APPENDIX 2.4.5
Tri-axial Cell Permeability Analysis for 7 No. undisturbed samples obtained from Drehid Site

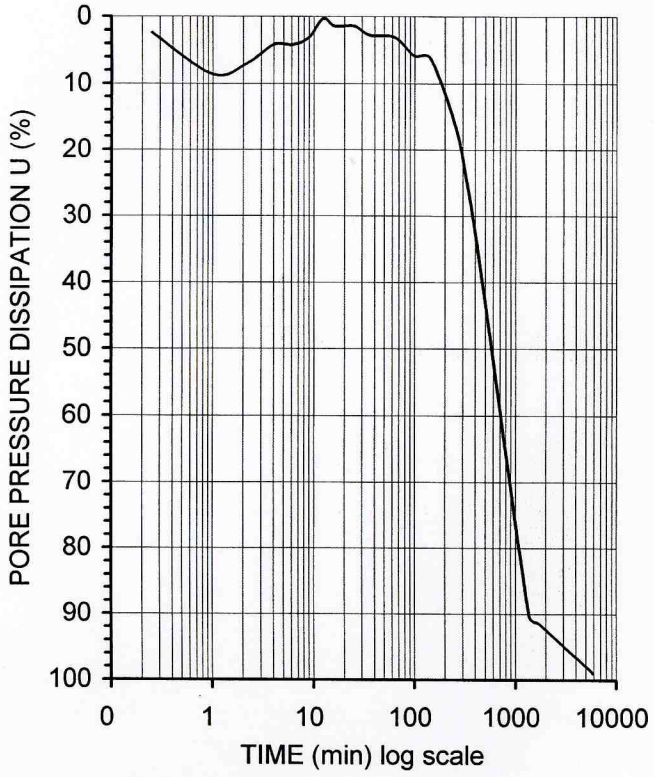
TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site.
TRIAL HOLE No.:

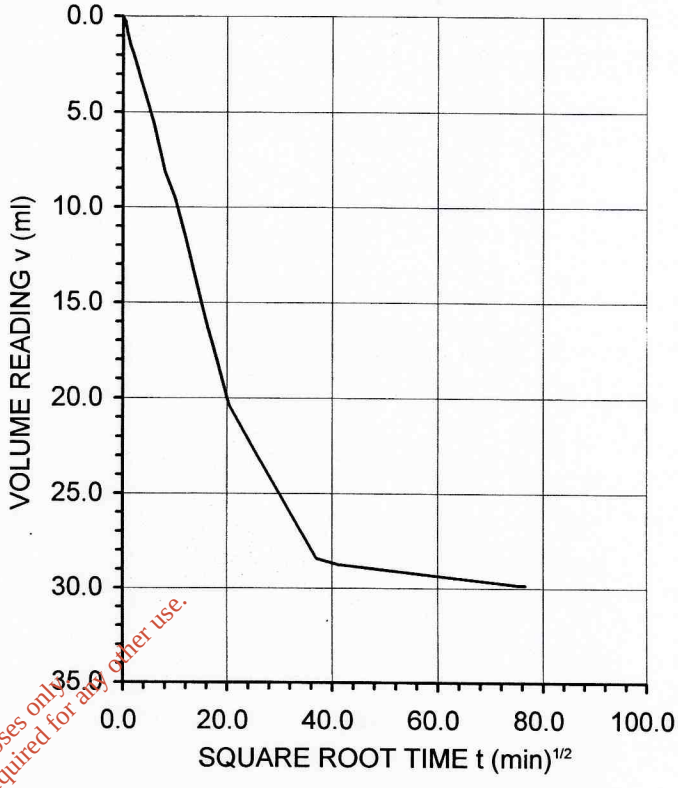
SAMPLE DEPTH:
SAMPLE No: TH7

TEST No.: 1
σ_3' (kPa): 25

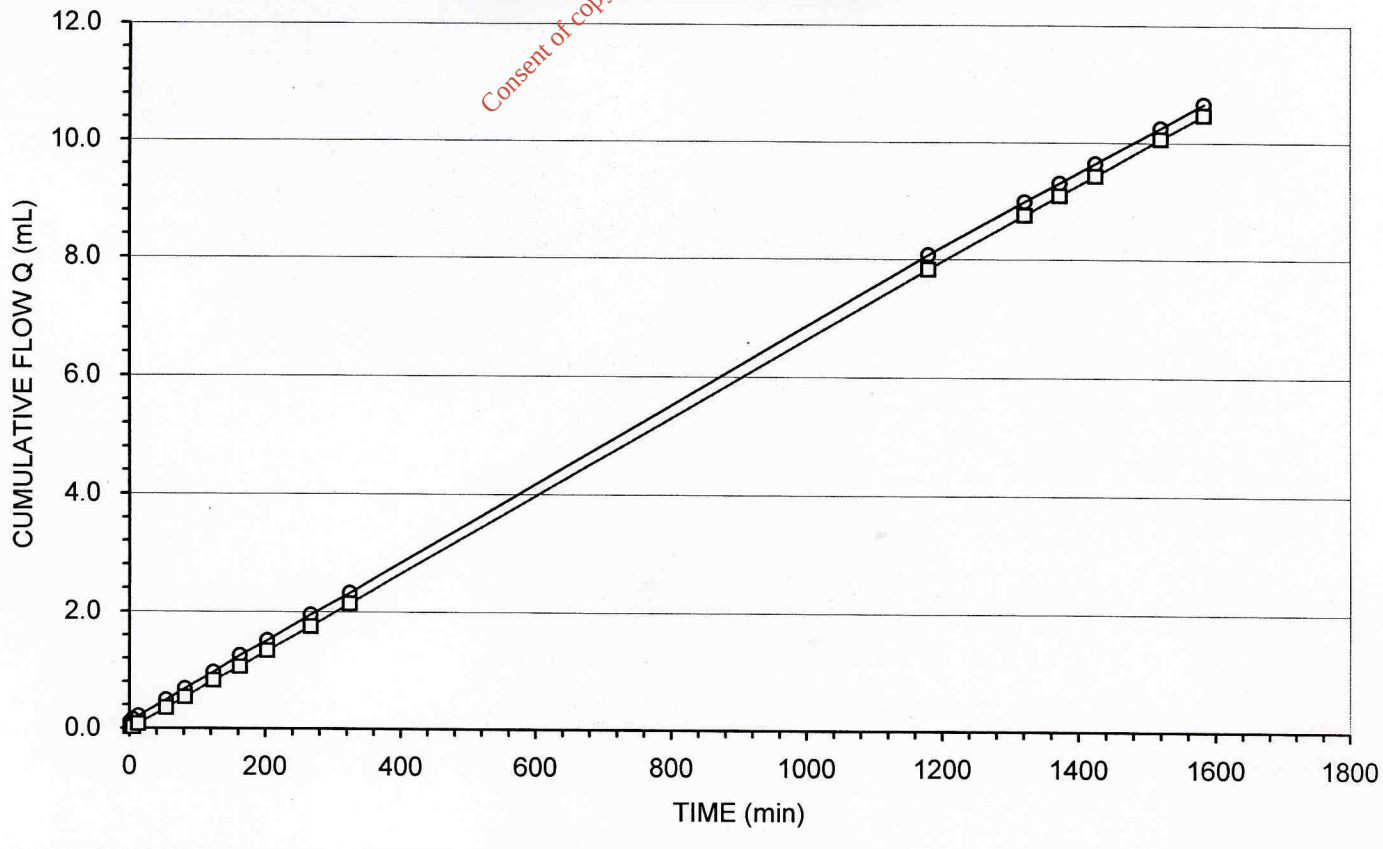
PRESSURE DISSIPATION v. LOG TIME



VOLUME CHANGE v. SQUARE ROOT TIME



CUMULATIVE FLOW v. TIME



TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site. **Location ID:** **Date Sampled:**
Sample Depth: **Sample No.:** TH7

SAMPLE DESCRIPTION:	Soft-soft/firm (after test) grey slightly sandy slightly gravelly CLAY containing occasional decayed roots and rootlets.

Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	

Constant Head Permeability Test in Triaxial Cell in accordance with Test 6 of BS 1377:Part 6:1990.

Type of Specimen:		Undisturbed U100 sample taken from compacted fill.			
Method of Preparation:					
Flow Conditions:		Vertical downwards			
Test No.		1			
Diameter (D)	mm	105.8			
Area (A)	mm^2	8798			
Length (L)	mm	108.5			
Initial Moisture Content	%	19.5			
Initial Bulk Density	kg/m^3	2172			
Initial Dry Density	kg/m^3	1817			
SATURATION STAGE:					
Method of Saturation		#			
Initial Cell Pressure	kPa	50			
Initial B Value		0.95			
Total Back-Pressure Applied	kPa	325			
Period of Saturation	hour	19			
Final B Value		1			
CONSOLIDATION STAGE:					
Cell Pressure (σ_3)	kPa	399.9			
Back-Pressure (u_b)	kPa	370			
Effective Consolidation Pressure (σ'_c)	kPa	29.9			
Period of Consolidation	hour	98			
Time for 50% Dissipation (t_{50}):	mins	580			
Coefficient of Consolidation (c_{vi}):	m^2/year	8			
PERMEABILITY MEASUREMENT:					
Cell Pressure (σ_3)	kPa	399.9			
Inlet Pressure (p_1)	kPa	380			
Back Pressure (p_2)	kPa	370			
Pressure Difference (p_1-p_2)	kPa	10			
Mean Effective Stress (σ'_3)	kPa	24.9			
Test Temperature	°C	22			
Correction Factor (R_t)		0.95			
From graph of Volume of Flow (ml) v. Time (mins):					
Mean Rate of Steady Flow (q)	mL/min	0.00642			
Corresponding Head Loss (p_c)	kPa	2.03			
Hydraulic Gradient (i)		7.5			
Final Moisture Content	%	16.7			
Final Bulk Density	kg/m^3	2213			
COEFFICIENT OF PERMEABILITY:					
Mean Effective Stress (σ'_3)	kPa	25			
$\sigma'_3 = \sigma_3 - 0.5(p_1 + p_2)$					
Coefficient of Permeability in the Vertical direction (k_v) at 20°C	**m/s**	**1.5×10^{-9}**			
$k_v = \frac{1.63\ q\ L\ R_t \times 10^{-4}}{A\ ((p_1 - p_2) - p_c)}$					

REMARKS: # Increments of cell pressure and back pressure.

GSI

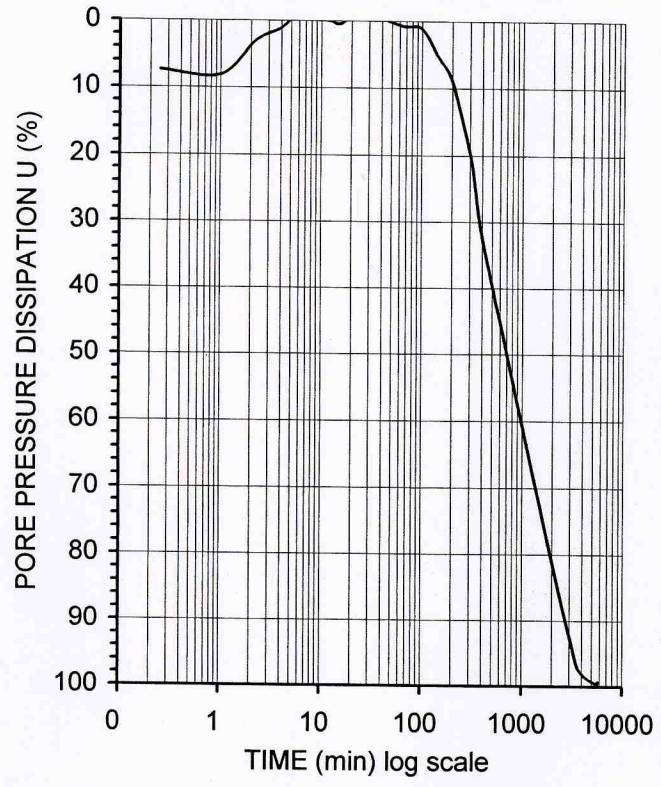
TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site.
TRIAL HOLE No.:

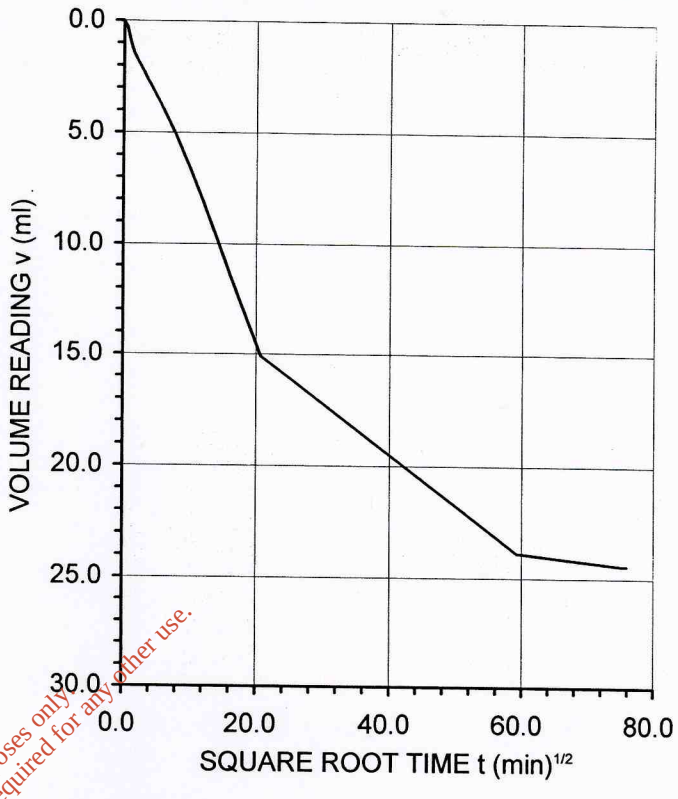
SAMPLE DEPTH:
SAMPLE No: TH6

TEST No.: 1
σ_3' (kPa): 25

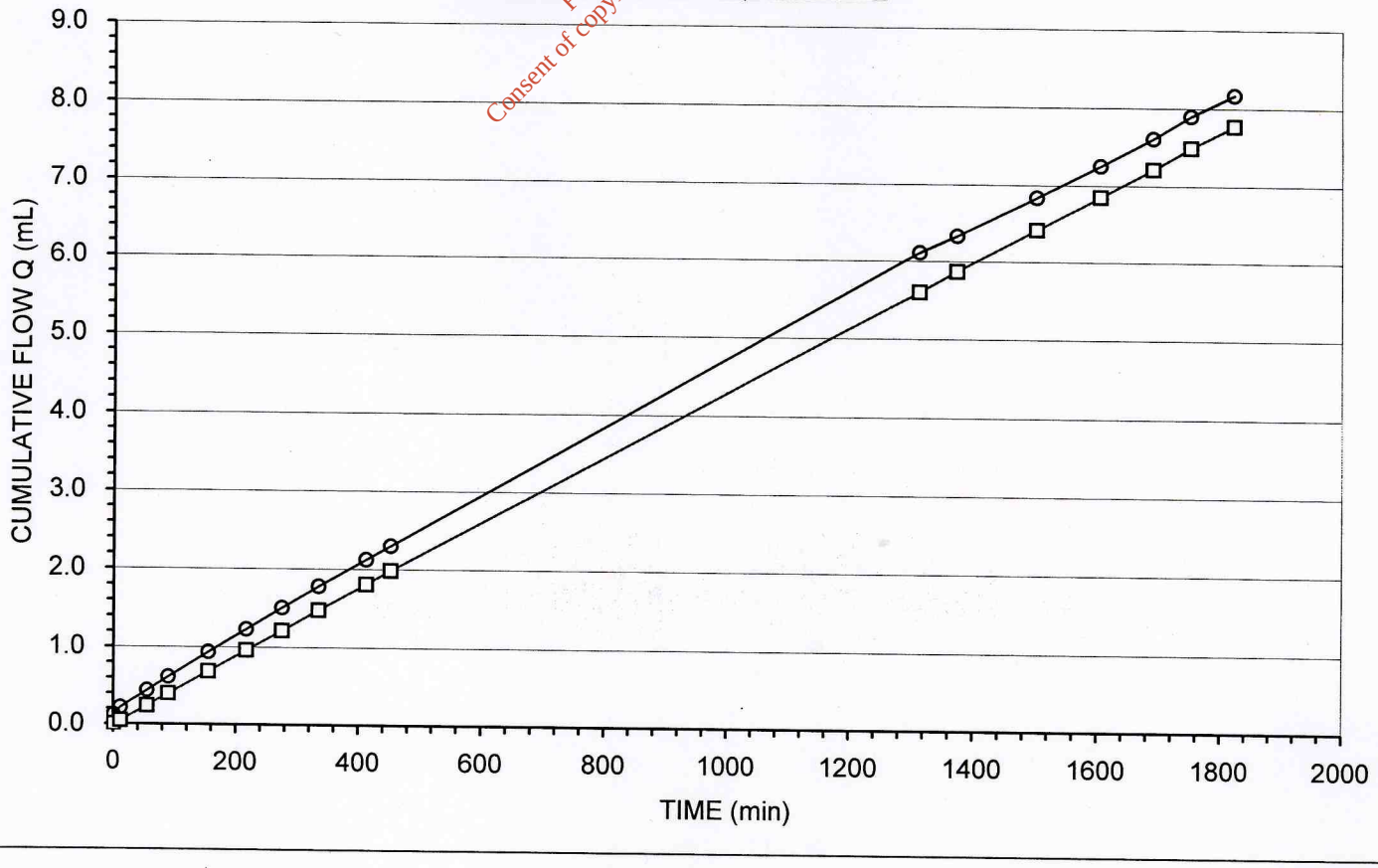
PRESSURE DISSIPATION v. LOG TIME



VOLUME CHANGE v. SQUARE ROOT TIME



CUMULATIVE FLOW v. TIME



wt99

GSI

SAMPLE No: **TH6**

TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site. **Location ID:** **Date Sampled:**
Sample Depth: **Sample No.:** TH6

SAMPLE DESCRIPTION:	Soft/firm (after test) friable grey slightly gravelly sandy CLAY containing numerous decayed roots and rootlets.

Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	

Constant Head Permeability Test in Triaxial Cell in accordance with Test 6 of BS 1377:Part 6:1990.

Type of Specimen:		Undisturbed U100 sample taken from compacted fill.			
Method of Preparation:					
Flow Conditions:		Vertical downwards			
Test No.		1			
Diameter (D)	mm	105.0			
Area (A)	mm^2	8666			
Length (L)	mm	118.9			
Initial Moisture Content	%	19.5			
Initial Bulk Density	kg/m^3	2074			
Initial Dry Density	kg/m^3	1736			
SATURATION STAGE:					
Method of Saturation		#			
Initial Cell Pressure	kPa	50			
Initial B Value		0.98			
Total Back-Pressure Applied	kPa	323			
Period of Saturation	hour	21			
Final B Value		1			
CONSOLIDATION STAGE:					
Cell Pressure (σ_3)	kPa	399.9			
Back-Pressure (u_b)	kPa	370			
Effective Consolidation Pressure (σ'_c)	kPa	29.9			
Period of Consolidation	hour	96			
Time for 50% Dissipation (t_{50}):	mins	700			
Coefficient of Consolidation (c_{vi}):	m^2/year	8			
PERMEABILITY MEASUREMENT:					
Cell Pressure (σ_3)	kPa	399.9			
Inlet Pressure (p_1)	kPa	380			
Back Pressure (p_2)	kPa	370			
Pressure Difference (p_1-p_2)	kPa	10			
Mean Effective Stress (σ'_3)	kPa	24.9			
Test Temperature	°C	22.25			
Correction Factor (R_t)		0.94			
From graph of Volume of Flow (ml) v. Time (mins):					
Mean Rate of Steady Flow (q)	mL/min	0.00426			
Corresponding Head Loss (p_c)	kPa	2.03			
Hydraulic Gradient (i)		6.8			
Final Moisture Content	%	17.7			
Final Bulk Density	kg/m^3	2099			
COEFFICIENT OF PERMEABILITY:					
Mean Effective Stress (σ'_3)	kPa	25			
$\sigma'_3 = \sigma_3 - 0.5(p_1 + p_2)$					
Coefficient of Permeability in the Vertical direction (k_v) at 20°C	**m/s**	**1.1×10^{-9}**			
$k_v = \frac{1.63\ q\ L\ R_t \times 10^{-4}}{A\ ((p_1 - p_2) - p_c)}$					

REMARKS: # Increments of cell pressure and back pressure.

GSI

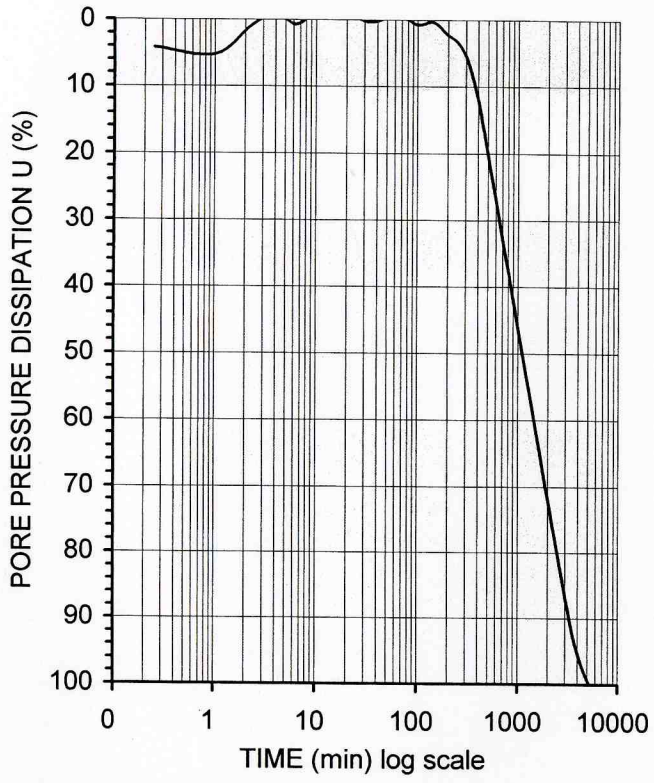
TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site.
TRIAL HOLE No.:

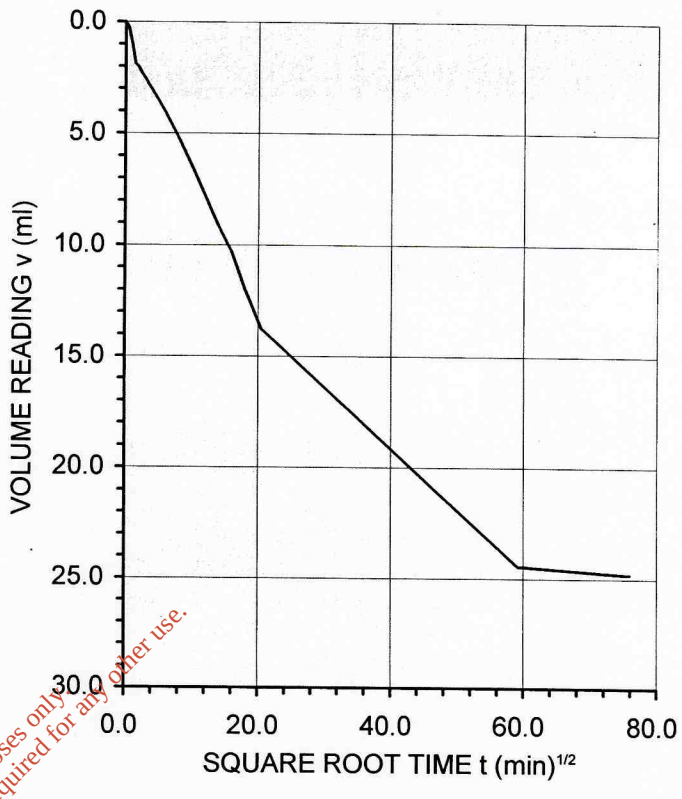
SAMPLE DEPTH:
SAMPLE No: TH5

TEST No.: 1
σ_3' (kPa): 25

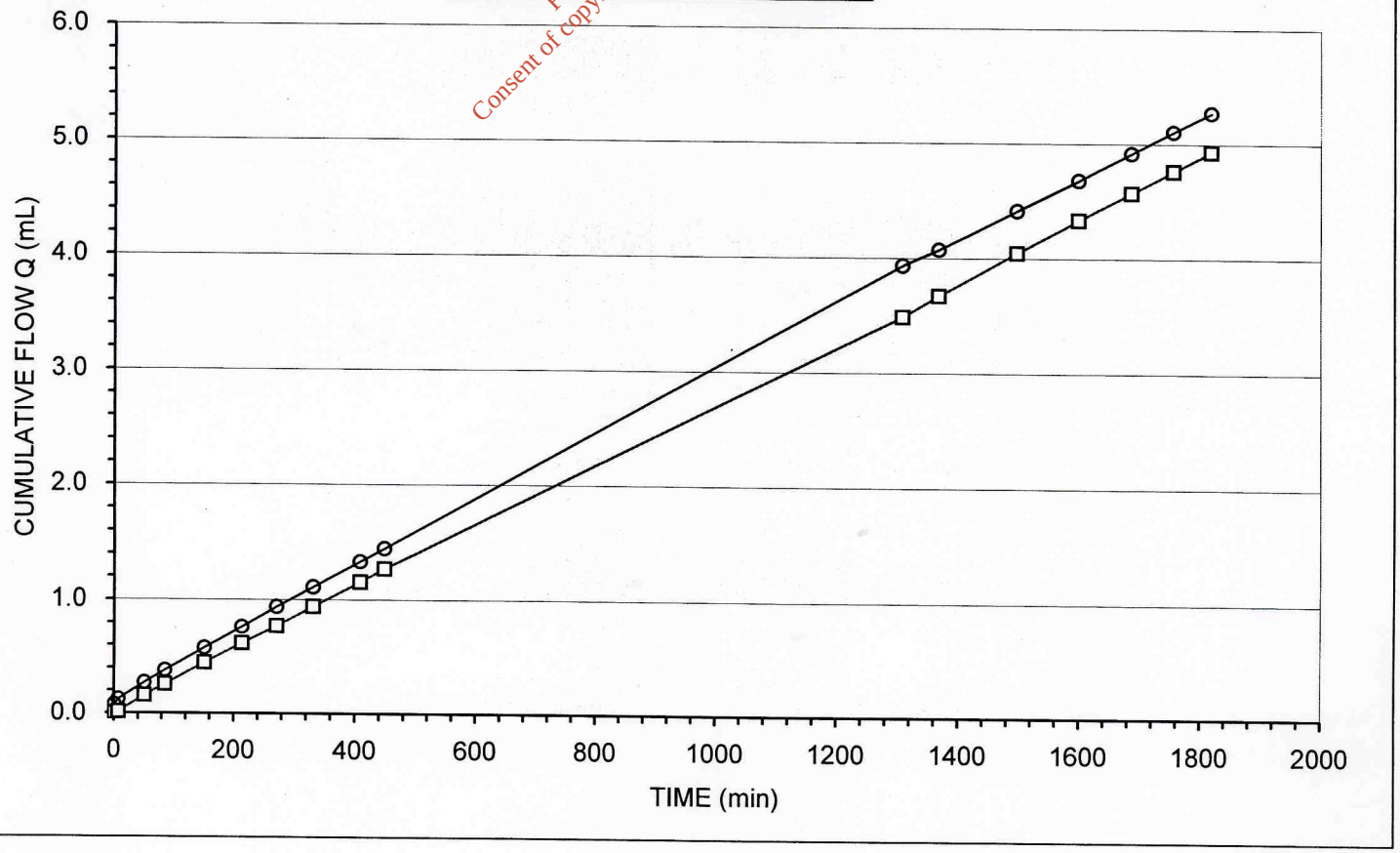
PRESSURE DISSIPATION v. LOG TIME



VOLUME CHANGE v. SQUARE ROOT TIME



CUMULATIVE FLOW v. TIME



W699

GSI

SAMPLE No: **TH5**

TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site. **Location ID:** **Date Sampled:**
Sample Depth: **Sample No.:** TH5

SAMPLE DESCRIPTION:	Soft-soft/firm (after test) grey with occasional orange brown mottlings slightly sandy gravelly CLAY containing occasional decayed roots and rootlets.

Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	

Constant Head Permeability Test in Triaxial Cell in accordance with Test 6 of BS 1377:Part 6:1990.

Type of Specimen:		Undisturbed U100 sample taken from compacted fill.			
Method of Preparation:					
Flow Conditions:		Vertical downwards			
Test No.		1			
Diameter (D)	mm	105.6			
Area (A)	mm^2	8762			
Length (L)	mm	118.1			
Initial Moisture Content	%	12.9			
Initial Bulk Density	kg/m^3	2256			
Initial Dry Density	kg/m^3	1998			
SATURATION STAGE:					
Method of Saturation		#			
Initial Cell Pressure	kPa	50			
Initial B Value		0.98			
Total Back-Pressure Applied	kPa	323			
Period of Saturation	hour	20			
Final B Value		1			
CONSOLIDATION STAGE:					
Cell Pressure (σ_3)	kPa	400.5			
Back-Pressure (u_b)	kPa	370			
Effective Consolidation Pressure (σ'_c)	kPa	30.5			
Period of Consolidation	hour	96			
Time for 50% Dissipation (t_{50}):	mins	1100			
Coefficient of Consolidation (c_{vi}):	m^2/year	5			
PERMEABILITY MEASUREMENT:					
Cell Pressure (σ_3)	kPa	400.5			
Inlet Pressure (p_1)	kPa	380			
Back Pressure (p_2)	kPa	370			
Pressure Difference (p_1-p_2)	kPa	10			
Mean Effective Stress (σ'_3)	kPa	25.5			
Test Temperature	°C	22.25			
Correction Factor (R_t)		0.94			
From graph of Volume of Flow (ml) v. Time (mins):					
Mean Rate of Steady Flow (q)	mL/min	0.00275			
Corresponding Head Loss (p_c)	kPa	2.01			
Hydraulic Gradient (i)		6.9			
Final Moisture Content	%	11.6			
Final Bulk Density	kg/m^3	2282			
COEFFICIENT OF PERMEABILITY:					
Mean Effective Stress (σ'_3) $\sigma'_3 = \sigma_3 - 0.5(p_1 + p_2)$	kPa	26			
Coefficient of Permeability in the Vertical direction (k_v) at 20°C $k_v = \frac{1.63\ q\ L\ R_t \times 10^{-4}}{A\ ((p_1 - p_2) - p_c)}$	**m/s**	**7.1×10^{-10}**			

REMARKS: # Increments of cell pressure and back pressure.

