Mitcham Vic. 3132
  - Mildura Laboratory - Accreditation Number 10784  
Unit 2 / 48 Tenth Street Mildura Vic 3500
  - Mobile Laboratory - Accreditation Number 13660

Unless stated otherwise, the test results shown on this report were determined in accordance with the following:

SAMPLE PREPARATION	Low Temperature Oven Dried & Dry Sieved
LINEAR SHRINKAGE:	Mould Length 250 mm
SPECIMEN CONDITION CODE (SCC)	A. Curling Occurred B. Crumbling Occurred C. No Curling or Crumbling Occurred
1. Sample Prep. AS 1289.1.1	5. Plasticity Index (PI) AS 1289.3.3.1
2. Liquid Limit (LL) AS 1289.3.1.1 <input type="checkbox"/>	6. Linear Shrinkage (LS) AS 1289.3.4.1
3. Liquid Limit (LL) AS 1289.3.1.2 <input checked="" type="checkbox"/>	7. Sieve Analysis AS 1289.3.6.1
4. Plastic Limit (PL) AS 1289.3.2.1	8. Moisture Content AS 1289.2.1.1

*Troy Purcell*

**TROY PURCELL**  
**APPROVED SIGNATORY**  
 REF : TP / VD

<b>TESTED BY:</b>	VD	<b>Page 2 of 5</b>	<b>JOB NUMBER:</b>	3120155.0
<b>CHECKED BY:</b>	TP 8/11/2012			
<b>SAMPLED BY / ON:</b>	VD 23/10/2012	<b>CLIENT:</b> Simon Grigg		
<b>BALANCE:</b>	5	Baring North Road Patchewollock		
<b>OVEN:</b>	4	<b>PROJECT:</b> Recreational Lake Ouyen		
<b>REPORT NUMBER:</b>	3120155.0 8/11/2012			

<b>BOREHOLE NUMBER:</b>	BH 1	BH 2	BH 3	BH 4	BH 5	
<b>SAMPLE NO:</b>	1352123	1353123	1354123	1355123	1356123	
<b>DEPTHS:</b> M	2	1	2.5	2.5	1	
<b>SAMPLE DESCRIPTION:</b>						
<b>Penetrometer:</b> kPa						
<b>UNIFIED CLASSIFICATION:</b>						
<b>Container No:</b>	432	178	130	187	190	
<b>Mass Container &amp; Wet Soil:</b>	282.2	252.4	235.7	287.7	293.4	
<b>Mass Container &amp; Dry Soil:</b>	248.0	231.5	207.5	257.3	274.8	
<b>Mass Container:</b>	69.1	86.6	75.2	94.2	75.5	
<b>Moisture Content:</b>	19.12%	14.42%	21.32%	18.64%	9.33%	
<b>AFTER WASHING</b>						
<b>Mass Container &amp; Dry Soil:</b>	124.3	147.3	94.6	145.3	214.5	
<b>Mass Container:</b>	69.1	86.6	75.2	94.2	75.5	
<b>Mass Dry Soil &lt; 0.075 :</b>	55.2	60.7	19.4	51.1	139.0	
<b>Mass Retained 0.425 :</b>	6.8	5.7	1.5	7.5	9.1	
<b>Mass Retained 2.36 :</b>	3.8	0.0	0.3	5.1	5.2	
<b>Mass Soil 0.075 - 2.36 :</b>	51.4	60.7	19.1	46.0	133.8	
<b>Mass Soil 0.075 - 0.425</b>	44.6	55.0	17.6	38.5	124.7	
<b>Mass Soil 0.425 - 2.36</b>	6.8	5.7	1.5	7.5	9.1	
<b>% CLAY AND SILT: -0.075</b>	69.1	58.1	85.3	68.7	30.3	
<b>% FINE SAND: 0.075-0.425</b>	24.9	38.0	13.3	23.6	62.6	
<b>% COARSE SAND:0.425-2.36</b>	3.8	3.9	1.1	4.6	4.6	
<b>% GRAVEL: +2.36</b>	2.1	0.0	0.2	3.1	2.6	
	100.0	100.0	100.0	100.0	100.0	

## EMERSON CLASS NUMBER AS 1289.3.8.1

CLIENT: Simon Grigg	REPORT No: 3120155.0
ADDRESS: Baring North Road Patchewollock VIC 3491	REPORT DATE: 8/11/2012
PROJECT: Recreational Lake	CHECKED BY: TP
LOCATION: OUYEN	
DATE SAMPLED: 23/10/2012	SAMPLING METHOD: AS 1289.1.2.1.6.5.3 Power auger/Drill rig
SAMPLED BY: VD	TESTED BY/ON: VD 26/10/2012

**SAMPLE DETAILS:**

SAMPLE NUMBER	SAMPLED FROM	SAMPLE DESCRIPTION	WATER TEMP.	WATER SOURCE	EMERSON CLASS
1355123	BH 4 - 2.5m	Silty CLAY	20°C	Distilled	5
1356123	BH 5 - 1.0m	Sandy CLAY	20°C	Distilled	4.0
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-



Accredited for compliance with ISO/IEC 17025  
The results of the tests, calibrations and/or  
measurements included in this document are  
traceable to Australian/national standards.  
This document shall be reproduced in full.

