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1984/89

Geological Survey of Victoria

RESULTS OF WESTGATE PARK SITE SOIL TESTS

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COPY 2

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DEPARTMENT OF MINERALS AND ENERGY

ABSTRACT

Eight soil samples from the investigation for the proposed park at Todd Road Port Melbourne (Westgate Park) were tested to determine their basic index properties. The samples were selected from man-made fill, the Port Melbourne Sands and the Coode Island silt formations.

KEYWORDS

Soil Tests, Westgate, Port Melbourne Sand, Coode Island silt.

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INTRODUCTION

As part of the investigation of the proposed Westgate Park site, eight samples of soil were supplied by Mr A M Cooney for testing. The samples were recovered from investigation bores and were tested to determine their basic index properties.

METHODS

The tests were carried out in accordance with Australian Standards AS 1289 & AS 1726 at the Port Melbourne soils laboratory.

The following table summarizes the tests conducted:-

Sample No	Bore	Depth (*)	Sieve Analysis AS 1289 C6.1	Hydrometer AS 1289 C6.2	Soil Particle Density AS 1289 C5.1	Liquid Limit AS 1289 C1.1; C1.2	Plastic Limit AS 1289 C2.1	Plasticity Index AS 1289 C3.1	Linear Shrinkage AS 1289 C4.1	Free Swell AS 1726-8.8
1	33.84.59	0.9- 1.06	x							x
2	33.84.59	1.82- 2.58	x		x					x
3	33.84.59	9.65-10.00		x	x	x	x	x	x	x
4	33.84.63	0.40- 1.62	x							x
5	33.84.63	4.86- 5.63	x							x
6	33.84.72	6.95- 8.35	x							x
7	33.84.72	9.90-11.90		x	x	x	x	x	x	x
8	33.84.73	6.95- 8.35	x							x

Table 1 Summary of Tests conducted

Each sample on which a sieve analysis was performed was split so that one sub-sample was graded as received (with the organic matter and shell fragments) and the other was graded after the removal of organic matter and carbonate material by treatment with Hydrogen Peroxide and Hydrochloric Acid.

PROJECT Westgate Park

BORE 33.84.59

SAMPLE

DEPTH 0.9m - 1.06m

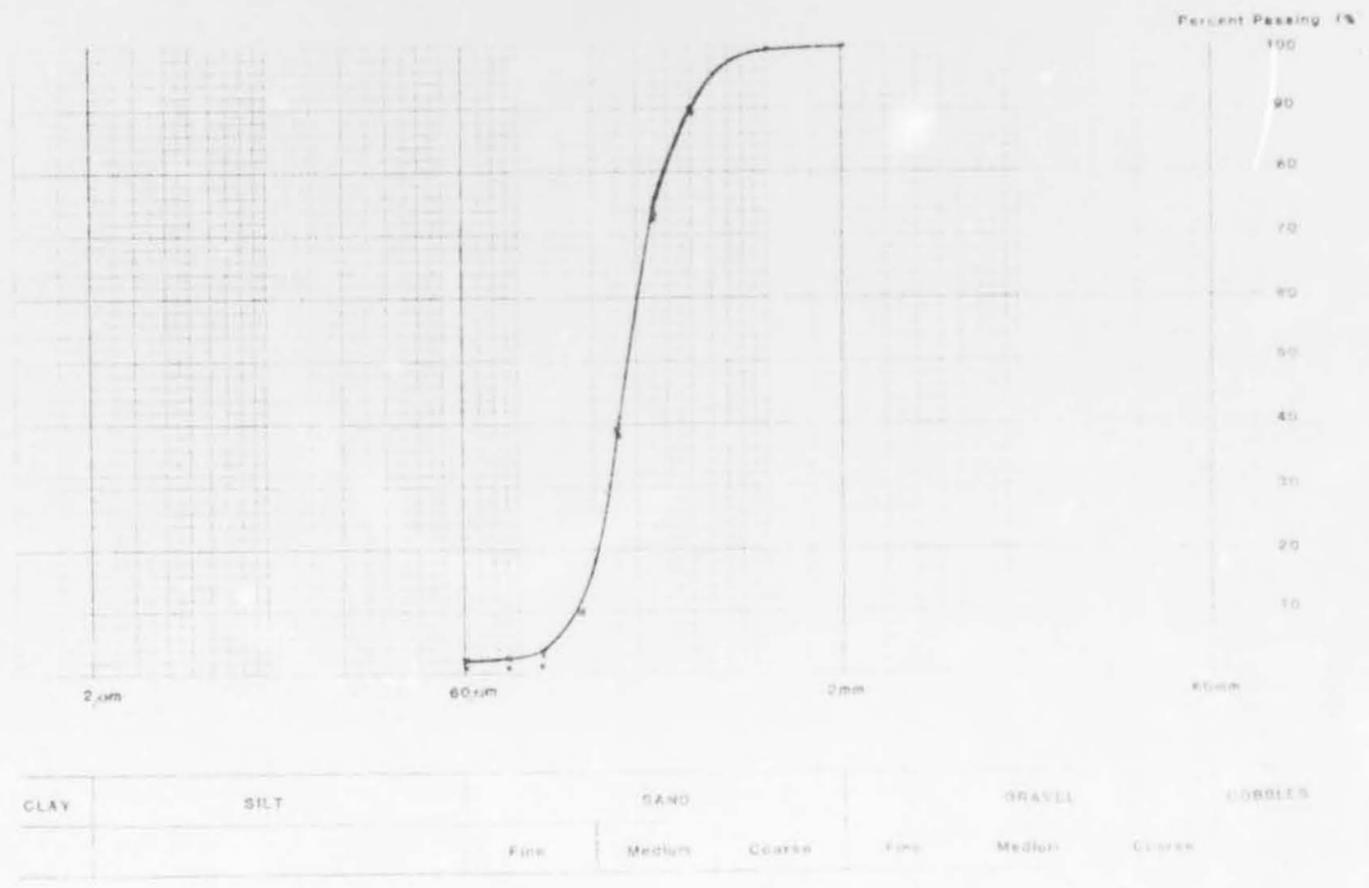
Size	Percent Passing	After Treatment
2.0 μ m	100	100
1.0 μ m	99	100
500 μ m	90	89
355 μ m	74	73
250 μ m	39	38
180 μ m	10	11
125 μ m	3	1
90 μ m	3(2.5)	1
63 μ m	2.1	1

TEST	RESULT
Plasticity Index	N.P.*
Free Swell	10%
Soil Particle Density	2.62gm/cm ³
Loss on treatment	5%
	(organics & shells)

* Non-plastic

SUMMARY

Medium-grained quartz sand containing about 5% organic matter & shells. The organic component was a mixture of plant matter and tarry, immiscible granules thought to be oil or grease products.



PROJECT Westgate Park

BORE 33.84.59

SAMPLE

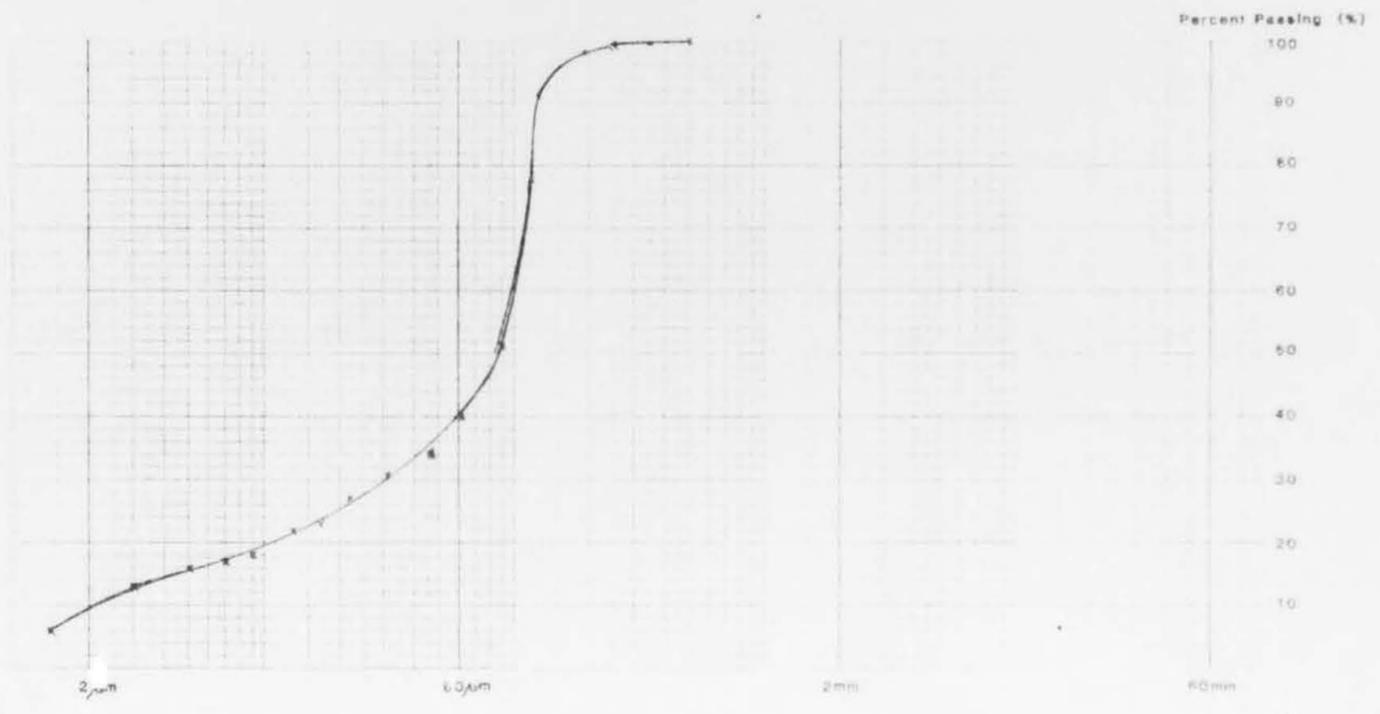
DEPTH 9.65m - 10.0m

Size	Percent Passing
500 μ m	100
355 μ m	99
250 μ m	99
180 μ m	98
125 μ m	91
90 μ m	51
63 μ m	40
47 μ m	34
33 μ m	31
24 μ m	27
17 μ m	23
13 μ m	22
7 μ m	17
3 μ m	13.0
1.4 μ m	6.0

TEST	RESULT
Liquid Limit	33
Plastic Limit	17
Plasticity Index	16
Linear Shrinkage	7%
Free Swell	70%
Soil Particle Density	2.65gm/cm ³
Organic content	5%
Carbonate content	2%

SUMMARY

A slightly clayey silty sand, sampled from the Coode Island Silt formation. The sample has a low plasticity.



CLAY	SILT		SAND			GRAVEL			COBBLES
			Fine	Medium	Coarse	Fine	Medium	Coarse	

PROJECT Westgate Park

BORE 33.84.72

SAMPLE

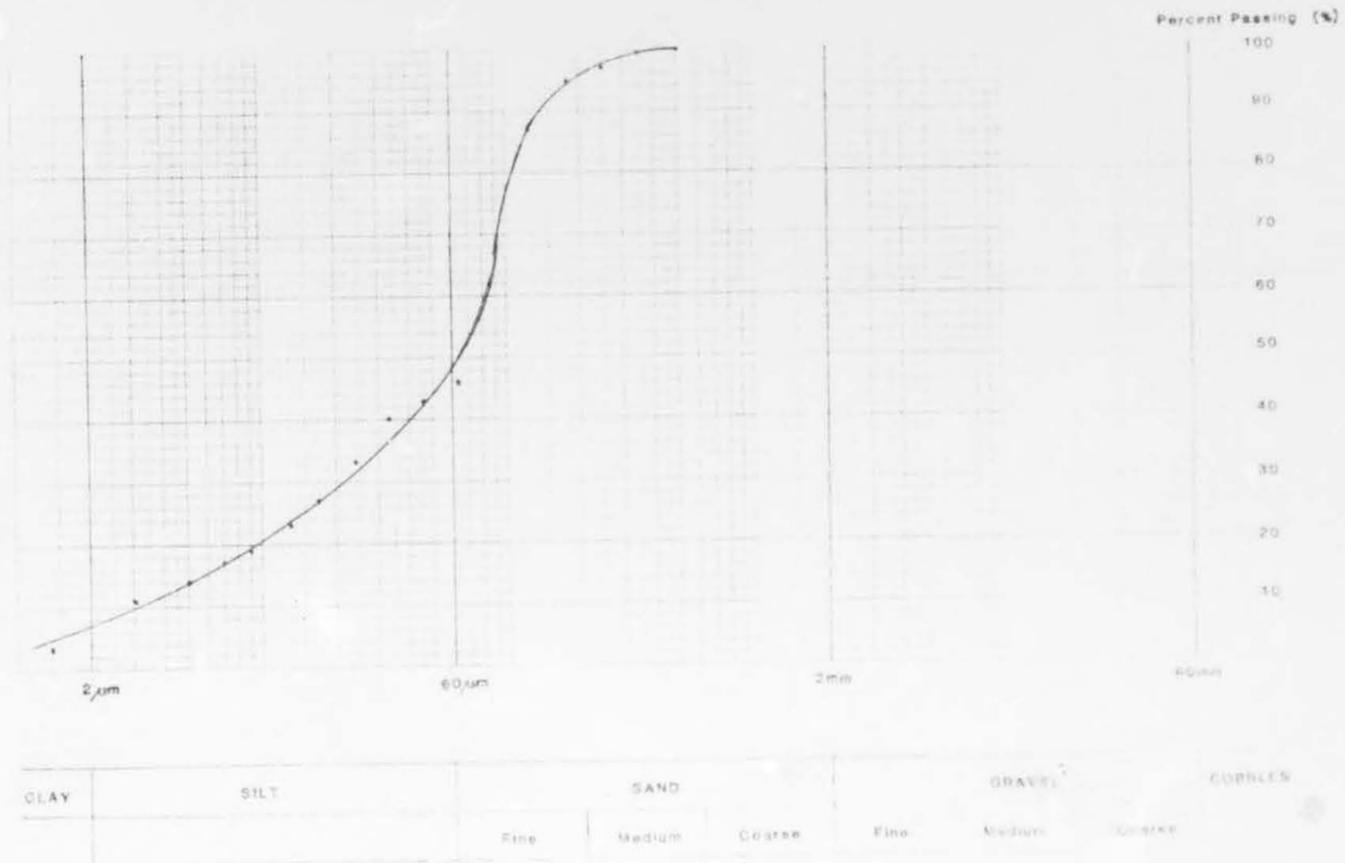
DEPTH 9.90m - 11.90m

Size	Percent Passing
500 μm	100
355 μm	99
250 μm	97
180 μm	95
125 μm	87
90 μm	67
63 μm	46
46 μm	43
33 μm	40
24 μm	33
17 μm	27
13 μm	23
7 μm	17
3 μm	11
1.4 μm	3.4

TEST	RESULT
Liquid Limit	39
Plastic Limit	18
Plasticity Index	21
Linear Shrinkage	9.5%
Free Swell	60%
Soil Particle Density	2.67gm/cm ³
Organic content	6%
Carbonate content	4%

SUMMARY

Slightly clayey, silty sand, sampled from the Coode Island silt formation. The sample has a low plasticity.



REFERENCES

Cooney, A.M., 1984. Westgate Park groundwater study:
report on drilling and surface geology.
Unpublished report 1984/78 G.S.V.

Standards Association of Australia.
Methods of Testing Soils for Engineering
Purposes.
Australian Standard 1289.

Standards Association of Australia.
S.A.A. Site Investigation Code.
Australian Standard 1726.