GSI

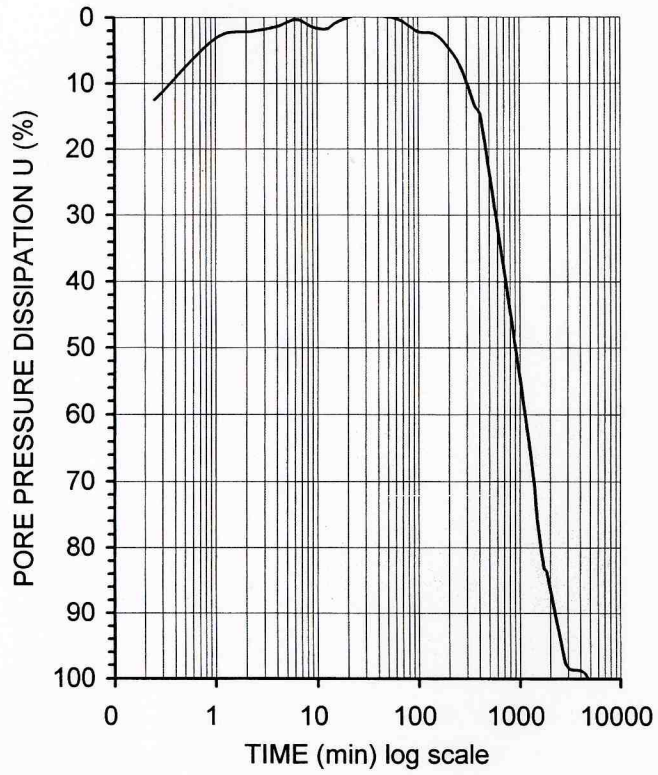
TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site.
TRIAL HOLE No.:

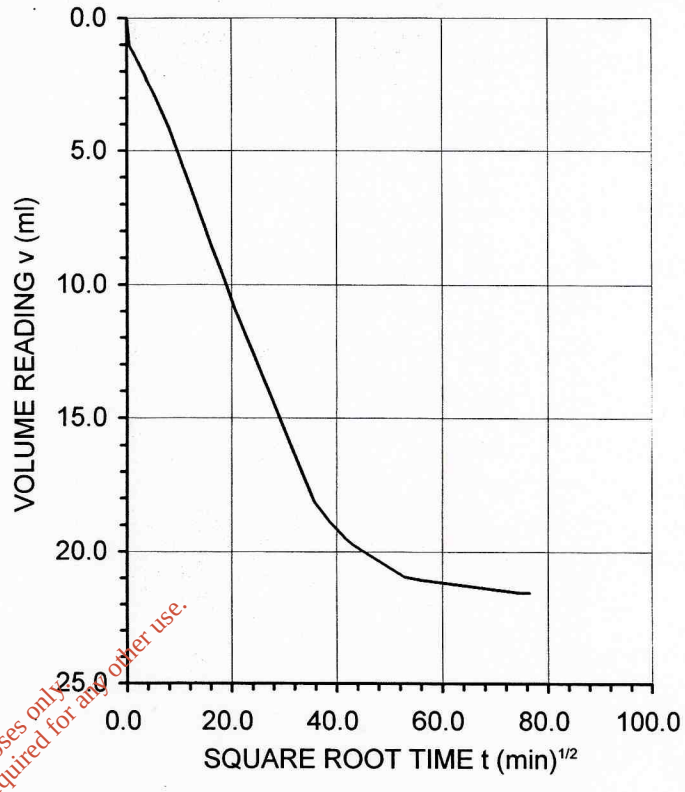
SAMPLE DEPTH:
SAMPLE No: TH4

TEST No.: 1
σ_3' (kPa): 25

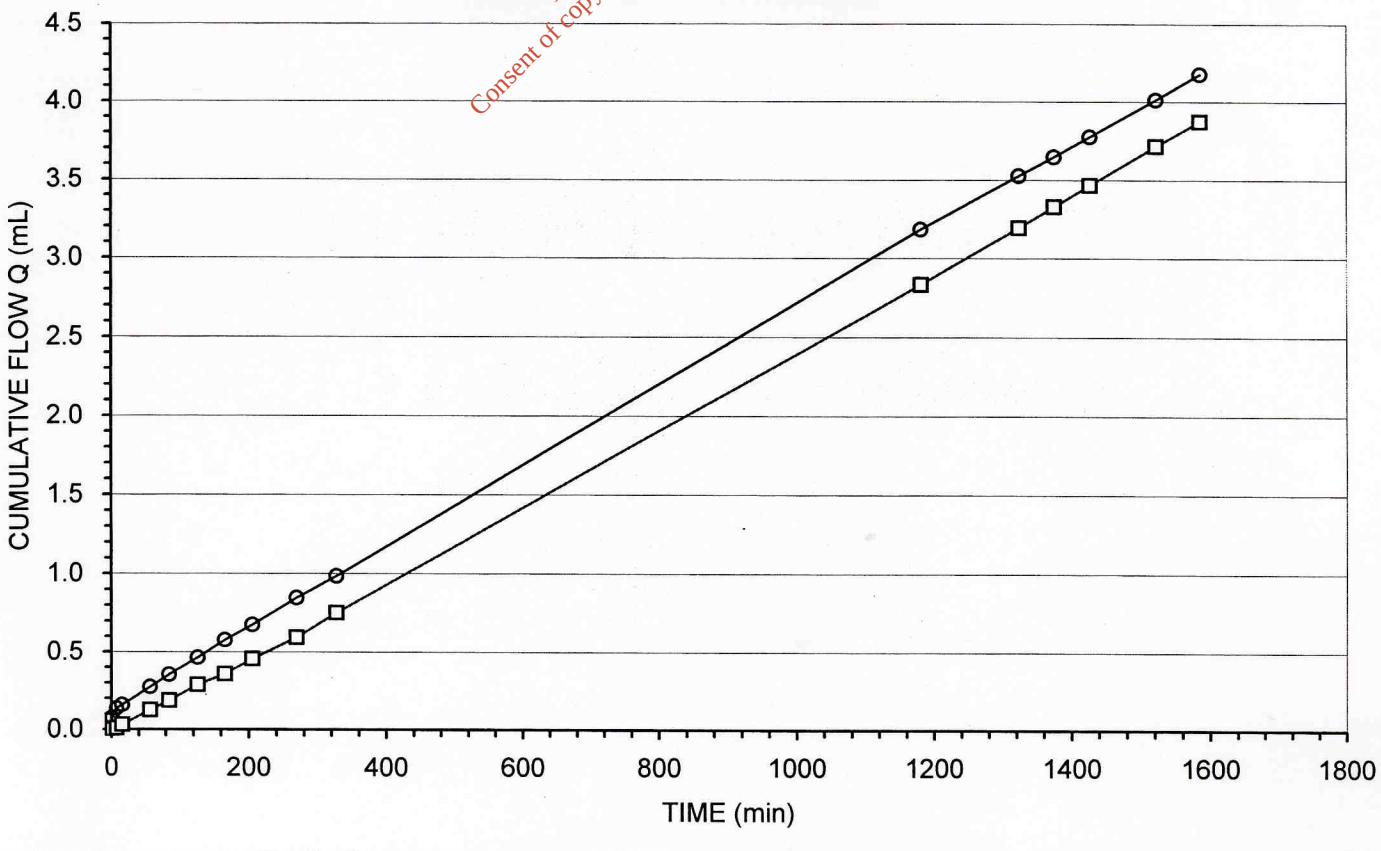
PRESSURE DISSIPATION v. LOG TIME



VOLUME CHANGE v. SQUARE ROOT TIME



CUMULATIVE FLOW v. TIME



w619m

GSI

SAMPLE No: **TH4**

TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site. **Location ID:** **Date Sampled:**
Sample Depth: **Sample No.:** TH4

SAMPLE DESCRIPTION:	Soft/firm-firm (after test) grey slightly sandy gravelly CLAY containing occasional decayed rootlets.			
Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	

Constant Head Permeability Test in Triaxial Cell in accordance with Test 6 of BS 1377:Part 6:1990.