**CIVILTEST PTY LTD**  
Mildura Laboratory - Accreditation Number 10784  
Unit 2 / 48 Tenth Street Mildura VIC 3500

.....  
**TROY PURCELL**  
**APPROVED SIGNATORY**  
**REF : TP / VD**

CIV-DOC-001-308S  
Issue #2 24/09/2008



## MAXIMUM DRY DENSITY & OPTIMUM MOISTURE CONTENT

### AS 1289.5.1.1 Standard Compaction

Report Number : 3120155.0 08/11/2012  
Project: Recreational Lake OUYEN  
Client: Simon Grigg  
Address: Baring North Road Patchewollock VIC 3491  
Sample Location: BH 3 Page 4 of 5  
Sample Number: 0001354  
Sample Date: 23/10/2012  
Material Description: Sandy Silty CLAY  
Sampling Method: AS 1289.1.2.1.6.5.3 Power auger/Drill rig

Standard Maximum Dry Density:	1.47 t/m <sup>3</sup>
Standard Optimum Moisture Content:	24.5 %

### LABORATORY CALCULATED RESULTS

DRY DENSITY	MOISTURE CONTENT
1.415	20.6
1.461	22.8
1.464	25.6
1.446	28.2
FIELD	21.0



Accredited for compliance with ISO/IEC 17025  
The results of the tests, calibrations and/or  
measurements included in this document are  
traceable to Australian/national standards.  
This document shall be reproduced in full.

#### CIVILTEST PTY LTD

- Mornington Laboratory - Accreditation Number 1407  
10 Latham Street Mornington Vic. 3931
- Mitcham Laboratory - Accreditation Number 790  
7/38 Thornton Crescent Mitcham Vic. 3132
- Mildura Laboratory - Accreditation Number 10784  
7/48 Tenth Street Mildura Vic 3500
- Mobile Laboratory - Accreditation Number 13660

**TROY PURCELL**  
Approved Signatory

CIV-DOC-001-503  
Issue # 8 22/09/2008

## MAXIMUM DRY DENSITY & OPTIMUM MOISTURE CONTENT

### AS 1289.5.1.1 Standard Compaction

Report Number : 3120155.0 08/11/2012  
Project: Recreational Lake OUYEN  
Client: Simon Grigg  
Address: Baring North Road Patchewollock VIC 3491  
Sample Location: BH 4 Page 5 of 5  
Sample Number: 0001355  
Sample Date: 23/10/2012  
Material Description: Sandy Silty CLAY  
Sampling Method: AS 1289.1.2.1.6.5.3 Power auger/Drill rig

Standard Maximum Dry Density:	1.50 t/m3
Standard Optimum Moisture Content:	20.5 %

### LABORATORY CALCULATED RESULTS

DRY DENSITY	MOISTURE CONTENT
1.462	18.0
1.501	20.3
1.468	24.2
1.474	26.8
FIELD	17.5



Accredited for compliance with ISO/IEC 17025  
The results of the tests, calibrations and/or  
measurements included in this document are  
traceable to Australian/national standards.  
This document shall be reproduced in full.

#### CIVILTEST PTY LTD

- Mornington Laboratory - Accreditation Number 1407  
10 Latham Street Mornington Vic. 3931
- Mitcham Laboratory - Accreditation Number 790  
7/38 Thornton Crescent Mitcham Vic. 3132
- Mildura Laboratory - Accreditation Number 10784  
7/48 Tenth Street Mildura Vic 3500
- Mobile Laboratory - Accreditation Number 13660

  
TROY PURCELL  
Approved Signatory

CIV-DOC-001-503  
Issue # 8 22/09/2008

## REPORT OF CONSTANT HEAD PERMEABILITY TEST AS 1289.6.7.3

Page 1 of 1

<b>Client :</b>	SIMON GRIGG	<b>Report No.</b>	3120155.1
<b>Client Address :</b>	BARING NORTH ROAD, PATCHEWOLLOCK	<b>Report Date</b>	25/11/2012
<b>Project :</b>	OUYEN RECREATIONAL LAKE, OUYEN	<b>Sample No.</b>	1354123/5151122
<b>Sampling :</b>	AS 1289.1.2.1.6.5.3 Power auger/Drill rig	<b>Sample Date</b>	23/10/2012
<b>Material :</b>	Silty CLAY	<b>Location</b>	BH3 - 2.5m

**DATES OF TEST** 16/11/12 to 22/11/12

### SPECIMEN INFORMATION

Height	115.2 mm
Diameter	105.3 mm
Height/Diam Ratio	1.1:1
Initial Moisture	26.5 %
Final Moisture	33.3 %
Initial Dry Density	1.42 t/m <sup>3</sup>
Density Ratio	97.0 %
Moisture Ratio	107.0 %

### Sample Information from Report No. 3120155.0

Target Density Ratio	98 %
Target Moisture Ratio	100 %
Compactive Effort	Standard
Max.Dry Density	1.47 t/m <sup>3</sup>
Optimum Moisture	24.7 %
Source	Site derived
Oversize % / 19mm	0%

### PERMEATION

Cell Pressure	400 kPa	Permeant : Deaired Water	
Pore Pressure	300 kPa	Outlet Pressure	290 kPa
Effective Stress	100 kPa	Hydraulic Head	10 kPa
B coefficient	-- %		

**COEFFICIENT OF PERMEABILITY**

**1 X E -9 m/sec**

### REMARKS

Moisture content determined by AS 1289 2.1.1



Accredited for compliance with ISO/IEC 17025  
The results of the tests, calibrations and/or  
measurements included in this document are  
traceable to Australian/national standards.  
This document shall only be reproduced in full.



### CIVILTEST PTY LTD

Mitcham Laboratory - Accreditation Number 790  
7/38 Thornton Crescent Mitcham Vic. 3132

**P MORGANS**  
**Approved Signatory**

CIV-DOC-001-611  
Issue #1 23/01/2009