APPENDIX I

Laboratory Test Sheets

SOIL TEST DATA

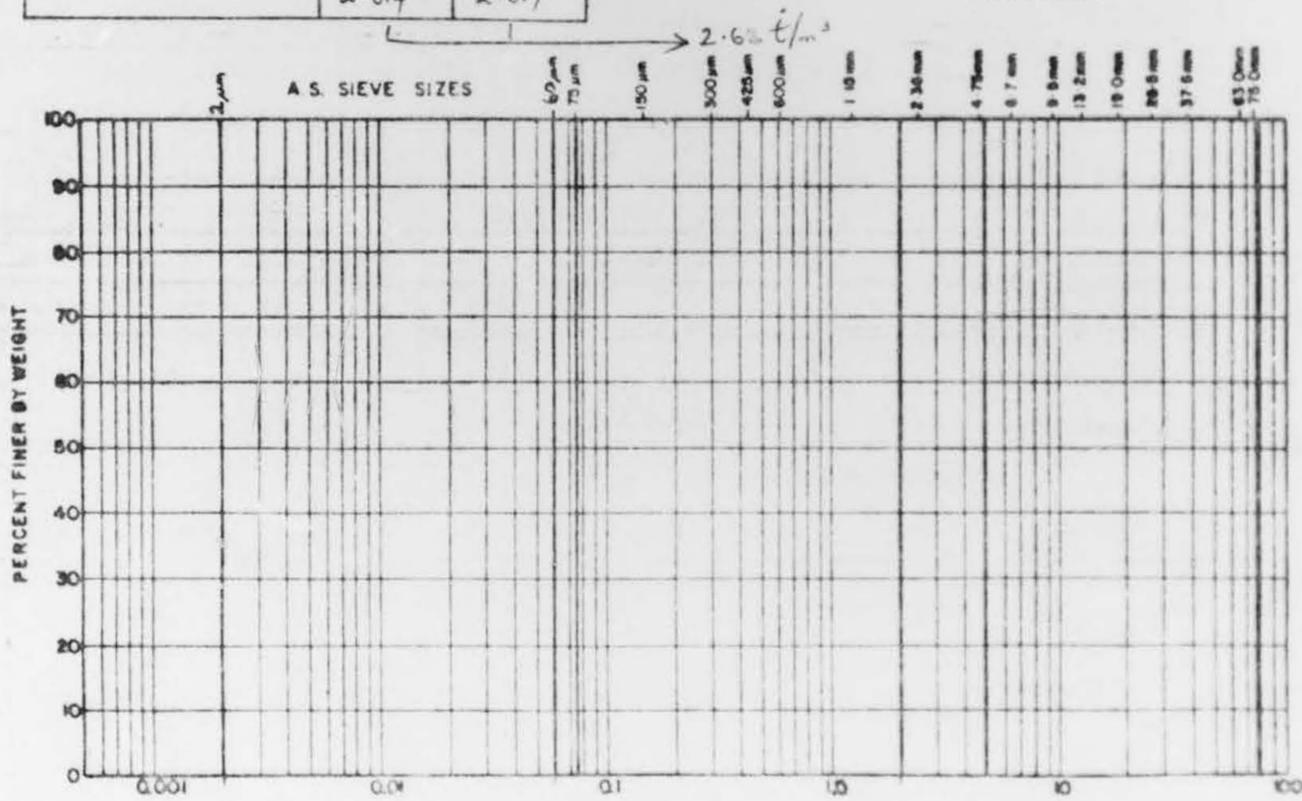
Job Number *Westgate Park*
 Date *4.10.84*

Bore Number *33.84.59*
 Depth *0.9m - 1.06m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.								Mould No.
Container Wt								Linear Shrinkage
Wet & Container								Free Swell
Dry & Container								
No. of Blows								Cylinder No. <i>10</i>
Moisture Content								Free Swell <i>10%</i>

Soil Particle Density		
Temperature	<i>19°</i>	<i>19°</i>
Bottle No.	<i>E</i>	<i>A</i>
Weight of Bottle	<i>78.36</i>	<i>78.95</i>
Weight of Bottle & Soil	<i>170.83</i>	<i>151.30</i>
Weight of Bottle & Soil & Water	<i>384.5</i>	<i>372.8</i>
Weight of Bottle & Water	<i>327.4</i>	<i>328.1</i>
Soil Particle Density	<i>2.614</i>	<i>2.617</i>

NB Immittible black lumps $\approx 1mm \phi$ throughout. Tar?



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in millilitres.

Hydrometer Analysis

- Mass of material classing _____ gm
- Dry mass of material retained on _____ mm sieve _____ gm
- Mass of untreated subsample, M_1 _____ gm
- Moisture content of untreated subsample, w _____ %
- Dry mass of untreated subsample $M_2 = \frac{M_1 \times 100}{100 + w}$ _____ gm
- Dry mass of subsample retained on _____ um sieve after treatment _____ gm
- Dry mass of subsample passing _____ um sieve plus dispersant _____ gm
- Dry mass of 100ml dispersant _____ gm
- Dry mass of subsample passing _____ um sieve (if pretreated use $M_2 - M_3 - M_4$) (if untreated use $M_2 - M_3 - M_4$) _____ gm
- $M \times M / M - M_4$ _____ gm
- Loss of mass in pretreatment $(1 - \frac{M_2 - M_3 - M_4}{M_2}) \times 100$ _____ %

	M_1 gm
	M_2 gm
	M_3 gm
	w %
	M_2 gm
	M_3 gm
	M_4 gm
	M_5 gm
	M_6 gm
	M_7 gm
	M_8 gm
	P %

15.5
10.5
0.5

NB.
Sand ex 2 days @ 105°C still appears damp! Maybe oil or some immiscible fluid with B.P. >105°C coating particles.

- Menisoid correction C_m _____
- Dispersant correction C_d _____
- Temperature correction C_t _____
- Start time _____

10W -
163.38

- Soil particle density ρ_s _____
- Sedimentation flask number _____
- Hydrometer No. _____

10W -
156.22
T.D.W -
148.5

- $C = \frac{F_1 \times F_2 \times F_3}{u}$
- Scoring $100 \times \frac{R_c}{u} =$ _____ $\times R_c$
- $a = \frac{0.0027}{\rho_s - 1}$

Actual time (hrs, mins)	Sieve	Cum. wt. (gm)	% Pass	Sieve	Cum. wt. (gm)	% Pass
Elapsed time (mins)	2.0 mm	0.30	100	1.0 mm	0.50	100
Temperature (°C)	1.0 mm	0.97	99	500 μm	16.35	89
R'h	500 μm	16.16	90	250 μm	39.49	73
Rh = R'h + C _d	350 μm	42.53	74	250 μm	92.50	38
R _c = Rh + C _t - C _m	250 μm	100.25	39	180 μm	132.08	11
F ₁	180 μm	146.46	10	125 μm	146.98	1
F ₂	125 μm	158.20	3	90 μm	197.49	1
F ₃	90 μm	159.26	2.5	63 μm	147.50	1
D (μm)	63 μm	159.99	2.1	Pan.	147.50	-
% passing	Pan.	160.42	-			

Untreated

Treated.

SUMMARY OF DATA			
LIQUID LIMIT _____	S.G. _____	pH _____	
PLASTIC LIMIT _____	E.C.N. _____	P. _____	
PLASTIC INDEX _____	% SAND _____	CLASSIFICATION _____	
LINEAR SHRINKAGE _____	% SILT _____		
FREE SWELL _____	% CLAY _____		

SOIL TEST DATA

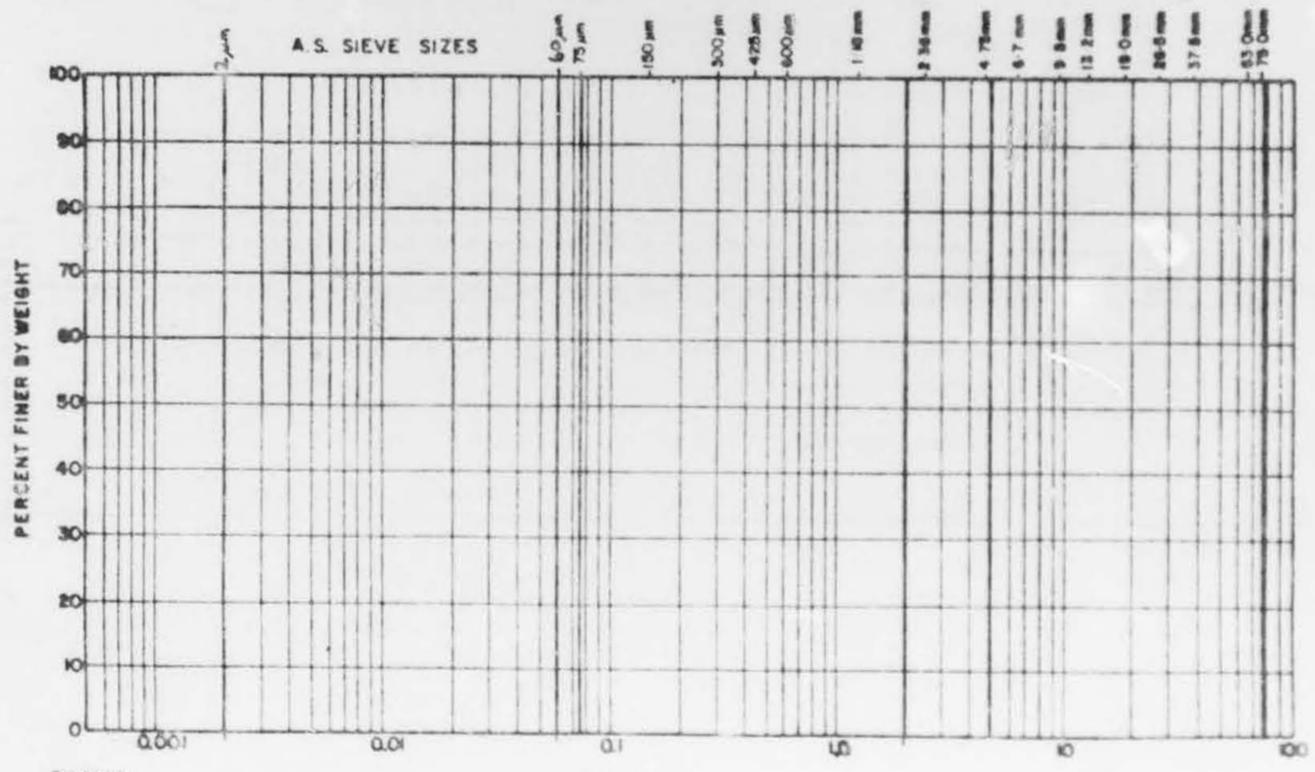
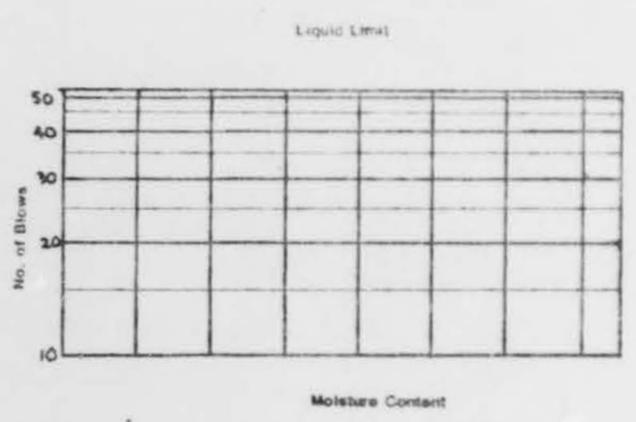
Job Number *Westgate Park*
 Date *5-10-84*

Bore Number *33-84-59*
 Depth *1.82 m - 2.58 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.								Mould No.
Container Wt								Linear Shrinkage
Wet & Container								Free Swell
Dry & Container								
No. of Blows								Cylinder No.
Moisture Content								Free Swell

5
10%

Soil Particle Density	
Temperature	
Bottle No.	
Weight of Bottle	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in millilitres.

Hydrometer Analysis

Mass of material passing 75 μm sieve	M ₁ gm
Dry mass of material retained on 75 μm sieve	M ₂ gm
Mass of untreated subsample	M ₃ gm
Moisture content of untreated subsample	w %
Dry mass of untreated subsample $\frac{M_3 \times 100}{100 + w}$	M ₄ gm
Dry mass of subsample retained on 75 μm sieve after treatment	M ₅ gm
Dry mass of subsample passing 75 μm sieve plus dispersant	M ₆ gm
Dry mass of 100ml dispersant	M ₇ gm
Dry mass of subsample passing 75 μm sieve (if pretreated use M ₆ - M ₇ - M ₅) (if untreated use M ₆ - M ₇)	M ₈ gm
$M_8 \times M_7 / M_6 - M_5$	M ₉ gm
Loss of mass in pretreatment $\frac{(1 - M_5 / M_8) \times 100}{M_8}$	p %



loss on treatment
= 1.8 %

Meniscus correction C₁

IBW

Soil particle density ρ_s

115.54

D = F₁ × F₂ × F₃ (gm)

Dispersant correction C₂

103.95

Sedimentation flask number

T.O.W.

Shaking 100 s × R_c =

Temperature correction C₃

Hydrometer No.

113.48

0.023 / (ρ_s - 1)

Start time

Actual time (hrs., mins.)	Sieve	Cum. wt. (gm)	% Pass	Sieve	Cum. wt. (gm)	% Pass.
Elapsed time (mins.)	1.0 mm	0.06	100	1.0 mm	0.04	100
Temperature (C)	500 μm	0.21	100	500 μm	0.15	100
R'h	355 "	0.50	100	355 "	0.33	100
Rh = R'h + C ₁	250 "	2.43	95	250 "	2.71	98
R _c = Rh + C ₂ - C ₃	180 "	29.72	71	180 "	27.87	75
F ₁	125 "	76.60	26	125 "	86.57	24
F ₂	90 "	100.80	4	90 "	111.52	2
F ₃	63 "	101.61	2.3	63 "	112.49	0.9
D (gm)	Pass.			Pass.	112.52	—
% passing						

Untreated.

SUMMARY OF DATA		
LIQUID LIMIT _____	S.G. _____	pH _____
PLASTIC LIMIT _____	E.C.N. _____	P. _____
PLASTIC INDEX _____	% SAND _____	CLASSIFICATION _____
LINEAR SHRINKAGE _____	% SILT _____	
FREE SWELL _____	% CLAY _____	

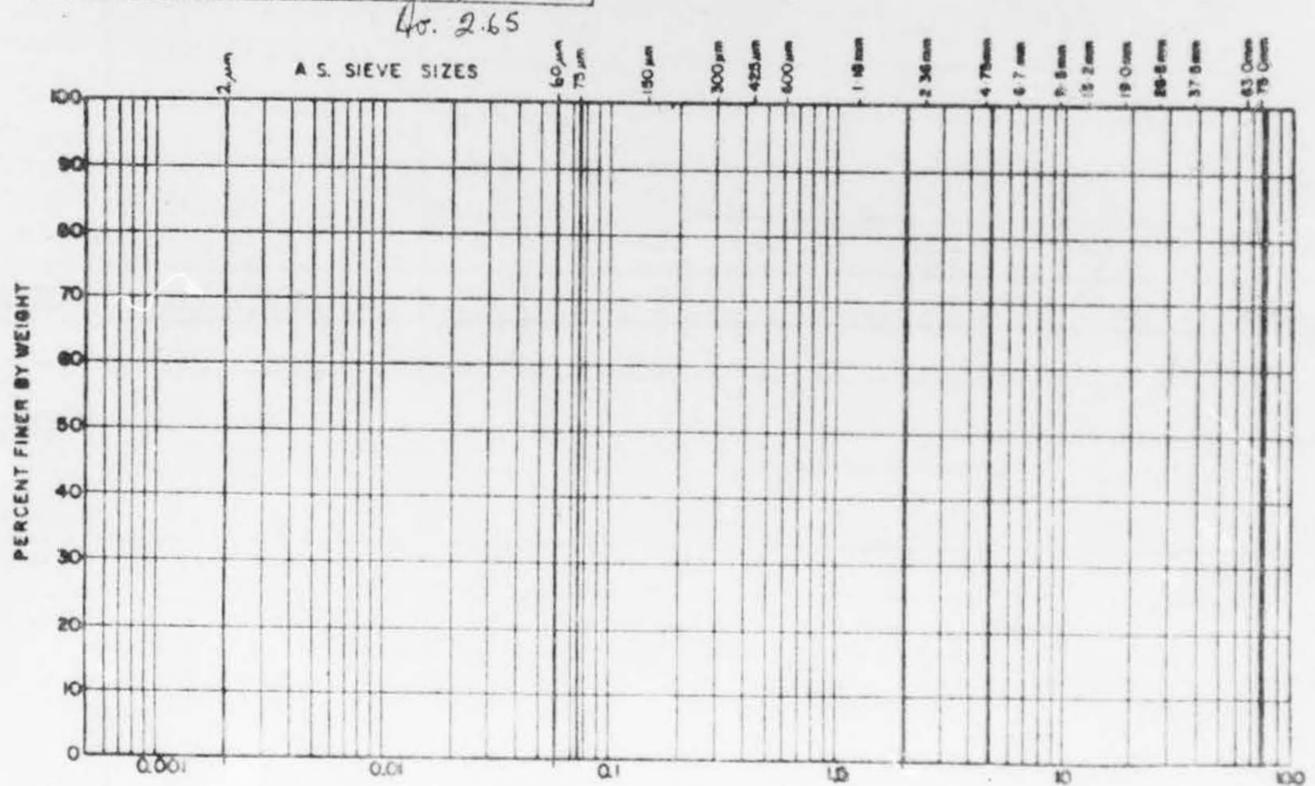
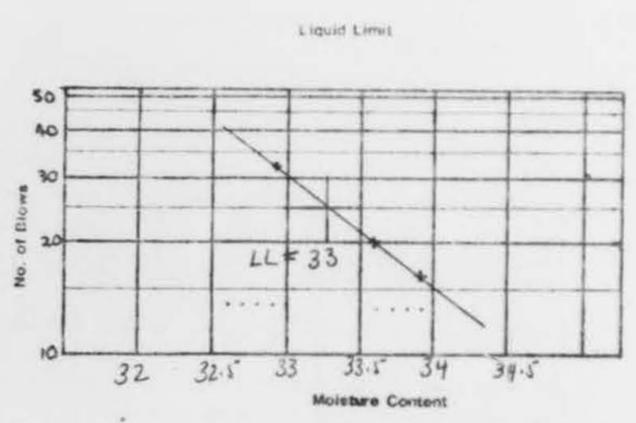
SOIL TEST DATA

Job Number *Westgate Park.*
 Date *4.10.84*

Core Number *33-84-59*
 Depth *9.65 - 10.0 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.	<i>E5</i>	<i>E6</i>	<i>C5</i>			<i>G6</i>	<i>Z1</i>	Mould No. <i>L4</i>
Container Wt	<i>20.52</i>	<i>20.88</i>	<i>20.36</i>			<i>19.60</i>	<i>20.24</i>	Linear Shrinkage <i>7.2%</i>
Wet & Container	<i>44.40</i>	<i>47.75</i>	<i>43.75</i>			<i>31.06</i>	<i>29.54</i>	Free Swell
Dry & Container	<i>38.49</i>	<i>41.00</i>	<i>37.83</i>			<i>29.37</i>	<i>28.17</i>	
No. of Blows	<i>32</i>	<i>20</i>	<i>16</i>					Cylinder No. <i>6</i>
Moisture Content	<i>32.9</i>	<i>33.6</i>	<i>33.9</i>			<i>17.3</i>	<i>17.3</i>	Free Swell <i>70%</i>

Soil Particle Density <i>with organics & shells.</i>		
Temperature	<i>14°</i>	<i>14°</i>
Bottle No.	<i>B</i>	<i>C</i>
Weight of Bottle	<i>80.07</i>	<i>78.87</i>
Weight of Bottle & Soil	<i>159.85</i>	<i>159.21</i>
Weight of Bottle & Soil & Water	<i>379.06</i>	<i>378.29</i>
Weight of Bottle & Water <i>(15°)</i>	<i>329.46</i>	<i>328.20</i>
Soil Particle Density	<i>2.646</i>	<i>2.656</i>



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in milliliters.

Hydrometer Analysis

Mass of material passing _____ mm sieve

Dry mass of material retained on _____ mm sieve

Mass of untreated subsample, M_1

Moisture content of untreated subsample w

Dry mass of untreated subsample $M_2 = \frac{M_1 \times 100}{100 + w}$

Dry mass of subsample retained on _____ μ m sieve after treatment

Dry mass of subsample passing _____ μ m sieve plus dispersant

Dry mass of 100ml dispersant

Dry mass of subsample passing _____ μ m sieve (if pretreated use $M_3 - M_4 - M_5$) (if untreated use $M_3 - M_4 - M_5$)

$M_3 - M_4 - M_5$

Loss of mass in pretreatment $(1 - \frac{M_3 - M_4 - M_5}{M_2}) \times 100$

	M_1 , gm
	M_2 , gm
76.50	M_3 , gm
	w , %
76.50	M_4 , gm
	M_5 , gm
	M_6 , gm
	M_7 , gm
	M_8 , gm
	M_9 , gm
	P , %

1DW - 76.50
 After H_2O_2 - 72.80 - 5%
 After HCl - 71.3 - 2.7%
 Dry & Cont - 576.8
 Cont 505.3
 71.3

Meniscus correction C_m

1

Soil particle density ρ_s

$D = F_1 \times F_2 \times F_3$ (gm)

Dispersant correction C_d

6

Sedimentation flask number

1

Spacing $100 \times R_c =$ $\times R_c$

Temperature correction C_t

1.3

Hydrometer No.

295

$\rho_w = 0.9998$
 $\rho_s - 1$

Start time

10:54

Actual time (hrs., mins.)	10:54 1/2	10:55	10:56	10:58	11:02	11:09	11:24	11:54	12:54	2:54	9:54	Sieve	Cum. wt. (gm)	% Pass
Elapsed time (mins.)	1/2	1	2	4	8	15	30	1 hr	2 hr	4 hr	23 hr	1.0 mm		
Temperature (C)				24°		24°		24 1/2°		24°		500 μ m	0.16	100
R'h	32.0	28.0	26.0	23	20	19	17	16	15	13	8	355 μ m	0.43	99
Rh = R'h + C _m												250 μ m	0.54	99
R _c = Rh + C _t - C _d												180 μ m	1.44	98
F ₁												125 μ m	6.34	91
F ₂												40 μ m	34.96	51
F ₃												63 μ m	40.41	42
D (gm)												Pan		
% passing														

See Computer Printout

SUMMARY OF DATA		
LIQUID LIMIT	33	S.G. 2.65
PLASTIC LIMIT	17	E.C.N. _____
PLASTIC INDEX	16	% SAND _____
LINEAR SHRINKAGE	7	% SILT _____
FREE SWELL	70%	% CLAY _____
		pH _____
		P. _____
		CLASSIFICATION _____

Bore Number..... 33.84.59 (Westgate)
 Sample Number..... 9.65-10.00
 Flask Number..... 1
 Hydrometer Number... 295

Bottle Weight (1)..... 80.07
 Bottle & Soil Weight (1)..... 159.85
 Bottle & Soil & Water Weight (1)... 379.08
 Bottle & Water Weight (1)..... 329.46
 Soil Particle Density (1)..... 2.65

Bottle Weight (2)..... 78.87
 Bottle & Soil Weight (2)..... 159.21
 Bottle & Soil & Water Weight (2)... 378.29
 Bottle & Water Weight (2)..... 328.20
 Soil Particle Density (2)..... 2.66

Average Soil Particle Density..... 2.65
 Wet Mass..... 71.30
 Dry Mass..... 71.30
 Mass of Untreated Subsample..... 71.30
 Dry Mass of Untreated Subsample..... 71.30
 Moisture Content of Untreated Subsample... 0.0 %

Meniscus Correction..... 1
 Dispersant Correction.... 6
 Temperature Correction... 1.3

Elapsed Time (ET)	Reading	RH	RC	F1	F2	F3	D	% Passing (PP)
0.5	32.0	33.0	28.3	3.48	1.305	14.14	64.3	39.7
1.0	28.0	29.0	24.3	3.57	1.305	10.00	46.6	34.1
2.0	26.0	27.0	22.3	3.62	1.305	7.07	33.4	31.3
4.0	23.0	24.0	19.3	3.69	1.305	5.00	24.1	27.1
8.0	20.0	21.0	16.3	3.75	1.305	3.54	17.3	22.9
15.0	19.0	20.0	15.3	3.78	1.305	2.58	12.7	21.5
30.0	17.0	18.0	13.3	3.82	1.305	1.83	9.1	18.7
60.0	16.0	17.0	12.3	3.84	1.305	1.29	6.5	17.3
120.0	15.0	16.0	11.3	3.86	1.305	0.91	4.6	15.9
240.0	13.0	14.0	9.3	3.91	1.305	0.65	3.3	13.0
1380.0	8.0	9.0	4.3	4.02	1.305	0.27	1.4	6.0

SOIL TEST DATA

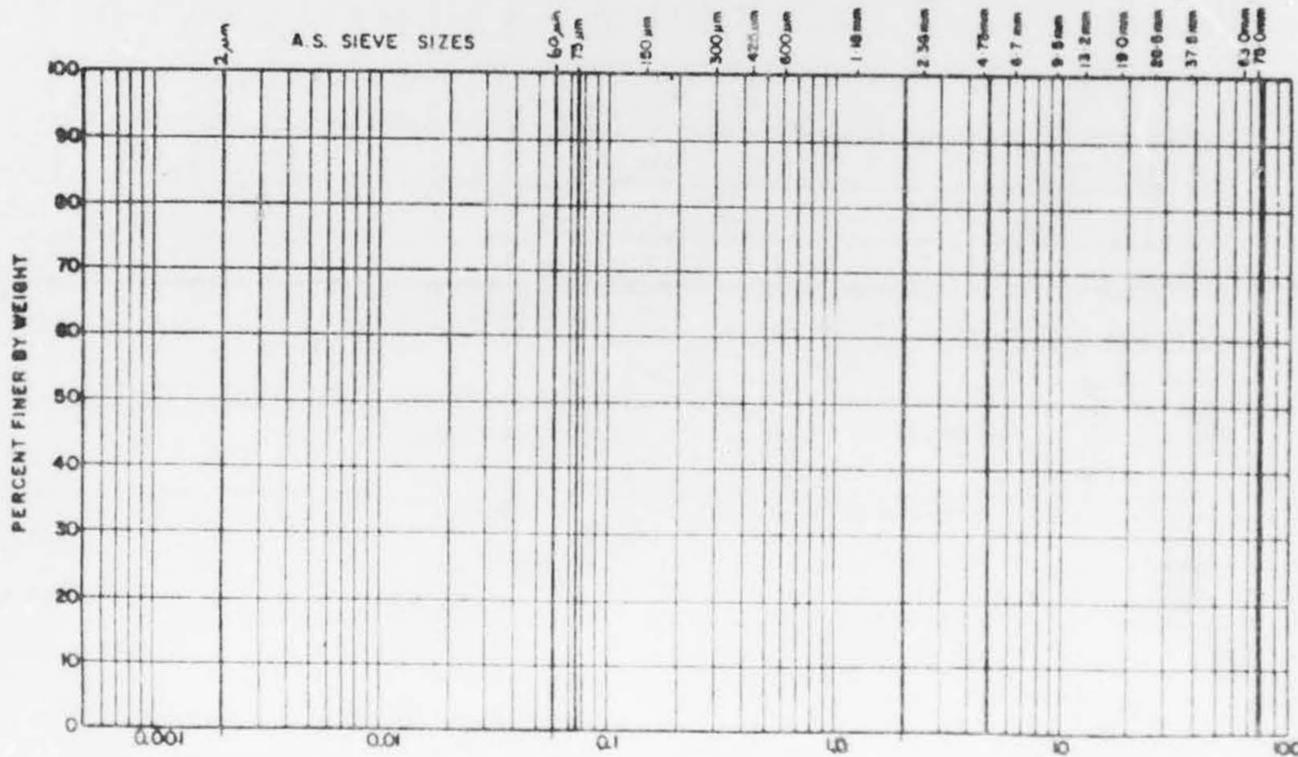
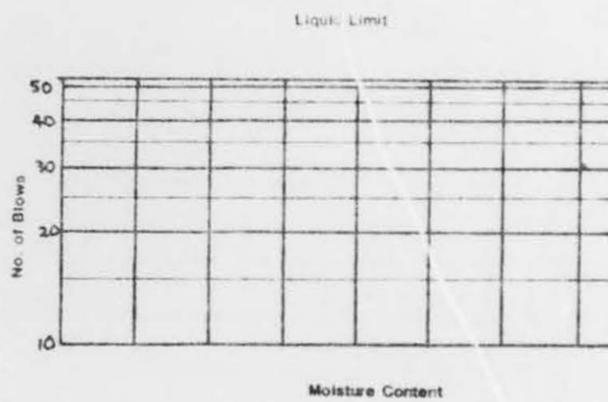
Job Number *Westgate Park*
 Date *10.10.84*

Bore Number *33.84.63*
 Depth *0.40 - 1.62 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.								Moist No.
Container Wt.								Linear Shrinkage
Wet & Container								Free Swell
Dry & Container								
No. of Blows								Cylinder No.
Moisture Content								Free Swell

14
20%

Soil Particle Density	
Temperature	
Bottle No.	
Weight of Bottle	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____ Checked by _____

N.B. Unless otherwise indicated all weights are in grams and volumes in millilitres.

Hydrometer Analysis

Mass of material passing _____ mm sieve

Dry mass of material retained on _____ mm sieve

Mass of untreated subsample M_1

Moisture content of untreated subsample w

Dry mass of untreated subsample $M_2 = \frac{M_1 \times 100}{100 + w}$

Dry mass of subsample retained on _____ um sieve after treatment

Dry mass of subsample passing _____ um sieve plus dispersant

Dry mass of 100ml dispersant

Dry mass of subsample passing _____ um sieve (if pretreated use $M_3 = M_{3a} - M_4$)
(if untreated use $M_3 = M_4 - M_5$)

$M \times M / M - M_4$

Loss of mass in pretreatment $(1 - M_3/M_2) \times 100$

	M_1 , gm
	M_2 , gm
	M_3 , gm
	w , %
	M_4 , gm
	M_5 , gm
	M_{3a} , gm
	M_4 , gm
	M_5 , gm
	M_6 , gm
	P , %

N.B. Very shelly.
Most of the loss on pre-treatment would have been due to HCl.
Coarse fraction is basalt aggregate (road metal?) < 10 mm
Some coarse quartz sand.

Meniscus correction C_m

Dispersant correction C_d

Temperature correction C_t

Start time

10W-
108.27

Soil particle density ρ_s

Sedimentation flask number

Hydrometer No.

10W-
94.96
10W-
89.01

$D = F_1 \times F_2 \times F_3$ (gm)

Boiling $100 \times R_c =$ _____ $\times R_c$

$a = \frac{0.823 \rho_s}{\rho_s - 1}$

Actual time (hrs., mins.)

Elapsed time (mins.)

Temperature (C)

$R^1 h$

$Rh = R^1 h + C_m$

$R_c = Rh + C_d - C_t$

F_1

F_2

F_3

D (um)

% passing

Sieve	Cum wt	% Pass.		Sieve	Cum wt.	% Pass.							
5.6mm	11.21	90		5.6mm	11.93	87							
4.0mm	12.28	89		4.0mm	12.83	86							
2.0mm	14.23	87		2.0mm	14.56	84							
1.0mm	19.97	82		1.0mm	20.37	77							
500um	33.32	69		500um	31.64	64							
355um	41.12	62		355um	38.03	57							
250um	57.12	47		250um	49.94	44							
180um	81.15	25		180um	67.63	24							
125um	100.46	7		125um	82.87	6							
Untreated	90um	103.93	4	Treated.	63um	104.33	4	90um	85.20	4	63um	85.30	4

SUMMARY OF DATA

LIQUID LIMIT _____	S.O. _____	pH _____
PLASTIC LIMIT _____	E.C.N. _____	P. _____
PLASTIC INDEX _____	%SAND _____	CLASSIFICATION _____
LINEAR SHRINKAGE _____	%SILT _____	
FREE SWELL _____	%CLAY _____	

10.5
10.5
10.5

Hydrometer Analysis

Mass of material passing _____ mm sieve	M ₁ gm
Dry mass of material retained on _____ mm sieve	M ₂ gm
Mass of untreated subsample	M ₃ gm
Moisture content of untreated subsample	W %
Dry mass of untreated subsample $\frac{M_3 \times 100}{100 + W}$	M ₄ gm
Dry mass of subsample retained on _____ um sieve after treatment	M ₅ gm
Dry mass of subsample passing _____ um sieve plus dispersant	M ₆ gm
Dry mass of 100ml dispersant	M ₇ gm
Dry mass of subsample passing _____ um sieve (if pretreated use M ₆ - M ₇ - M ₅) (if untreated use M ₆ - M ₅)	M ₈ gm
$M \times M / M - M_1$	M ₉ gm
Loss of mass in pretreatment: $(1 - M_5 / M_3) \times 100$	P %

Meniscus correction C₁

100.20

Soil particle density ρ_s

112.83

D = F₁ X F₂ X F₃ (um)

Dispersant correction C₂

100.20

Sedimentation flask number

TDW-

% passing = $\frac{100 \times R_c}{M_8}$ x R_c

Temperature correction C₃

100.20

Hydrometer No.

108.01

$\alpha = \frac{0.627}{\rho_s - 1}$

Start time

Actual time (hrs., mins.)

Elapsed time (mins.)

Temperature (C)

R'h

Rh = R'h + C₁

R_c = Rh + C₂ - C₃

F₁

F₂

F₃

D (um)

% passing

Sieve	Cum. wt. (gm)	% Pass.	Sieve	Cum. wt. (gm)	% Pass.
1.0mm	0.02	100	1.0mm	-	100
500um	0.08	100	500um	0.05	100
355um	0.16	100	355um	0.17	100
250um	1.41	99	250um	1.55	99
180um	12.63	87	180um	13.93	87
125um	64.71	35	125um	70.19	35
90um	96.56	4	90um	106.32	2
63um	98.04	2.2	63um	107.76	0.2
Pan	98.16	-	Pan	107.83	-

Treated.

SUMMARY OF DATA

LIQUID LIMIT _____	S.O. _____	pH _____
PLASTIC LIMIT _____	E.C.N. _____	P. _____
PLASTIC INDEX _____	% SAND _____	CLASSIFICATION _____
LINEAR SHRINKAGE _____	% SILT _____	
FREE SWELL _____	% CLAY _____	

SOIL TEST DATA

Job Number *Westgate Park.*

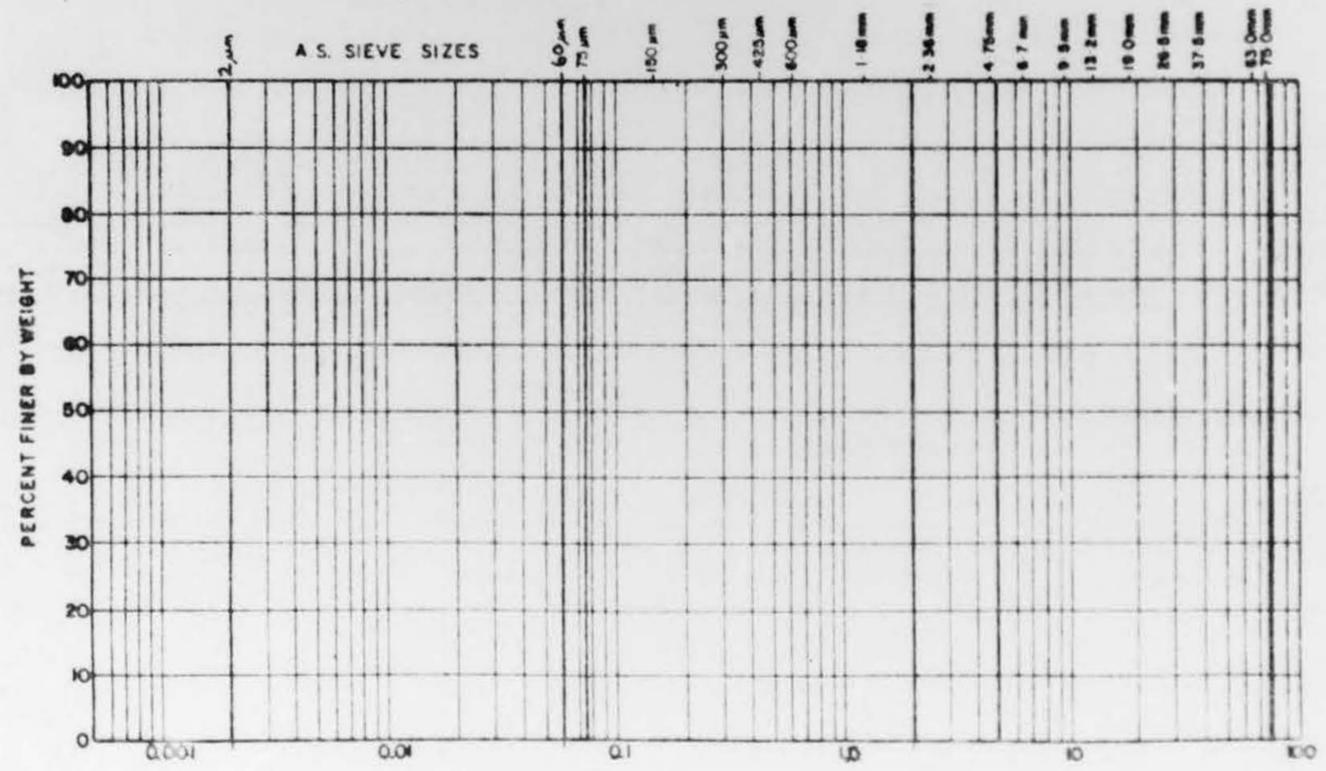
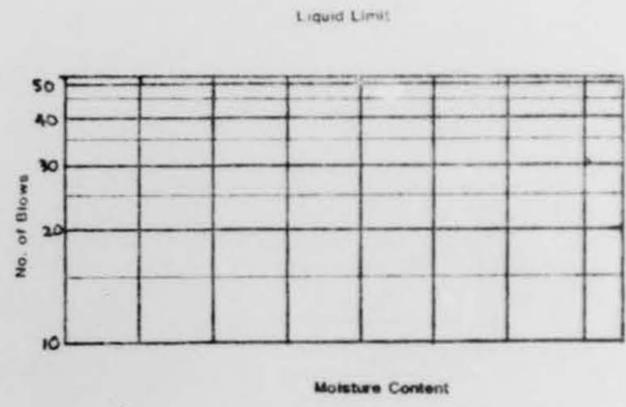
Bore Number *33.84.63*

Date *5.10.84*

Depth *4.86 m - 5.63 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.								Mould No.
Container Wt.								Linear Shrinkage
Wet & Container								Free Swell
Dry & Container								
No. of Blows								Cylinder No. <i>11</i>
Moisture Content								Free Swell <i>15%</i>

Soil Particle Density	
Temperature	
Bottle No.	
Weight of Bottle	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in millilitres.

SOIL TEST DATA

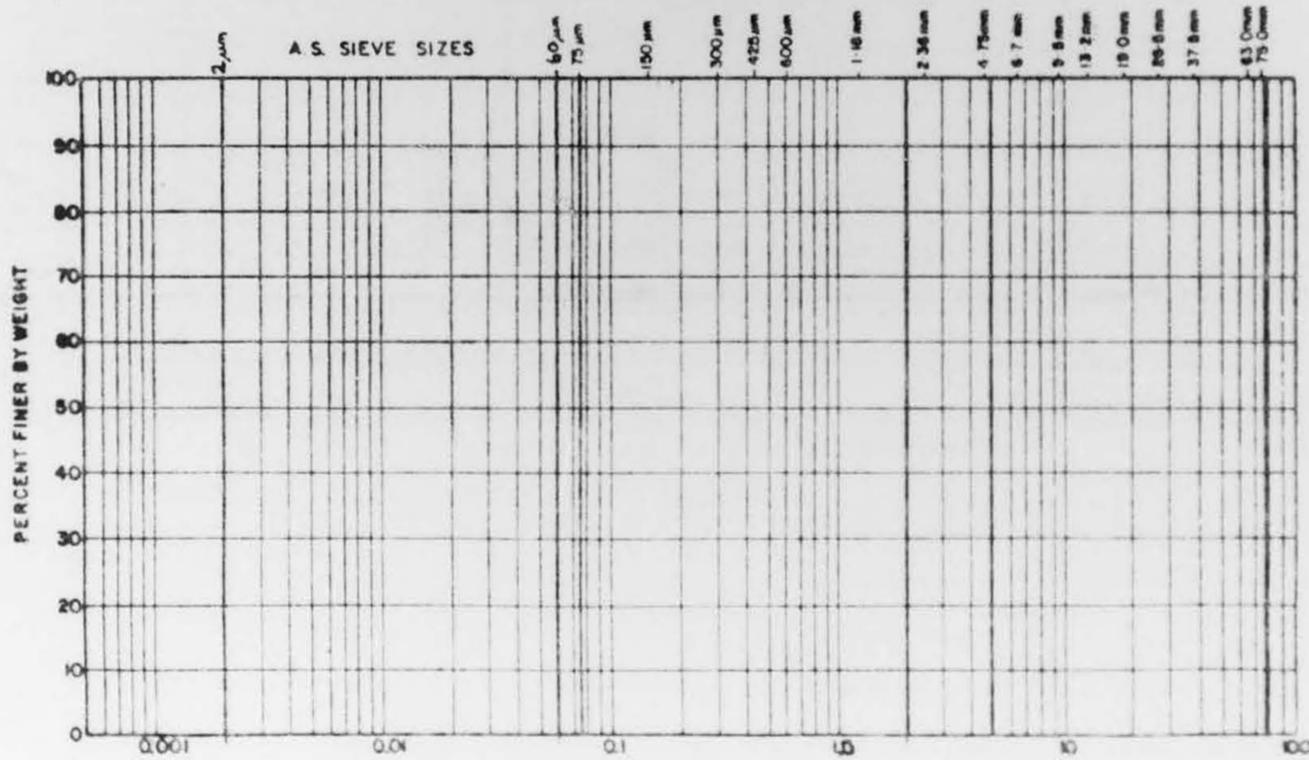
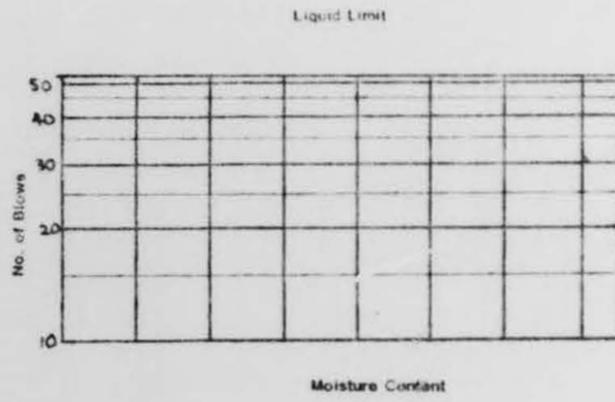
Job Number *Westgate Park*
 Date *10.10.84*

Bore Number *33.84.72*
 Depth *6.95 m - 8.35 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.								Mould No.
Container Wt.								Linear Shrinkage
Wet & Container								Free Swell
Dry & Container								
No. of Blows								Cylinder No.
Moisture Content								Free Swell

8
20%

Soil Particle Density	
Temperature	
Bottle No.	
Weight of Bottle	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in millilitres.

24

Wet
Dry

Hydrometer Analysis

Mass of material passing _____ mm sieve

Dry mass of material retained on _____ mm sieve

Mass of untreated subsample, M_1

Moisture content of untreated subsample, w

Dry mass of untreated subsample $\frac{M_1 \times 100}{100 + w}$

Dry mass of subsample retained on _____ um sieve after treatment

Dry mass of subsample passing _____ um sieve plus dispersant

Dry mass of 100ml dispersant

Dry mass of subsample passing _____ um sieve
(if pretreated use $M_2 - M_3 - M_4$)
(if untreated use $M_2 - M_3$)

$M_2 \times M / M - M_1$

Loss of mass in pretreatment $(1 - \frac{M_2 - M_3}{M_1}) \times 100$

	M_1 gm
	M_2 gm
	M_3 gm
	w %
	M_4 gm
	M_5 gm
	M_6 gm
	M_7 gm
	M_8 gm
	M_9 gm
	M_{10} gm
	P %

Meniscus correction C_m

Dispersant correction C_d

Temperature correction C_t

start time

Actual time (hrs. mins.)

Elapsed time (mins.)

Temperature (C)

$R'h$

$R_h = R'h + C_d$

$R_c = R_h + C_t - C_m$

F_1

F_2

F_3

D (μ m)

% passing

Soil particle density P_s
Sedimentation flask number
Hydrometer No.

109.68
TDW
105.5

$D = F_1 \times F_2 \times F_3$ (μ m)

% passing = $100 \times \frac{R_c}{M_2}$
 $= \frac{0.623 R_c}{P_s - 1}$

Sieve	Cum. wt. (gm)	% Pass	Sieve	Cum. wt. (gm)	% Pass
1.0 mm	0.15	100	1.0 mm	—	—
500 μ m	0.38	100	500 μ m	0.06	100
355 μ m	0.50	100	355 μ m	0.14	100
250 μ m	2.18	98	250 μ m	1.55	99
180 μ m	16.70	85	180 μ m	12.93	88
125 μ m	64.66	41	125 μ m	60.90	42
90 μ m	106.91	3	90 μ m	103.14	2
63 μ m	108.34	2	63 μ m	105.31	0.2
Pan.	105.46	—	Pan.	105.40	—

Untreated

Treated

SUMMARY OF DATA		
LIQUID LIMIT _____	S.G. _____	pH _____
PLASTIC LIMIT _____	E.C.N. _____	P. _____
PLASTIC INDEX _____	% SAND _____	CLASSIFICATION _____
LINEAR SHRINKAGE _____	% SILT _____	
FREE SWELL _____	% CLAY _____	

SOIL TEST DATA

Job Number *Westgate Park*
 Date *4.10.84*

Bore Number *33-84-72*
 Depth *9.90 - 11.90 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.	<i>C7</i>					<i>G7</i>	<i>B F6</i>	Mould No. <i>54</i>
Container Wt.	<i>20.70</i>					<i>22.16</i>	<i>19.88</i>	Linear Shrinkage <i>12/125 = 9.6%</i>
Wet & Container	<i>236.99</i>					<i>28.11</i>	<i>28.40</i>	Free Swell <i>with organics & CaCO₃</i>
Dry & Container	<i>32.28</i>					<i>27.21</i>	<i>27.08</i>	
No. of Blows	<i>16</i>							Cylinder No. <i>3</i>
Moisture Content	<i>40.7</i>					<i>17.6</i>	<i>18.3</i>	Free Swell <i>60%</i>

→ LL = 39

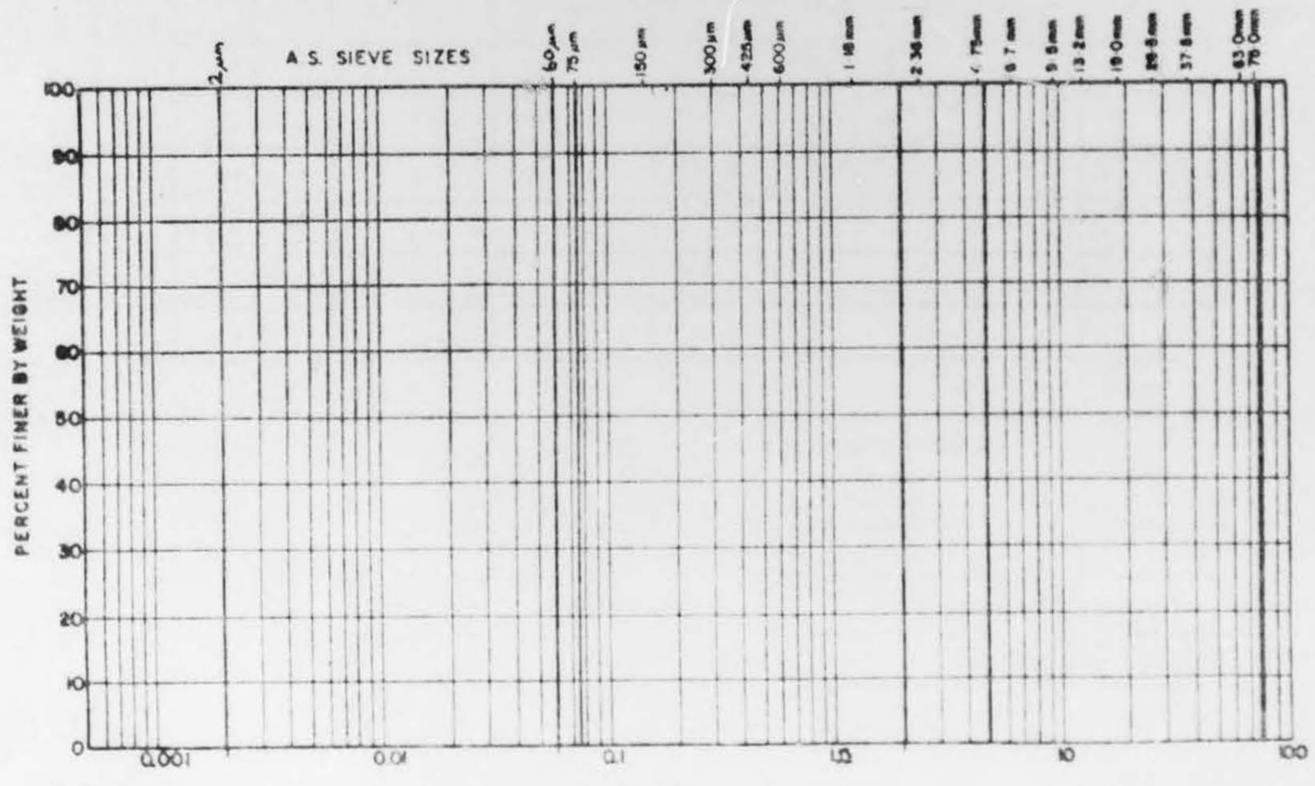
→ PL = 18

Soil Particle Density <i>with organics & CaCO₃</i>		
Temperature	<i>15°</i>	<i>15°</i>
Bottle No.	<i>Y</i>	<i>Z</i>
Weight of Bottle	<i>146.88</i>	<i>150.50</i>
Weight of Bottle & Soil	<i>246.83</i>	<i>269.61</i>
Weight of Bottle & Soil & Water	<i>707.9</i>	<i>723.7</i>
Weight of Bottle & Water	<i>645.3</i>	<i>649.5</i>
Soil Particle Density	<i>2.676</i>	<i>2.663</i>

Av. 2.67



Moisture Content



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in millilitres.

Hydrometer Analysis without organics & CaCO₃

Wet
Dry

Mass of material passing _____ mm sieve M_1 gm

Dry mass of material retained on _____ mm sieve M_2 gm

Mass of untreated subsample M_3 gm

Moisture content of untreated subsample w %

Dry mass of untreated subsample M_4 gm

Dry mass of subsample retained on _____ mm sieve after treatment M_5 gm

Dry mass of subsample passing _____ um sieve plus dispersant M_{6+} gm

Dry mass of 100ml dispersant M_7 gm

Dry mass of subsample passing _____ um sieve (if pretreated use $M_5 - M_7 - M_8$) (if untreated use $M_5 - M_8$) M_8 gm

$M \times M_7 / M - M_8$

Loss of mass in pretreatment $(1 - M_5 - M_8) \times 100 / M_4$ %

I.D.W. - 74.19
 After H₂O₂ - 70.32 → 5.5 %
 After HCl - 67.6 gm → 4.0 %
 Dry & Container - 565.0
 Container - 497.4
 67.6

Meniscus correction C_m 1

Dispersant correction C_d 6

Temperature correction C_t 1.3

Start time 10.57

Soil particle density ρ_s 2.67

Sedimentation flask number 2

Hydrometer No. 274

$D = F_1 \times F_2 \times F_3$ (um)

% passing $100 \times R_c / M_8$

$R_c = 0.623 \frac{P_s}{\rho_s - 1}$

Actual time (hrs., mins.)	10:57 1/2	10:58	10:59	11:01	11:05	11:12	11:27	11:57	12:57	2:57	23 hr	Sieve	Cum. wt. (gm)	% Pass.
Elapsed time (mins.)	1/2	1	2	4	8	15	30	1 hr	2 hr	4 hr	23 hr	500 um	-	100
Temperature (C)												355 um	0.75	99
R'h	35	33	31	26	22	19	16.5	15	13	11	6	250 um	2.16	97
Rh = R'h + C _m												180 um	3.71	95
R _c = Rh + C _d - C _t												125 um	8.94	87
F ₁												90 um	22.51	67
F ₂												63 um	26.20	-
F ₃												Pan	-	-
D (um)														
% passing														

See Computer print.

LIQUID LIMIT	39	S.G.	2.67	pH	
PLASTIC LIMIT	18	E.C.N.	-	P.	
PLASTIC INDEX	21	% SAND		CLASSIFICATION	
LINEAR SHRINKAGE	9.5	% SILT			
FREE SWELL	60 %	% CLAY			

Bore Number..... 33,84.72(Westgate)
 Sample Number..... 9,90-11.90
 Flask Number..... 2
 Hydrometer Number... 274

Bottle Weight (1)..... 146.88
 Bottle & Soil Weight (1)..... 246.83
 Bottle & Soil & Water Weight (1)... 707.90
 Bottle & Water Weight (1)..... 645.30
 Soil Particle Density (1)..... 2.68

Bottle Weight (2)..... 150.80
 Bottle & Soil Weight (2)..... 269.61
 Bottle & Soil & Water Weight (2)... 723.70
 Bottle & Water Weight (2)..... 649.50
 Soil Particle Density (2)..... 2.66

Average Soil Particle Density..... 2.67
 Wet Mass..... 67.60
 Dry Mass..... 67.60
 Mass of Untreated Subsample..... 67.60
 Dry Mass of Untreated Subsample..... 67.60
 Moisture Content of Untreated Subsample... 0.0 %

Meniscus Correction..... 1
 Dispersant Correction.... 6
 Temperature Correction... 1.3

Elapsed Time (ET)	Reading	RH	RC	F1	F2'	F3	D	% Passing (PP)
0.5	35.0	36.0	31.3	3.47	1.298	14.14	63.6	46.1
1.0	33.0	34.0	29.3	3.51	1.298	10.00	45.6	43.2
2.0	31.0	32.0	27.3	3.56	1.298	7.07	32.6	40.2
4.0	26.0	27.0	22.3	3.67	1.298	5.00	23.8	32.9
8.0	22.0	23.0	18.3	3.76	1.298	3.54	17.2	27.0
15.0	19.0	20.0	15.3	3.82	1.298	2.58	12.8	22.5
30.0	16.5	17.5	12.8	3.88	1.298	1.83	9.2	18.9
60.0	15.0	16.0	11.3	3.91	1.298	1.29	6.6	16.7
120.0	13.0	14.0	9.3	3.96	1.298	0.91	4.7	13.7
240.0	11.0	12.0	7.3	4.00	1.298	0.65	3.4	10.8
1380.0	6.0	7.0	2.3	4.11	1.298	0.27	1.4	3.4

SOIL TEST DATA

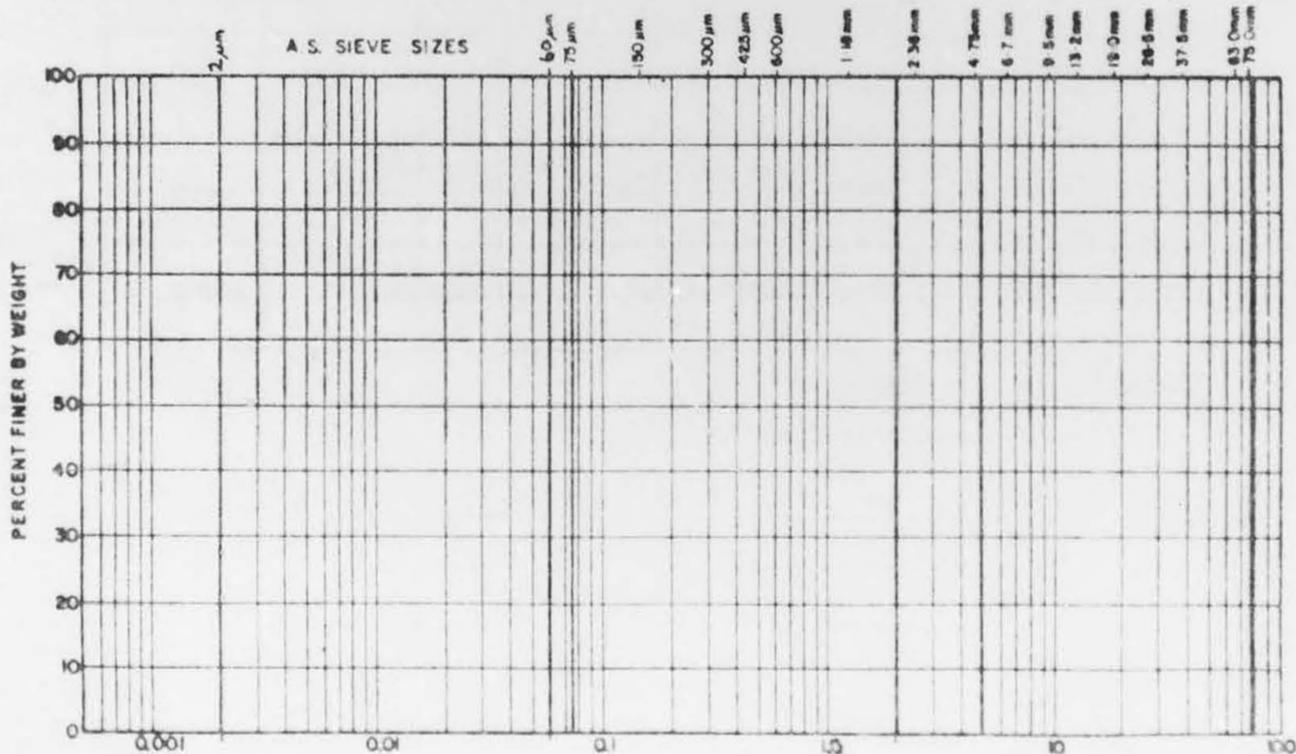
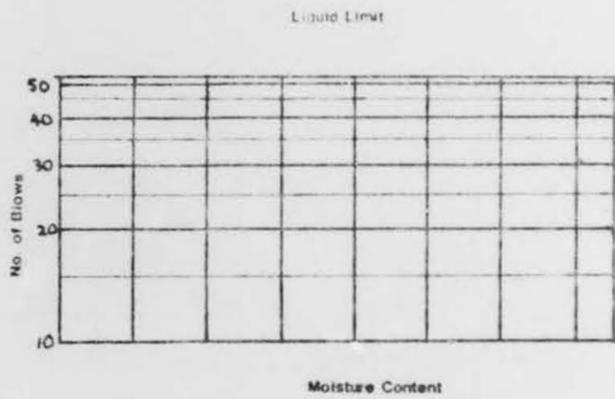
Job Number *Westgate Park.*
 Date *5.10.84.*

Bore Number *33-84.73*
 Depth *6.95 m - 8.35 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage
	1	2	3	4	5	1	2	
Container No.								Mould No.
Container Wt.								Linear Shrinkage
Wet & Container								Free Swell
Dry & Container								
No. of Blows								Cylinder No.
Moisture Content								Free Swell

1
20%

Soil Particle Density	
Temperature	
Bottle No.	
Weight of Bottle	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in milliliters.

Hydrometer Analysis

Mass of material passing _____ mm sieve

Dry mass of material retained on _____ mm sieve

Mass of untreated subsample M_1

Moisture content of untreated subsample w

Dry mass of untreated subsample $M_2 = \frac{M_1 \times 100}{100 + w}$

Dry mass of subsample retained on _____ μ m sieve after treatment

Dry mass of subsample passing _____ μ m sieve plus dispersant

Dry mass of 100ml dispersant

Dry mass of subsample passing _____ μ m sieve (if pretreated use $M_5 - M_4 - M_3$) (if untreated use $M_5 - M_4 - M_3$)

$M_1 \times M / M - M_4$

Loss of mass in pretreatment $(1 - \frac{M_2 + M_3}{M_1}) \times 100$

	M_1 gm
	M_2 gm
	M_3 gm
	w %
	M_4 gm
	M_5 gm
	M_6 gm
	M_7 gm
	M_8 gm
	M_9 gm
	P %

M.S.
wet
dry

Loss on treatment

$$\frac{10W - TDW}{TDW} \times 100 = 20.6\%$$

Meniscus correction C_m

10W -

Soil particle density ρ_s

$D = F_1 \times F_2 \times F_3$ (μ m)

Dispersant correction C_d

52.93

Sedimentation flask number

10W

% passing $100 \times \frac{M_5}{M_2} =$ $\times R_c$

Temperature correction C_t

TDW -

Hydrometer No.

54-64

$a = \frac{0.523}{\rho_s - 1}$

Start time

81.25 gm

Actual time (hrs. mins.)

Elapsed time (mins.)

Temperature (C)

$R^1 h$

$Rh = R^1 h + C_m$

$R_2 = Rh + C_t - C_d$

F_1

F_2

F_3

D (μ m)

% passing

Sieve	Cum. wt. (gm)	% Pass	Sieve	Cum. wt. (gm)	% Pass
1.00 mm	0.01	100	2.0 mm	-	100
500 μ m	0.03	100	1.0 mm	0.04	100
355 μ m	0.08	100	500 μ m	0.1	100
250 μ m	0.97	99	355 μ m	0.20	100
180 μ m	7.58	91	250 μ m	1.15	99
125 μ m	46.11	44	180 μ m	7.49	91
90 μ m	79.27	3	125 μ m	45.51	46
63 μ m	80.46	1	90 μ m	81.78	3
Pan.	80.57	-	63 μ m	83.57	1.3
			Pan	83.66	-

~~Treated~~ Un.treated.

SUMMARY OF DATA		
LIQUID LIMIT _____	S.G. _____	pH _____
PLASTIC LIMIT _____	E.C.N. _____	P. _____
PLASTIC INDEX _____	% SAND _____	CLASSIFICATION _____
LINEAR SHRINKAGE _____	% SILT _____	
FREE SWELL _____	% CLAY _____	

**S
T
A
R
T**



Geological Survey of Victoria

RESULTS OF WESTGATE PARK SITE SOIL TESTS

P G DAHLHAUS

UNPUBLISHED REPORT 1984/89

DEPARTMENT OF MINERALS AND ENERGY

1984/89

COPY 2

P. G. DAHLHAUS

ABSTRACT

Eight soil samples from the investigation for the proposed park at Todd Road Port Melbourne (Westgate Park) were tested to determine their basic index properties. The samples were selected from man-made fill, the Port Melbourne Sands and the Coode Island silt formations.

KEYWORDS

Soil Tests, Westgate, Port Melbourne Sand, Coode Island silt.

C O N T E N T S

P A G E

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INTRODUCTION

As part of the investigation of the proposed Westgate Park site, eight samples of soil were supplied by Mr A M Cooney for testing. The samples were recovered from investigation bores and were tested to determine their basic index properties.

METHODS

The tests were carried out in accordance with Australian Standards AS 1289 & AS 1726 at the Port Melbourne soils laboratory.

The following table summarizes the tests conducted:-

Sample No	Bore	Depth (m)	Sieve Analysis AS 1289 C6.1	Hydrometer AS 1289 C6.2	Soil Particle Density AS 1289 C3.1	Liquid Limit AS 1289 C1.1; C1.2	Plastic Limit AS 1289 C3.1	Plasticity Index AS 1289 C3.1	Linear Shrinkage AS 1289 C4.1	Free Swell AS 1726-B.8
1	33.84.59	0.9- 1.06	x							x
2	33.84.59	1.82- 2.58	x							x
3	33.84.59	9.65-10.00		x	x	x	x	x	x	x
4	33.84.63	0.40- 1.62	x							x
5	33.84.63	4.86- 5.63	x							x
6	33.84.72	6.95- 8.35	x							x
7	33.84.72	9.90-11.90		x	x	x	x	x	x	x
8	33.84.73	6.95- 8.35	x							x

Table 1 Summary of Tests conducted

Each sample on which a sieve analysis was performed was split so that one sub-sample was graded as received (with the organic matter and shell fragments) and the other was graded after the removal of organic matter and carbonate material by treatment with Hydrogen Peroxide and Hydrochloric Acid.

PROJECT Westgate Park

BORE 31.84.59

SAMPLE

DEPTH 0.9m - 1.06m

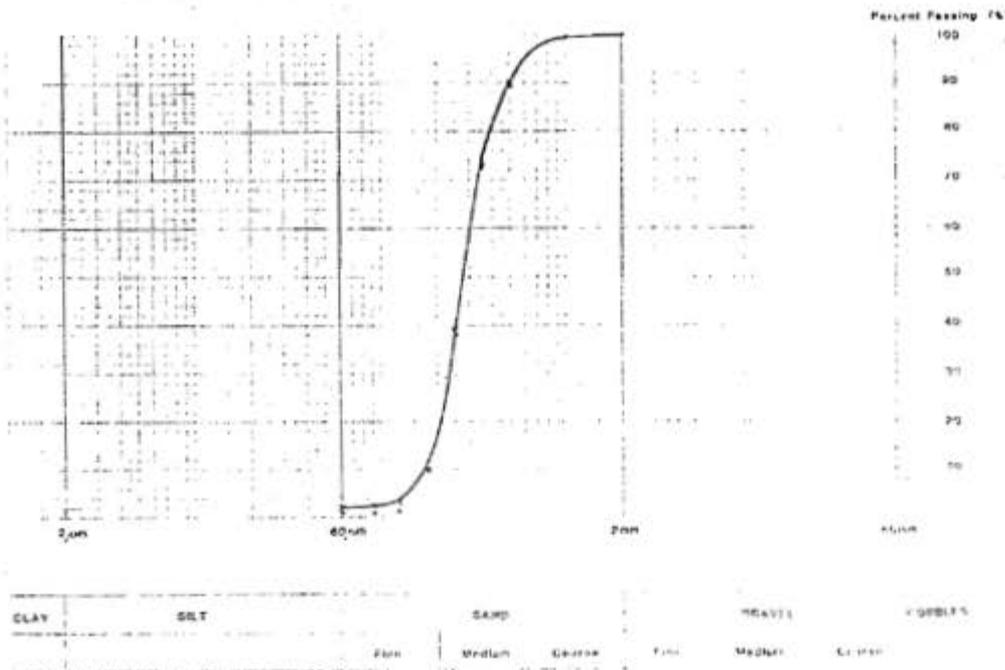
Size	Percent Passing	After Treatment
2.0 μ m	100	100
1.0 μ m	99	100
500 μ m	90	89
355 μ m	74	73
250 μ m	39	38
180 μ m	10	11
125 μ m	3	1
90 μ m	3(2.5)	1
63 μ m	2.1	1

TEST	RESULT
Plasticity Index	N.P.*
Free Swell	10%
Soil Particle Density	2.62 gm/cm ³
Loss on treatment	5%
	(organics & shells)

* Non-plastic

SUMMARY

Medium-grained quartz sand containing about 5% organic matter & shells. The organic component was a mixture of plant matter and tarry, immiscible granules thought to be oil or grease products.



PROJECT Westgate Park

BORE 33.84.59

SAMPLE

DEPTH 1.82m - 2.58m

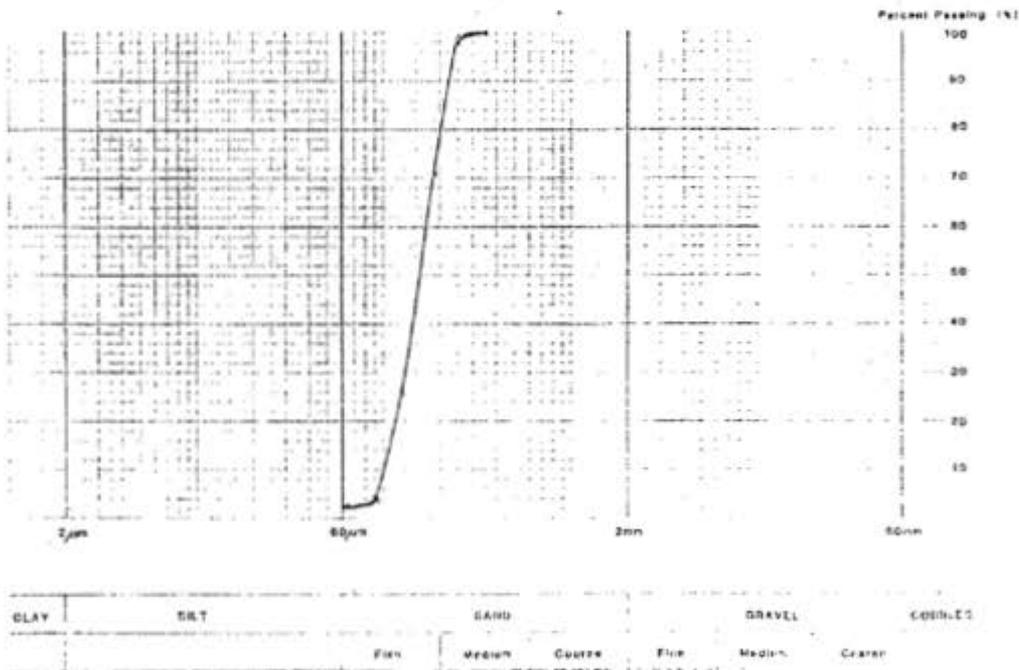
Size	Percent Passing	After Treatment
355 μ m	100	100
250 μ m	98	98
180 μ m	71	75
125 μ m	26	24
90 μ m	4	2
63 μ m	2.3	0.9

TEST	RESULT
Plasticity Index	N.P.*
Free Swell	10%
Loss on treatment	2% (organics & shells)

* Non-plastic

SUMMARY

Fine-grained (almost single size) quartz sand, probably a dune sand.



PROJECT Westgate Park

BORE 33.84.59

SAMPLE

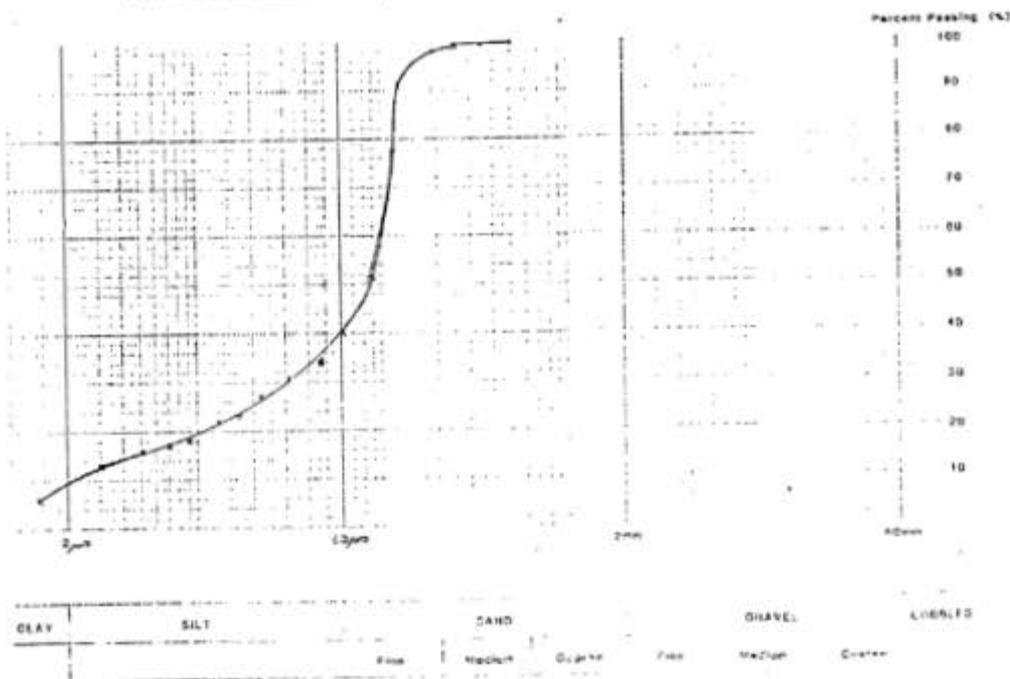
DEPTH 9.65m - 10.0m

Size	Percent Passing
500 μ m	100
355 μ m	99
250 μ m	98
180 μ m	98
125 μ m	91
90 μ m	51
63 μ m	40
47 μ m	34
33 μ m	31
24 μ m	27
17 μ m	21
13 μ m	22
7 μ m	17
3 μ m	13.0
1.4 μ m	6.0

TEST	RESULT
Liquid Limit	33
Plastic Limit	17
Plasticity Index	16
Linear Shrinkage	7%
Free Swell	70%
Soil Particle Density	2.65gm/cm ³
Organic content	5%
Carbonate content	2%

SUMMARY

A slightly clayey silty sand, sampled from the Coode Island Silt formation. The sample has a low plasticity.



PROJECT Westgate Park

CORE 33.84.72

SAMPLE

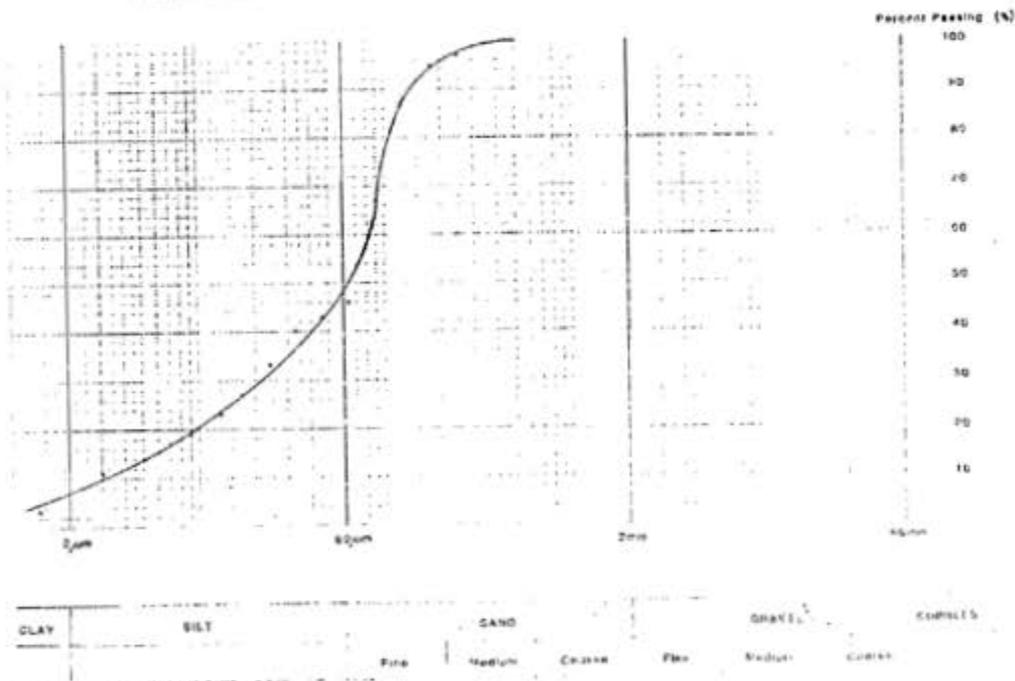
DEPTH 9.90m - 11.90m

Size	Percent Passing
500 μ m	100
355 μ m	99
250 μ m	97
180 μ m	95
125 μ m	87
90 μ m	67
63 μ m	46
46 μ m	43
33 μ m	40
24 μ m	33
17 μ m	27
13 μ m	23
7 μ m	17
3 μ m	11
1.4 μ m	3.4

TEST	RESULT
Liquid Limit	39
Plastic Limit	18
Plasticity Index	21
Linear Shrinkage	9.5%
Free Swell	60%
Soil Particle Density	2.67 gm/cm ³
Organic content	6%
Carbonate content	4%

SUMMARY

Slightly clayey, silty sand, sampled from the Coope Island silt formation. The sample has a low plasticity.



PROJECT Westgate Park

BORE 33.84.73

SAMPLE

DEPTH 6.95m - 8.35m

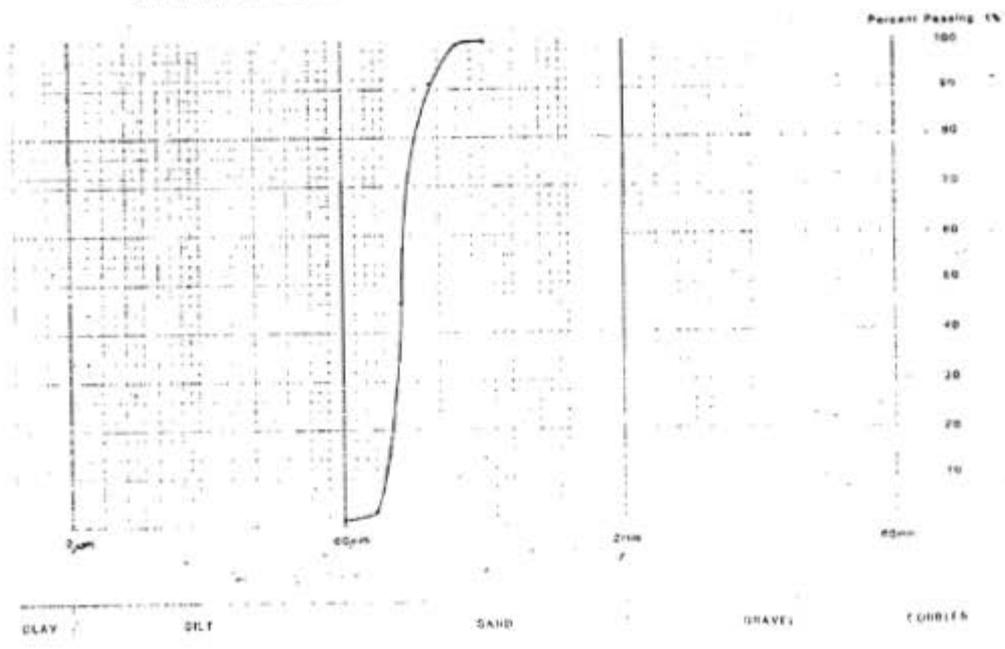
Size	Percent Passing	After treatment
355 µm	100	100
250 µm	99	99
180 µm	91	91
125 µm	46	44
90 µm	3	3
63 µm	1.3	1

TEST	Result
Plasticity Index	N.P.*
Free Swell	20%
Loss on treatment	2%
	(organics & shells)

* Non-Plastic

SUMMARY

Fine-grained, almost single-sized, non-plastic, quartz sand; probably a dune sand.



REFERENCES

Cooney, A.M., 1984. Westgate Park groundwater study:
report on drilling and surface geology.
Unpublished report 1984/78 G.S.V.

Standards Association of Australia.
Methods of Testing Soils for Engineering
Purposes.
Australian Standard 1289.

Standards Association of Australia.
S.A.A. Site Investigation Code.
Australian Standard 1726.

APPENDIX I

Laboratory Test Sheets

SOIL TEST DATA

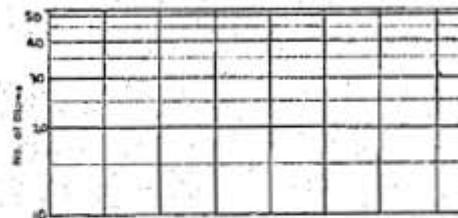
Job Number *Westgate Park.*
 Date *4.10.84*

Box Number *33.84.59*
 Depth *0.9m - 1.06m*

No.	Liquid Limit					Plastic Limit		Linear Shrinkage	
	1	2	3	4	5	1	2	1	2
Container No.								Method	
Container Vol.								Linear Shrinkage	
Test & Container								Free Swell	
Dry & Container								Container No.	<i>10</i>
No. of blows								Free Swell	<i>10%</i>
Moisture Content									

Soil Particle Density		
Temperature	<i>19°</i>	<i>19°</i>
Bottle No.	<i>E</i>	<i>A</i>
Weight of Bottle	<i>76.36</i>	<i>78.95</i>
Weight of Bottle & Soil	<i>170.83</i>	<i>151.30</i>
Weight of Bottle & Soil & Water	<i>384.5</i>	<i>572.8</i>
Weight of Bottle & Water	<i>15°</i> <i>327.4</i>	<i>328.1</i>
Soil Particle Density	<i>2.614</i>	<i>2.617</i>

NB Immiscible black lumps \approx 1mm ϕ throughout. See?



Tested by _____ Compared by _____ Checked by _____
 N.B. Unless otherwise indicated, all weights are in grams and volumes in millilitres.

Hydrometer Analysis

- Mass of material passing 20 # sieve
- Dry mass of material retained on 20 # sieve
- Mass of untreated subsample
- Moisture content of untreated subsample
- Dry mass of untreated subsample $M_s = 100$
- Dry mass of subsample retained on 20 # sieve after treatment
- Dry mass of subsample passing 20 # sieve after treatment
- Dry mass of 100mL dispersant
- Dry mass of subsample passing 20 # sieve (if pretreated use $M_s - M_2 - M_3$, if untreated use $M_s - M_2$)
- $M_s M_2 / M - M_2$
- Loss of mass in pretreatment $(1 - M_2/M_s) \times 100$

	0.075
	0.15
	0.3
	0.6
	1.2
	2.5
	5.0
	10
	20
	40
	75
	150
	300
	600
	1060

NB.
 Sand ex 2 days @ 105°C still appears damp! Maybe oil or some immiscible fluid with B.P. > 105°C coating particles.

Handful correction C_1

100
163.38

Soil particle density ρ_s

100
156.22
1.00
148.5

D, F, T, T_0, T_0^2

Dispersant correction C_2

Sedimentation basin number

$W = 100 \times T_0^2 \times \rho_s$

Temperature correction C_3

Hydrometer No.

$W_0 = 100 \times T_0^2 \times \rho_s$

Start time

Actual time (hrs, mins)

Elapsed time (mins)

Temperature (C)

h'

$h_1 - h' = C_1 - C_2$

$h_2 - h_1 = C_1 - C_2$

V_1

V_2

V_3

D (µm)

% passing

	Sieve	µm	% Pass		Sieve	µm	% Pass
2.0mm	0.30	100		1.0	0.60	100	
1.0mm	0.47	99		500	16.35	89	
500µ	16.16	90		250	39.49	73	
355µ	42.53	74		250	92.50	38	
250µ	100.25	39		180	132.08	11	
180µ	146.44	10		125	186.98	1	
125µ	153.30	3		90	197.49	1	
90µ	159.26	2.5		63	147.50	1	
63µ	159.99	2.1		Pass	147.50	-	
Pass	160.42	-					

Untreated

Treated

SUMMARY OF DATA		
LIQUID LIMIT	_____	S.O. _____
PLASTIC LIMIT	_____	E.C.N. _____
PLASTIC INDEX	_____	%SAND _____
LINEAR SHRINKAGE	_____	%CLT _____
FREE SWELL	_____	%CLAY _____
		CLASSIFICATION _____

SOIL TEST DATA

Job Number *Westgate Park*

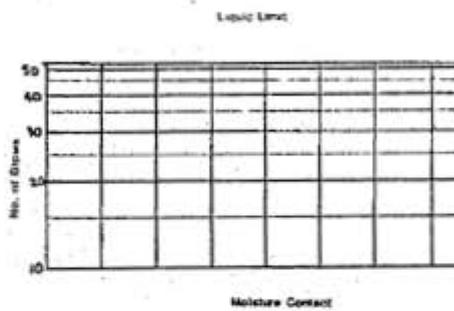
Date Recd *33. 8/ 54*

Date *5-10-54*

Depth *1-52 - - 2-55 -*

	Liquid Limit					Plastic Limit		Linear Shrinkage	
	1	2	3	4	5	1	2	Area %	Linear Shrinkage
Container No.									
Container No.									
Wt & Container									
Dry & Container									
No. of Blows								5	
Moisture Content								10%	

Soil Particle Density	
Temperature:	
Bottle No.	
Weight of Bottle	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____ Checked by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in milliliters.

Hydrometer Analysis

- Mass of material passing ... 75 sieve
- Dry mass of material retained on ... 75 sieve
- Mass of untreated subsample
- Moisten content of untreated subsample
- Dry mass of untreated subsample $M_1 \times \frac{100}{100 + w}$
- Dry mass of subsample retained on ... sieve after treatment
- Dry mass of subsample passing ... sieve after treatment
- Dry mass of 100µm dispersion
- Dry mass of subsample passing ... 100µm sieve
 Of untreated use $M_1 \cdot M_2 \cdot (M_1 - M_2)$
 Of treated use $M_2 \cdot M_1 \cdot (M_2 - M_1)$
- $M_1 \cdot X \cdot M_2 \cdot M_1 - M_2$
- Loss of mass in pretreatment $(1 - \frac{M_2}{M_1}) \times 100$

	M ₁ gm
	M ₂ gm
	M ₃ gm
	W %
	M ₄ gm
	M ₅ gm
	M ₆ gm
	M ₇ gm
	M ₈ gm
	W %

loss on treatment
= 1.8%

Moisture correction C₁

16w

Soil particle density p_s

115.54

D = F₁ + F₂ + F₃ (gm)

Dispersion correction C₂

103.45

Sedimentation flask number

58-101

Reading $100 \times X \cdot R_2$

Temperature correction C₃

Hydrometer Co.

113.48

$\frac{0.025 \cdot p_r}{p_s - 1}$

Start time

- Actual time (Sec., min.)
- Elapsed time (min.)
- Temperature (°C)
- R₁'s
- R₂ = R₁'s + C₁
- R₃ = R₂ + C₂ + C₃
- F₁
- F₂
- F₃
- D (gm)
- % passing

Sieve	Cum. wt. (gm)	% Pass.	Sieve	Cum. wt. (gm)	% Pass.
1.0 mm	0.06	100	10 mm	0.04	100
500 µm	0.21	100	500 µm	0.15	100
300 µm	0.50	100	300 µm	0.33	100
250 µm	2.43	98	250 µm	2.71	98
180 µm	29.72	71	180 µm	27.87	75
125 µm	76.60	26	125 µm	86.57	24
90 µm	100.80	4	90 µm	111.62	2
63 µm	101.61	2.3	63 µm	112.49	0.9
Pan.			Pan.	112.52	

Untreated.

SUMMARY OF DATA		
LIQUID LIMIT _____	S.D. _____	pH _____
PLASTIC LIMIT _____	E.C.M. _____	p. _____
PLASTIC INDEX _____	% SAND _____	CLASSIFICATION _____
LINEAR SHRINKAGE _____	% SILT _____	
FREE SWELL _____	% CLAY _____	

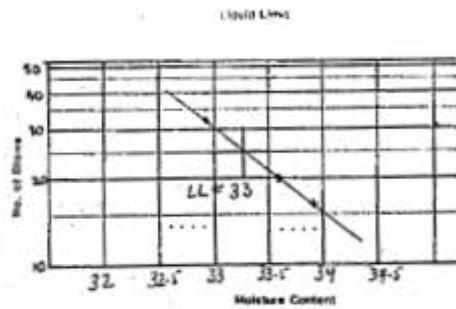
SOIL TEST DATA

Job Name: Westgate Park.
Date: 4.10.54

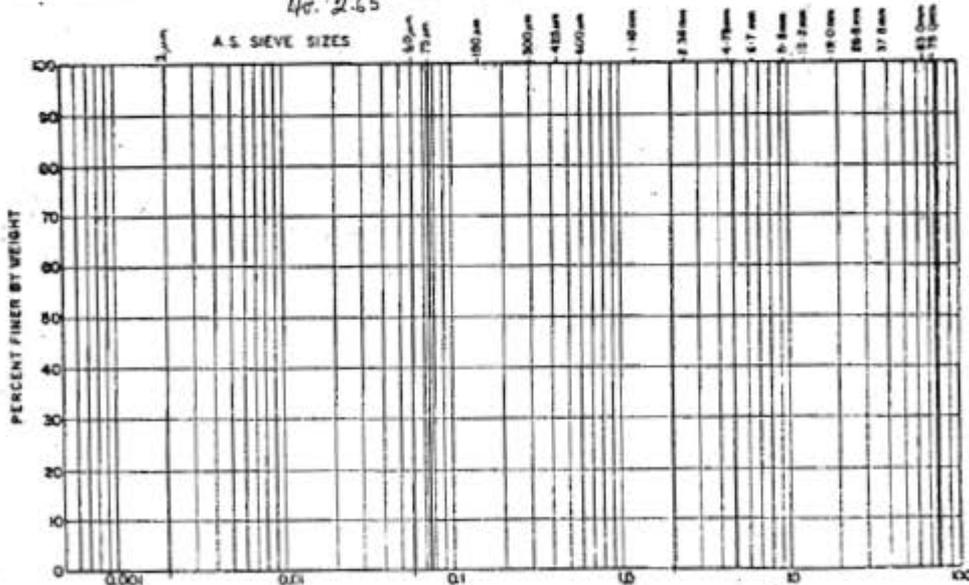
Date Number: 33-84-59
Depth: 9.65 - 10.0 m

	with organic & shells. LIQ. LIMB					PLASTIC LIMB		Liquid Shrinkage	
	1	2	3	4	5	1	2	Moist No.	Shrink %
Container No.	E5	E6	C5			E6	Z1		L4
Container Wt.	20.52	20.86	20.36			19.60	20.24	Liquid Shrinkage	% 7.2%
Wet & Container	44.40	47.75	42.75			31.06	29.54	Free Sand	
Dry & Container	38.49	41.00	37.83			29.37	28.17		
No. of Blows	32	20	16					Clay No.	6
Moisture Content	32.9	33.6	33.9			17.3	17.3	Free Sand	70%

Soil Particle Density with organic & shells.		
Temperature	14°	14°
Bottle No.	B	C
Volume of Water	80.07	78.87
Weight of Bottle & Soil	159.85	159.21
Weight of Bottle & Soil & Water	379.06	378.29
Weight of Bottle & Water	15° 329.46	328.20
Soil Particle Density	2.646	2.656



Gr. 2.65



Tested by _____ Computed by _____ Checked by _____
N.B. Unless otherwise specified, all weights are in grams and volumes in millilitres.

Bore Number..... 33.84.59 (Westgate)
 Sample Number..... 9.65-10.00
 Flask Number..... 1
 Hydrometer Number... 295

Bottle Weight (1)..... 80.07
 Bottle & Soil Weight (1)..... 159.85
 Bottle & Soil & Water Weight (1)... 379.08
 Bottle & Water Weight (1)..... 329.46
 Soil Particle Density (1)..... 2.65

Bottle Weight (2)..... 78.87
 Bottle & Soil Weight (2)..... 159.21
 Bottle & Soil & Water Weight (2)... 378.29
 Bottle & Water Weight (2)..... 328.20
 Soil Particle Density (2)..... 2.66

Average Soil Particle Density..... 2.65
 Wet Mass..... 71.30
 Dry Mass..... 71.30
 Mass of Untreated Subsample..... 71.30
 Dry Mass of Untreated Subsample..... 71.30
 Moisture Content of Untreated Subsample... 0.0 %

Meniscus Correction..... 1
 Dispersant Correction.... 4
 Temperature Correction... 1.3

Elapsed Time (ET)	Reading	RH	RC	F1	F2	F3	D	% Passing (PP)
0.5	32.0	33.0	28.3	3.48	1.305	14.14	64.3	39.7
1.0	28.0	29.0	24.3	3.57	1.305	10.00	46.6	34.1
2.0	26.0	27.0	22.3	3.62	1.305	7.07	33.4	31.3
4.0	23.0	24.0	19.3	3.69	1.305	5.00	24.1	27.1
8.0	20.0	21.0	16.3	3.75	1.305	3.54	17.3	22.9
15.0	19.0	20.0	15.3	3.78	1.305	2.58	12.7	21.5
30.0	17.0	18.0	13.3	3.82	1.305	1.83	9.1	18.7
60.0	16.0	17.0	12.3	3.84	1.305	1.29	6.5	17.3
120.0	15.0	16.0	11.3	3.86	1.305	0.91	4.6	15.9
240.0	13.0	14.0	9.3	3.91	1.305	0.65	3.3	13.0
1380.0	8.0	9.0	4.3	4.02	1.305	0.27	1.4	6.0

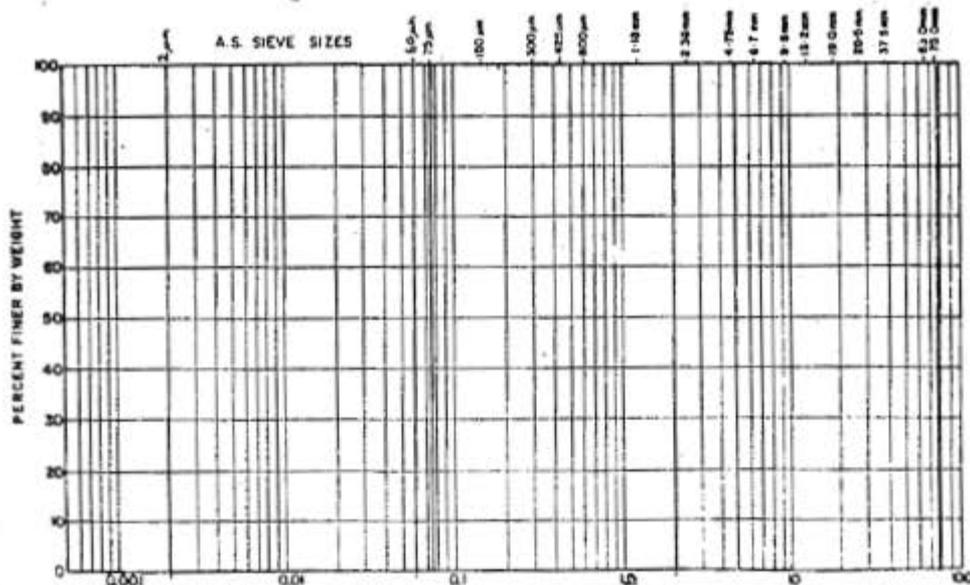
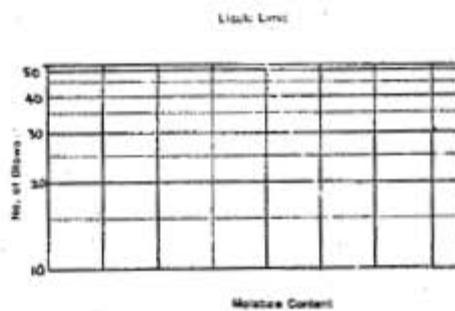
SOIL TEST DATA

Job Number *Westgate Rd.*
Date *10.10.84*

Soil Number *33.84.63*
Depth *0.40-1.62 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage	
	1	2	3	4	5	1	2		
Estimate No.								Mould No.	
Container Vol.								Linear Shrinkage	
Wet & Container								Free Swell	
Dry & Container									
No. of Blows								Cylinder No.	<i>14</i>
Moisture Content								First Seal	<i>20</i>

Soil Particle Density		
Temperature		
Dottle No.		
Weight of Dottle		
Weight of Bottle & Soil		
Weight of Dottle & Soil & Water		
Weight of Dottle & Water		
Soil Particle Density		



Tested by _____ Computed by _____ Checked by _____
N.B. 100% between brackets is weights and volumes in relation.

66

Hydrometric Analysis

- Mass of material retained on #10 sieve
- Dry mass of material retained on #10 sieve
- Mass of untreated subsample
- Moisture content of untreated subsample
- Dry mass of untreated subsample $M_1 \times 100 / L_1 \times W$
- Dry mass of subsample retained on #10 sieve after treatment
- Dry mass of subsample passing #10 sieve plus dispersion
- Dry mass of 500µ dispersion
- Dry mass of subsample passing #10 sieve
 (if untreated use $M_1 \times M_2 / (M_1 + M_2)$)
 (if untreated use $M_1 \times M_2 / M_2$)
- $M_1 \times M_2 / (M_1 + M_2)$
- Loss of mass in pretreatment $(1 - M_2 / M_1) \times 100$

	M ₁ gm
	M ₂ gm
	M ₃ gm
	W %
	M ₄ gm
	M ₅ gm
	M ₆ gm
	M ₇ gm
	M ₈ gm
	M ₉ gm
	P %

N.B. Very shelly.
Most of the loss on pre-treatment would have been due to HCl.
Coarse fraction is basalt aggregate (road metal?) < 10mm
Some coarse quartz sand.

Meniscus correction C_m

10W -
108.27

Soil particle density ρ_s

10W -
99.96
10W -
89.01

$D_r = \frac{P_2 \times C_2 + P_3 \times C_3}{C_1}$

Discriminant correction C_d

Sedimentation test number

Washing: $100 \times \frac{C_2}{C_1} = \frac{C_2}{C_1} \times R_c$

Temperature correction C_t

Hydrometer No.

$\frac{0.0027}{R_c - 1}$

Start time

Actual time (hrs. min.)

Elapsed time (mins.)

Temperature (°C)

R_h

R_h - R_h + C_d

R_h - R_h + C_d - C_t

F₁

F₂

F₃

D (µm)

% passing

Sieve	Cum. wt.	% Pass.		Sieve	Cum. wt.	% Pass.			
5.6mm	11.21	90		5.6mm	11.93	87			
4.0mm	12.23	89		4.0mm	12.83	86			
2.0mm	14.23	87		2.0mm	14.56	84			
1.0mm	19.97	82		1.0mm	20.37	77			
500µ	33.32	69		500µ	31.64	64			
355µ	41.12	62		355µ	38.03	57			
250µ	57.12	47		250µ	49.94	44			
180µ	81.15	25		180µ	67.63	24			
125µ	100.46	7		125µ	82.67	6			
90µ	103.93	4	63µ (14.33)	4	90µ	85.20	4	63µ	85.30

Untreated

Treated

SUMMARY OF DATA		
LIQUID LIMIT	_____	E.O. _____
PLASTIC LIMIT	_____	E.C.N. _____
PLASTIC INDEX	_____	% SAND _____
LINEAR SHRINKAGE	_____	% SILT _____
FREE SWELL	_____	% CLAY _____
		CLASSIFICATION _____

Hydrometer Analysis

- Mass of material passing 4.75 mm sieve
- Dry mass of material retained on 4.75 mm sieve
- Mass of untreated substrate
- Moisture content of untreated substrate
- Dry mass of untreated substrate $M_1 \times 100 / (100 + w)$
- Dry mass of subsample retained on 4.75 mm sieve after treatment
- Dry mass of subsample passing 4.75 mm sieve after treatment
- Dry mass of 100% clay
- Dry mass of subsample passing 4.75 mm sieve $M_2 \times 100 / (100 + w)$ (if pretreated use $M_2 - M_1 - M_3$)
 (if untreated use $M_2 - M_1$)
- $M_2 \times M_1 / (M_2 - M_1)$
- Loss of mass w/o pretreatment $(1 - M_2/M_1) \times 100$

	M_1, gm
	M_2, gm
	M_3, gm
	$w, \%$
	M_4, gm
	M_5, gm
	M_6, gm
	M_7, gm
	M_8, gm
	M_9, gm
	M_{10}, gm
	M_{11}, gm
	M_{12}, gm
	M_{13}, gm
	$P, \%$

- Moisture correction C_p
- Dispersant correction C_d
- Temperature correction C_t
- start time

100.20

- Soil particle density ρ_s
- Hydrometer No.

100.20
112.83
105.01

$D = \frac{1}{\rho_s} \times \frac{1}{1 + \frac{w}{100}}$

Factor $100 \times 2 R_{cd} / (100 + w)$
 $= \frac{0.627 R_{cd}}{\rho_s - 1}$

	$\times R_c$

- Actual time (hrs, mins)
- Closed time (mins)
- Temperature (C)
- R_h
- $R_h + R_h + C_c$
- $R_c - R_h + C_c - C_d$
- F_1
- F_2
- F_3
- F_4
- F_5
- F_6
- % passing

Size	Cum. wt. (gm)	% Pass.	Size	Cum. wt. (gm)	% Pass.
1.0mm	0.02	100	1.0mm	-	100
500	0.08	100	500	0.05	100
355	0.16	100	355	0.17	100
250	1.41	99	250	1.55	99
180	12.63	87	180	13.93	87
125	64.71	35	125	70.19	35
90	96.56	4	90	106.82	2
63	98.04	2.2	63	107.76	0.2
Pan	98.11	-	Pan	107.83	-

Treated.

SUMMARY OF DATA		
LIQUID LIMIT	_____	LL
PLASTIC LIMIT	_____	PL
PLASTIC INDEX	_____	PI
LINEAR SHRINKAGE	_____	SL
FREE SWELL	_____	FS
	SO	_____
	E.C.N.	_____
	NSAND	_____
	%SLT	_____
	%CLAY	_____
	CLASSIFICATION	_____

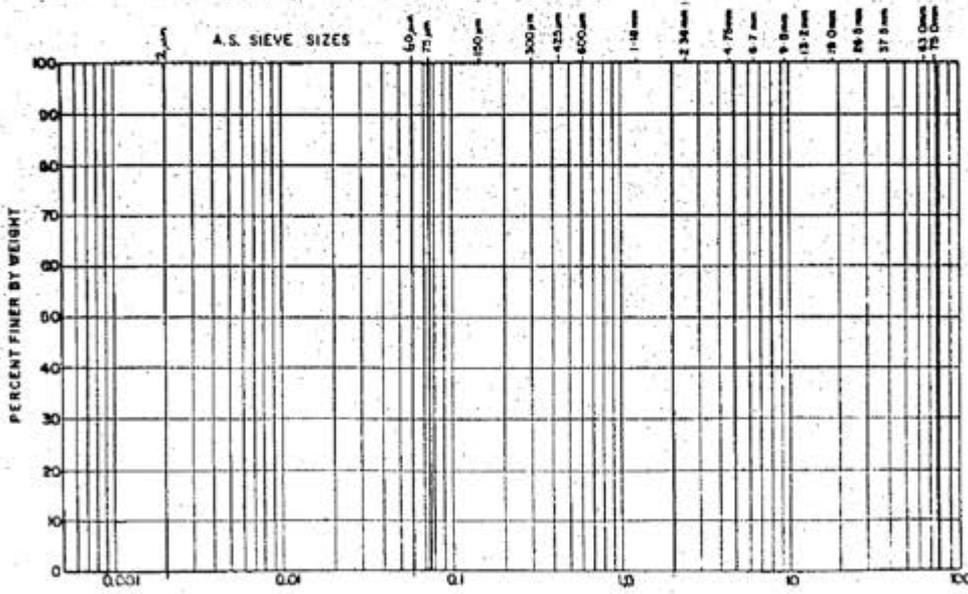
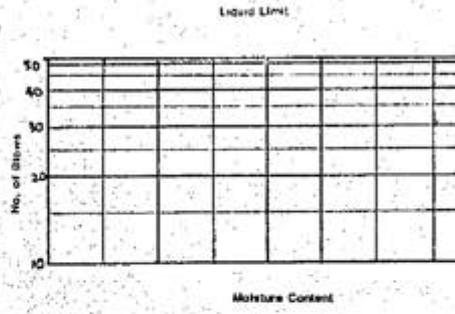
SOIL TEST DATA

Job Number *Westgate Park*
 Date *5.10.84*

Bois Number *33.84.63*
 Depth *4.86 m - 5.63 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage	
	1	2	3	4	5	1	2		
Container No.								Moisture	
Container Wt.								Liquid Shrinkage	
Wet & Container								Free Swell	
Dry & Container								Change No. <i>11</i>	
No. of Blows								Free Swell <i>157</i>	
Moisture Content									

Soil Particle Density	
Temperature	
Bottle No.	
Weight of Bottle	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____
 N.B. Unless otherwise indicated all weights are in grams and volumes in millilitres. Checked by _____

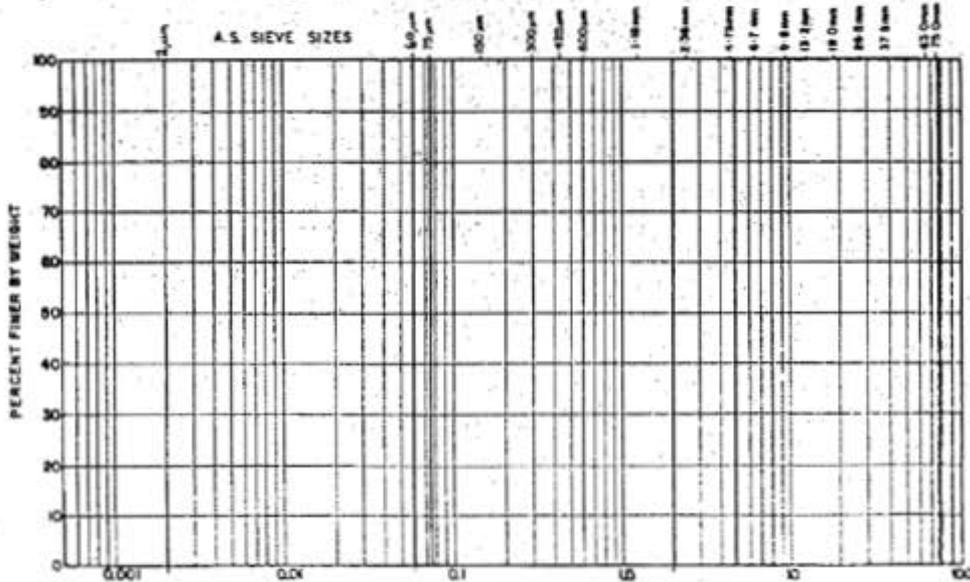
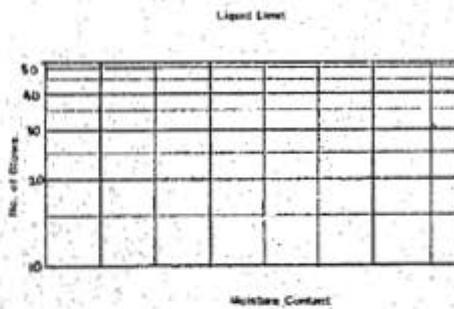
SOIL TEST DATA

Job Number *Westgate Park*
 Date *10.10.54*

Core Number *33.84.72*
 Depth *6.95 m - 8.35 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage	
	1	2	3	4	5	1	2	Shrinkage %	Shrinkage Ratio
Container No.									
Container No.									
Wts & Contents									
Dry & Container									
No. of Blows								Cylinder No.	8
Moisture Content								Free Swell	20%

Soil Particle Density		
Apparatus		
Bottle No.		
Weight of Bottle		
Weight of Bottle & Soil		
Weight of Bottle & Soil & Water		
Weight of Bottle & Water		
Soil Particle Density		



Tested by _____ Computed by _____ Checked by _____
N.B. (1) All weights indicated as weights wet unless otherwise stated in table.

24

14.2
wet
wt

Hydrometer Analysis

- Mass of material passing ... mm sieve
- Dry mass of material retained on ... mm sieve
- Mass of untreated subsample
- Moisture content of untreated subsample
- Dry mass of untreated subsample $M_1 \times \frac{100}{100 + w}$
- Dry mass of subsample retained on ... mm sieve after treatment
- Dry mass of subsample passing ... mm sieve plus desiccant
- Dry mass of 100% dispersant
- Dry mass of subsample passing ... mm sieve (if pretreated use $M_2 - M_4 - M_5$) (if untreated use $M_2 - M_4 - M_5$)
- $M \times M_2 / M_1 - M_4$
- Loss of mass in pretreatment $(1 - \frac{M_4 - M_5}{M_2}) \times 100$

	M ₁ , gm
	M ₂ , gm
	M ₃ , gm
	W, %
	M ₄ , gm
	M ₅ , gm
	M ₆ , gm
	M ₇ , gm
	M ₈ , gm
	P, %

- Meniscus correction C_m
- Dispersant correction C_d
- Temperature correction C_t
- Start time

100-26

- Soil particle density ρ_s
- Sedimentation flask number
- Hydrometer No.

100-26
109.68
TDW
105.5

$D = F_1 \times F_2 \times F_3 \text{ (gm)}$
 $\% \text{ passing} = 100 \times \frac{M_2}{M_1} \times R_c$
 $R_c = \frac{0.422 \times P_s}{P_s - 1}$

- Actual time (See Form)
- Elapsed time (min.)
- Temperature (°C)
- R₁h
- R₂h = R₁h × C_t
- R₃h = R₂h × C_d × C_m
- F₁
- F₂
- F₃
- D (gm)
- % passing

Sieve	Cum. wt (gm)	% Pass.	Sieve	Cum. wt (gm)	% Pass.
10mm	0.45	100	10mm	✓	
500mm	0.36	100	500mm	0.06	100
355mm	0.50	100	355mm	0.14	100
250mm	2.16	96	250mm	1.56	99
180mm	16.70	85	180mm	12.93	88
125mm	64.66	41	125mm	60.90	42
90mm	106.71	3	90mm	103.14	2
63mm	108.34	2	63mm	105.31	0.2
Pan.	108.46		Pan.	105.40	✓

Untreated

Treated

SUMMARY OF DATA		
LIQUID LIMIT	_____	S.G. _____
PLASTIC LIMIT	_____	E.C.M. _____
PLASTIC INDEX	_____	% SAND _____
LINEAR SHRINKAGE	_____	% SILT _____
FREE SWELL	_____	% CLAY _____
		CLASSIFICATION _____

SOIL TEST DATA

Job Number *Westgate Park*

Base Number 33-84-72

Date 4.10.84

Depth 9.90 - 11.90 m

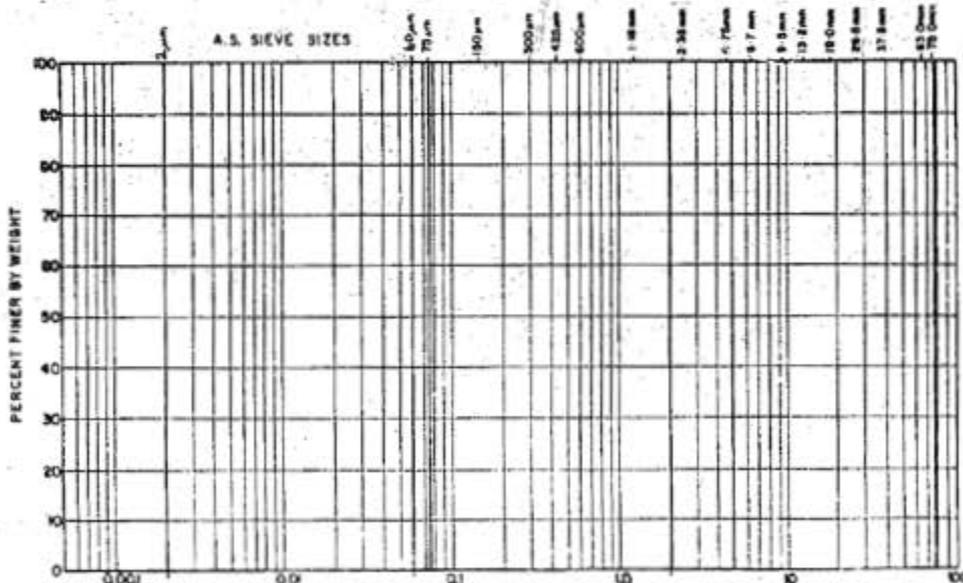
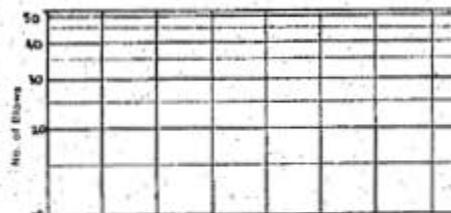
	Liquid Limit					Plastic Limit		Linear Shrinkage	
	1	2	3	4	5	1	2	Mould No.	Linear Shrinkage
Container No.	C7					67	6 F6		54
Container Wt.	20.70					22.16	19.88	Linear Shrinkage	1 1/2 = 9.1%
Wt. & Contents	236.99					28.11	28.40	Free Swell	with organics & CaCO ₃
Dry & Content	32.28					27.21	27.08		
Wt. of Dish	16							Cylinder No.	3
Moisture Content	40.7					17.6	18.3	Test Switch	60%

LL = 39

PL = 18

Soil Particle Density with organics & CaCO ₃		
Temperature	15°	15°
Bottle No.	Y	Z
Weight of Bottle	146.88	150.80
Weight of Bottle & Soil	246.83	269.61
Weight of Bottle & Soil & Water	707.9	723.7
Weight of Bottle & Water	645.3	649.5
Soil Particle Density	2.676	2.663

A_v = 2.67



Tested by

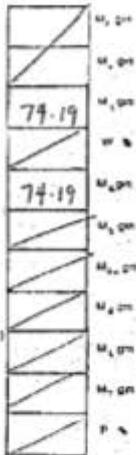
Computed by

Checked by

Note: Unless otherwise specified, all weights are in grams and all volume in milliliters.

Hydrometer Analysis without organics & CaCO₃

- Mass of material passing ... gms
- Dry mass of material retained on ... gms
- Mass of untreated subsample
- Moisture content of untreated subsample
- Dry mass of untreated subsample $M_u \times 100 / (100 + w)$
- Dry mass of subsample retained on ... gms after treatment
- Dry mass of subsample passing ... gms after plus discharge
- Dry mass of 100% dispersion
- Dry mass of subsample passing ... gms sieve (if untreated use $M_u \times M_u - M_u$)
- $M_u \times M_u / M - M_u$
- Loss of mass in pretreatment $(M - M_u) \times 100 / M_u$



$$\frac{w}{100} \times \frac{100}{100 + w}$$

I.D.W. — 74.19
 After H₂O₂ — 70.32 → 5.52
 After HCl — 67.6 gm → 1.07
 Dry & Container — 565.0
 Container — 497.4
 67.6

Mendocino correction C _m	1
Dispersant correction C _d	6
Temperature correction C _t	1.3
Start time	10.57

Soil Particle Density ρ _s	2.67
Sturmation disk number	2
Hydrometer U ₀	274

$D_r = \frac{100}{U} \times F_s \times F_d \text{ (gm)}$
 $\text{Spacing} = 100 \times \frac{1}{U} \times F_s \times F_d$
 $\times R_c$
 $\times \frac{0.623 \rho_s}{\rho_s - 1}$

Actual time (Des, min.)	10.57	10.58	10.59	11.01	11.05	11.12	11.27	11.57	12.57	2.57	23 hr	Sieve	Cum. wt. (gms)	% Pass.
Classed (see print)	1/2	1	2	4	8	15	30	1 hr	2 hr	4 hr	23 hr	500 μm	—	100
Temperature (°C)												365	0.75	99
R ₁ h	35	33	31	26	22	19	16.5	.15	13	11	6	250 μm	2.16	97
R ₂ h = R ₁ h + C _m												150 μm	3.71	96
R ₃ h = R ₂ h + C _d												125 μm	8.94	87
F ₁	See Computer print											90 μm	22.51	67
F ₂												63 μm	26.20	—
F ₃												Pass	—	—
D (gm)														
% passing														

SUMMARY OF DATA			
LIQUID LIMIT	39	S.G.	2.67
PLASTIC LIMIT	18	E.C.N.	—
PLASTIC INDEX	21	% SAND	—
LINEAR SHRINKAGE	9.5	% SILT	—
FREE SWELL	60%	% CLAY	—
		CLASSIFICATION	—

Bore Number..... 33.84.72(Westgate)
 Sample Number..... 9.80-11.90
 Flask Number..... 2
 Hydrometer Number... 274

Bottle Weight (1)..... 146.88
 Bottle & Soil Weight (1)..... 246.83
 Bottle & Soil & Water Weight (1)... 707.90
 Bottle & Water Weight (1)..... 645.30
 Soil Particle Density (1)..... 2.68

Bottle Weight (2)..... 150.80
 Bottle & Soil Weight (2)..... 267.61
 Bottle & Soil & Water Weight (2)... 723.70
 Bottle & Water Weight (2)..... 649.50
 Soil Particle Density (2)..... 2.66

Average Soil Particle Density..... 2.67
 Wet Mass..... 67.60
 Dry Mass..... 67.60
 Mass of Untreated Subsample..... 67.60
 Dry Mass of Untreated Subsample..... 67.60
 Moisture Content of Untreated Subsample... 0.0 %

Meniscus Correction..... 1
 Dispersant Correction.... 6
 Temperature Correction... 1.3

Elapsed Time (ET)	Reading	RH	RC	F1	F2	F3	D	% Passing (PP)
0.5	35.0	36.0	31.3	3.47	1.298	14.14	63.6	46.1
1.0	33.0	34.0	29.3	3.51	1.298	10.00	45.6	43.2
2.0	31.0	32.0	27.3	3.56	1.298	7.07	32.6	40.2
4.0	26.0	27.0	22.3	3.67	1.298	5.00	23.8	32.9
8.0	22.0	23.0	18.3	3.76	1.298	3.54	17.2	27.0
15.0	19.0	20.0	15.3	3.82	1.298	2.58	12.8	22.5
30.0	16.5	17.5	12.8	3.88	1.298	1.83	9.2	18.9
60.0	15.0	16.0	11.3	3.91	1.298	1.29	6.6	16.7
120.0	13.0	14.0	9.3	3.96	1.298	0.91	4.7	13.7
240.0	11.0	12.0	7.3	4.00	1.298	0.65	3.4	10.8
1380.0	6.0	7.0	2.3	4.11	1.298	0.27	1.4	3.4

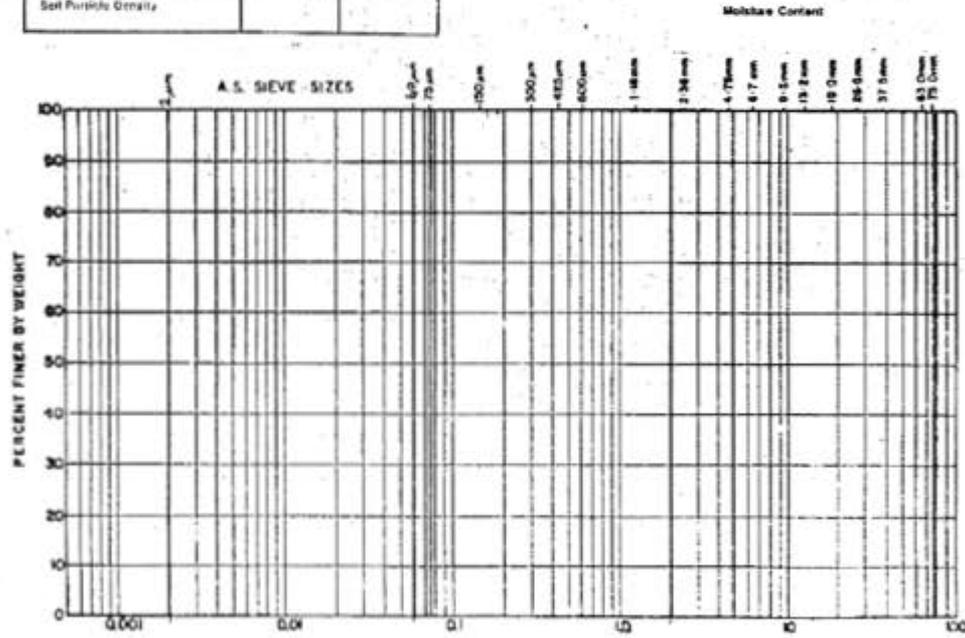
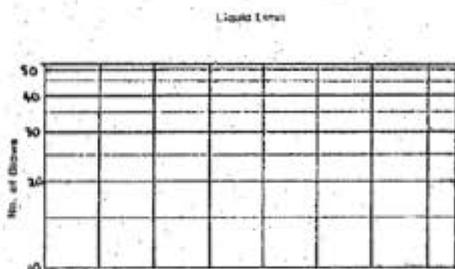
SOIL TEST DATA

Job Number *Westgate Park*
 Date *5-10-84*

Box Number *33-84-73*
 Depth *6.95 m - 8.35 m*

	Liquid Limit					Plastic Limit		Linear Shrinkage	
	1	2	3	4	5	1	2	Shrinkage (%)	Shrinkage (%)
Container No.									
Container Vol.									
Wt. & Contents									
Gr. & Content									
No. of Blows								1	
Moisture Content									20%

Soil Particle Density	
Preparation	
Bath No.	
Weight of Bath	
Weight of Bottle & Soil	
Weight of Bottle & Soil & Water	
Weight of Bottle & Water	
Soil Particle Density	



Tested by _____ Computed by _____ Checked by _____
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29

25 c
wt
ing

Hydrometer Analysis

Mass of material passing _____ gm

Dry mass of material retained on _____ gm

Mass of untreated subsample _____ gm

Moisture content of untreated subsample _____ %

Dry mass of untreated subsample $M_u \times 100$ _____ gm

Dry mass of subsample retained on _____ gm after treatment

Dry mass of subsample passing _____ gm after plus dispersed

Dry mass of 100% dispersant _____ gm

Dry mass of subsample passing _____ gm after (if corrected use $M_u(M_u - M_d)$)
(if untreated use $M_u(M_u - M_d)$)

$M_u M / M - M_d$

Loss of mass in pretreatment $(M - M_u) / M \times 100$

	M, gm
	M, gm
	M, gm
	M, %
	M, gm
	P, %

Loss on treatment
 $\frac{10W - 70W}{70W} \times 100$
 2.06%

Moisture correction C_m 10W

Dispersion correction C_d 52.43

Temperature correction C_t 70W

Start time 81.254

Soil particle density ρ_s _____

Bottomometer disk number 10W

Hydrometer No. 84.64

$D = F \times F_1 \times F_2 / \rho_s$

$\frac{100 \times 100 \times R_c}{M_u} \times R_c$

$\frac{0.0027}{\rho_s - 1}$

Actual (mg (hrs, mm))	Sieve	Cum. wt. (g)	% Pass	Sieve	Cum. wt.	% Pass
Elapsed time (mins.)	1.60	0.01	100	2.0	-	100
Temperature (C)	500	0.03	100	1.0	0.04	100
W^2	355	0.08	100	600	0.1	100
$W_1 - W^2 = C_u$	250	0.97	99	355	0.20	100
$W_2 - W_1 = C_2 - C_1$	180	7.58	91	250	1.15	99
P_1	125	46.8	94	180	7.49	91
P_2	90	79.27	3	125	45.51	46
P_3	63	80.46	1	90	81.78	3
D (gm)	Pan	80.57	-	63	83.57	1.3
% passing				Pan	83.66	-

~~Treated.~~ Un.Treated.

SUMMARY OF DATA

LIQUID LIMIT _____ S.G. _____ pH _____

PLASTIC LIMIT _____ E.C.N. _____ P. _____

PLASTIC INDEX _____ SAND _____ CLASSIFICATION _____

LINEAR SHRINKAGE _____ S.S.T. _____

FREE SWELL _____ N.C.LAY _____