Type of Specimen:		Undisturbed U100 sample taken from compacted fill.			
Method of Preparation:					
Flow Conditions:		Vertical downwards			
Test No.		1			
Diameter (D)	mm	105.3			
Area (A)	mm^2	8708			
Length (L)	mm	110.9			
Initial Moisture Content	%	13.3			
Initial Bulk Density	kg/m^3	2308			
Initial Dry Density	kg/m^3	2036			
SATURATION STAGE:					
Method of Saturation		#			
Initial Cell Pressure	kPa	50			
Initial B Value		0.98			
Total Back-Pressure Applied	kPa	320			
Period of Saturation	hour	19			
Final B Value		0.99			
CONSOLIDATION STAGE:					
Cell Pressure (σ_3)	kPa	399			
Back-Pressure (u_b)	kPa	370			
Effective Consolidation Pressure (σ'_c)	kPa	29			
Period of Consolidation	hour	97			
Time for 50% Dissipation (t_{50}):	mins	900			
Coefficient of Consolidation (c_{vi}):	m^-/year	5			
PERMEABILITY MEASUREMENT:					
Cell Pressure (σ_3)	kPa	399			
Inlet Pressure (p_1)	kPa	380			
Back Pressure (p_2)	kPa	370			
Pressure Difference (p_1-p_2)	kPa	10			
Mean Effective Stress (σ'_3)	kPa	24			
Test Temperature	°C	22			
Correction Factor (R_t)		0.95			
From graph of Volume of Flow (ml) v. Time (mins):					
Mean Rate of Steady Flow (q)	mL/min	0.00255			
Corresponding Head Loss (p_c)	kPa	2.01			
Hydraulic Gradient (i)		7.4			
Final Moisture Content	%	11.5			
Final Bulk Density	kg/m^3	2342			
COEFFICIENT OF PERMEABILITY:					
Mean Effective Stress (σ'_3)	kPa	24			
$\sigma'_3 = \sigma_3 - 0.5(p_1 + p_2)$					
Coefficient of Permeability in the Vertical direction (k_v) at 20°C	**m/s**	**6.3×10^{-10}**			
$k_v = \frac{1.63\ q\ L\ R_t \times 10^{-4}}{A\ ((p_1 - p_2) - p_c)}$					

REMARKS: # Increments of cell pressure and back pressure.

GSI

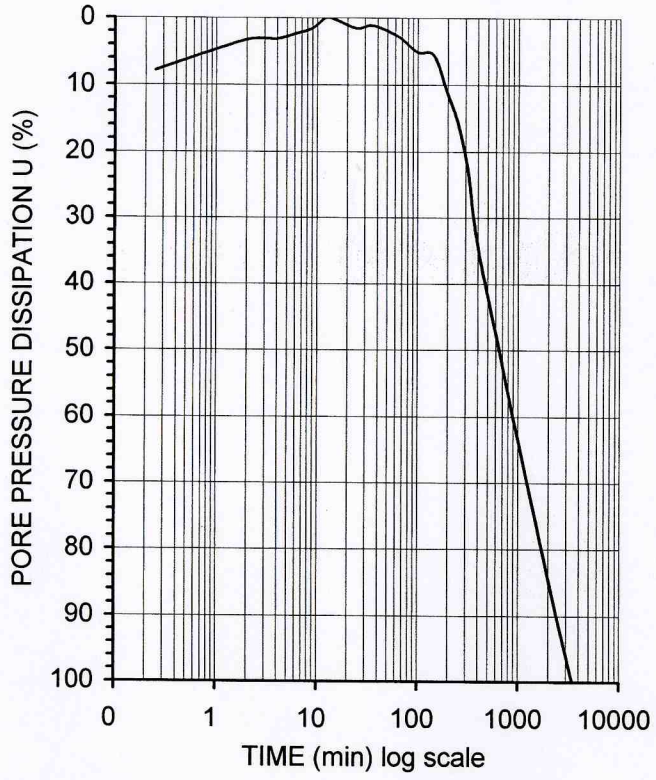
TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site.
TRIAL HOLE No.:

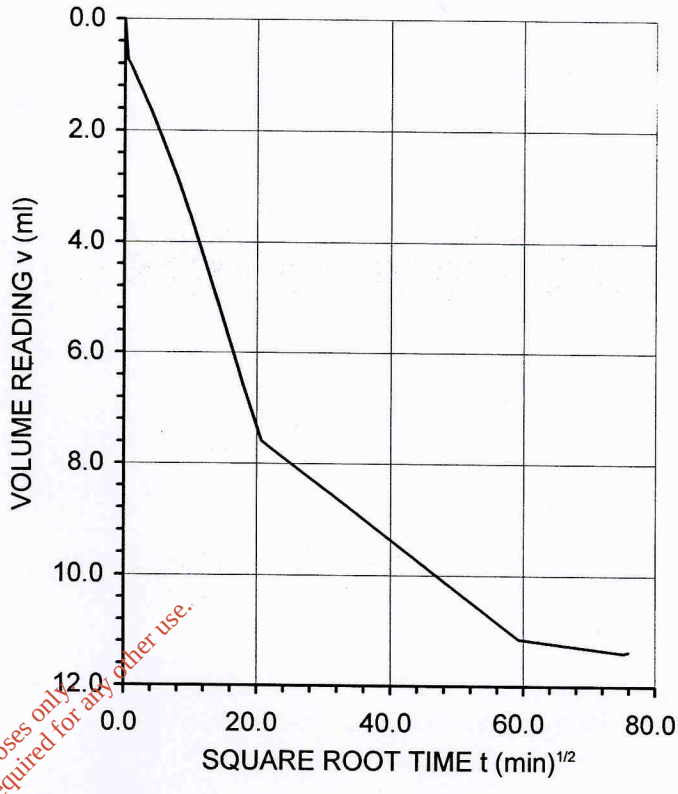
SAMPLE DEPTH:
SAMPLE No: TH3

TEST No.: 1
σ_3' (kPa): 25

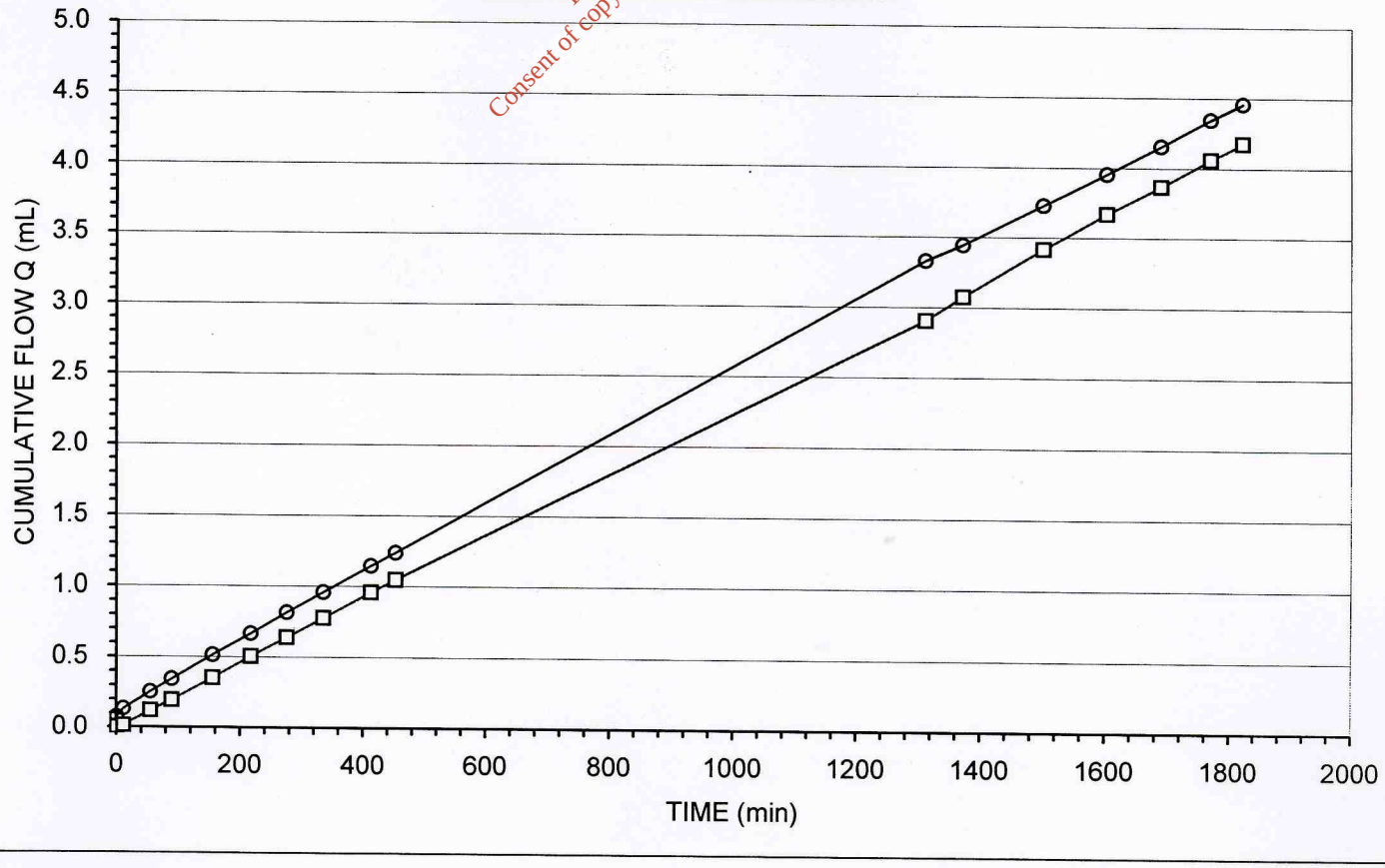
PRESSURE DISSIPATION v. LOG TIME



VOLUME CHANGE v. SQUARE ROOT TIME



CUMULATIVE FLOW v. TIME



wt69a

GSI

SAMPLE No: **TH3**

TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site. **Location ID:** **Date Sampled:**
Sample Depth: **Sample No.:** TH3

SAMPLE DESCRIPTION:	Stiff (after test) friable grey slightly sandy gravelly CLAY containing occasional decayed roots.

Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	

Constant Head Permeability Test in Triaxial Cell in accordance with Test 6 of BS 1377:Part 6:1990.

Type of Specimen:		Undisturbed U100 sample taken from compacted fill.			
Method of Preparation:					
Flow Conditions:		Vertical downwards			
Test No.		1			
Diameter (D)	mm	105.6			
Area (A)	mm^2	8756			
Length (L)	mm	119.5			
Initial Moisture Content	%	12.1			
Initial Bulk Density	kg/m^3	2242			
Initial Dry Density	kg/m^3	2001			
SATURATION STAGE:					
Method of Saturation		#			
Initial Cell Pressure	kPa	50			
Initial B Value		0.97			
Total Back-Pressure Applied	kPa	323			
Period of Saturation	hour	21			
Final B Value		1			
CONSOLIDATION STAGE:					
Cell Pressure (σ_3)	kPa	399.9			
Back-Pressure (u_b)	kPa	370			
Effective Consolidation Pressure (σ'_c)	kPa	29.9			
Period of Consolidation	hour	96			
Time for 50% Dissipation (t_{50}):	mins	650			
Coefficient of Consolidation (c_{vi}):	m^2/year	8			
PERMEABILITY MEASUREMENT:					
Cell Pressure (σ_3)	kPa	399.9			
Inlet Pressure (p_1)	kPa	380			
Back Pressure (p_2)	kPa	370			
Pressure Difference (p_1-p_2)	kPa	10			
Mean Effective Stress (σ'_3)	kPa	24.9			
Test Temperature	°C	22.25			
Correction Factor (R_t)		0.94			
From graph of Volume of Flow (ml) v. Time (mins):					
Mean Rate of Steady Flow (q)	mL/min	0.00229			
Corresponding Head Loss (p_c)	kPa	2.01			
Hydraulic Gradient (i)		6.8			
Final Moisture Content	%	11.3			
Final Bulk Density	kg/m^3	2252			
COEFFICIENT OF PERMEABILITY:					
Mean Effective Stress (σ'_3)	kPa	25			
$\sigma'_3 = \sigma_3 - 0.5(p_1 + p_2)$					
Coefficient of Permeability in the Vertical direction (k_v) at 20°C	**m/s**	**6.0×10^{-10}**			
$k_v = \frac{1.63\ q\ L\ R_t \times 10^{-4}}{A\ ((p_1 - p_2) - p_c)}$					

REMARKS: # Increments of cell pressure and back pressure.

GSI

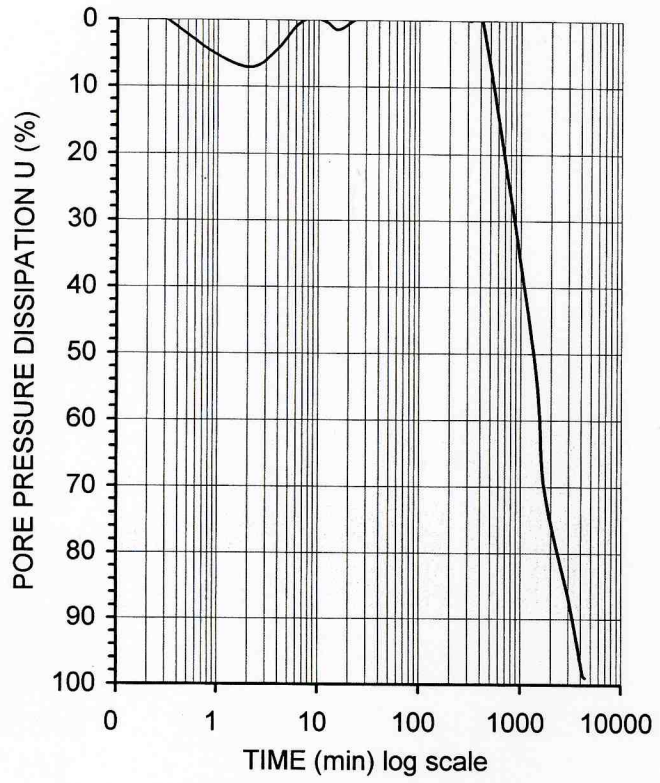
TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site.
TRIAL HOLE No.:

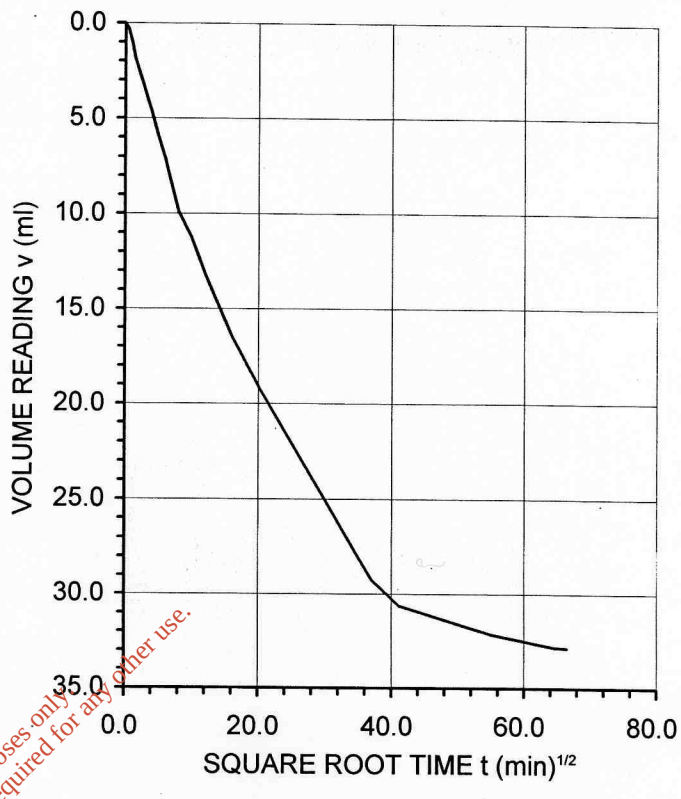
SAMPLE DEPTH:
SAMPLE No: TH2

TEST No.: 1
σ_3' (kPa): 25

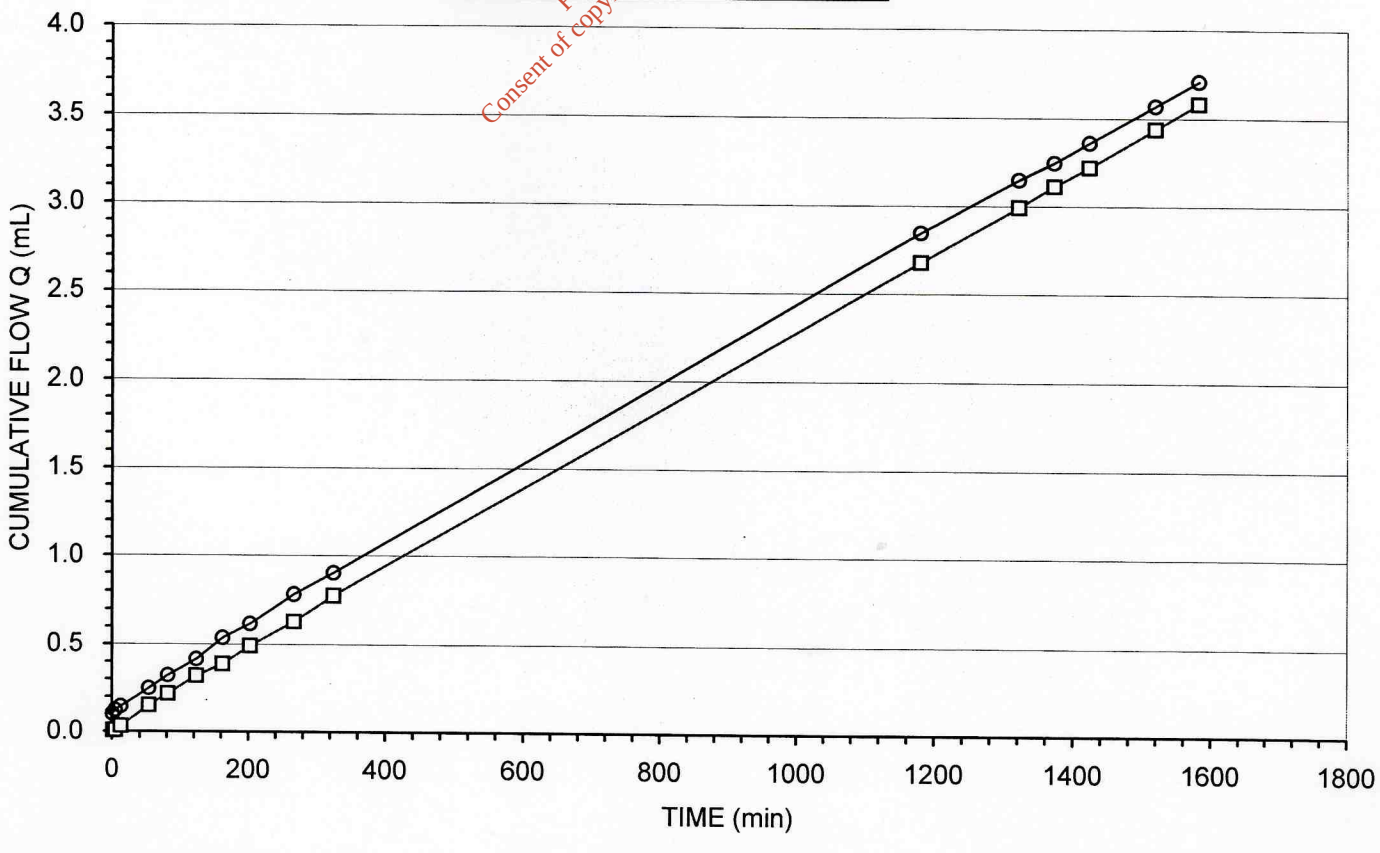
PRESSURE DISSIPATION v. LOG TIME



VOLUME CHANGE v. SQUARE ROOT TIME



CUMULATIVE FLOW v. TIME



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GSI

SAMPLE No: **TH2**

TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site. **Location ID:** **Date Sampled:**
Sample Depth: **Sample No.:** TH2

SAMPLE DESCRIPTION:	Soft-soft/firm (after test) grey slightly sandy gravelly CLAY containing occasional decayed rootlets.			
Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	

Constant Head Permeability Test in Triaxial Cell in accordance with Test 6 of BS 1377:Part 6:1990.

Type of Specimen:		Undisturbed U100 sample taken from compacted fill.			
Method of Preparation:					
Flow Conditions:		Vertical downwards			
Test No.		1			
Diameter (D)	mm	105.6			
Area (A)	mm^2	8759			
Length (L)	mm	109.7			
Initial Moisture Content	%	13.6			
Initial Bulk Density	kg/m^3	2289			
Initial Dry Density	kg/m^3	2014			
SATURATION STAGE:					
Method of Saturation		#			
Initial Cell Pressure	kPa	50			
Initial B Value		0.96			
Total Back-Pressure Applied	kPa	322			
Period of Saturation	hour	19			
Final B Value		0.99			
CONSOLIDATION STAGE:					
Cell Pressure (σ_3)	kPa	399.9			
Back-Pressure (u_b)	kPa	370			
Effective Consolidation Pressure (σ'_c)	kPa	29.9			
Period of Consolidation	hour	74			
Time for 50% Dissipation (t_{50}):	mins	1370			
Coefficient of Consolidation (c_{vi}):	m^2/year	3			
PERMEABILITY MEASUREMENT:					
Cell Pressure (σ_3)	kPa	399.9			
Inlet Pressure (p_1)	kPa	380			
Back Pressure (p_2)	kPa	370			
Pressure Difference (p_1-p_2)	kPa	10			
Mean Effective Stress (σ'_3)	kPa	24.9			
Test Temperature	°C	22			
Correction Factor (R_t)		0.95			
From graph of Volume of Flow (ml) v. Time (mins):					
Mean Rate of Steady Flow (q)	mL/min	0.00224			
Corresponding Head Loss (p_c)	kPa	2.01			
Hydraulic Gradient (i)		7.4			
Final Moisture Content	%	11.5			
Final Bulk Density	kg/m^3	2329			
COEFFICIENT OF PERMEABILITY:					
Mean Effective Stress (σ'_3)	kPa	25			
$\sigma'_3 = \sigma_3 - 0.5(p_1 + p_2)$					
Coefficient of Permeability in the Vertical direction (k_v) at 20°C	**m/s**	**5.4×10^{-10}**			
$k_v = \frac{1.63\ q\ L\ R_t \times 10^{-4}}{A\ ((p_1 - p_2) - p_c)}$					

REMARKS: # Increments of cell pressure and back pressure.

GSI

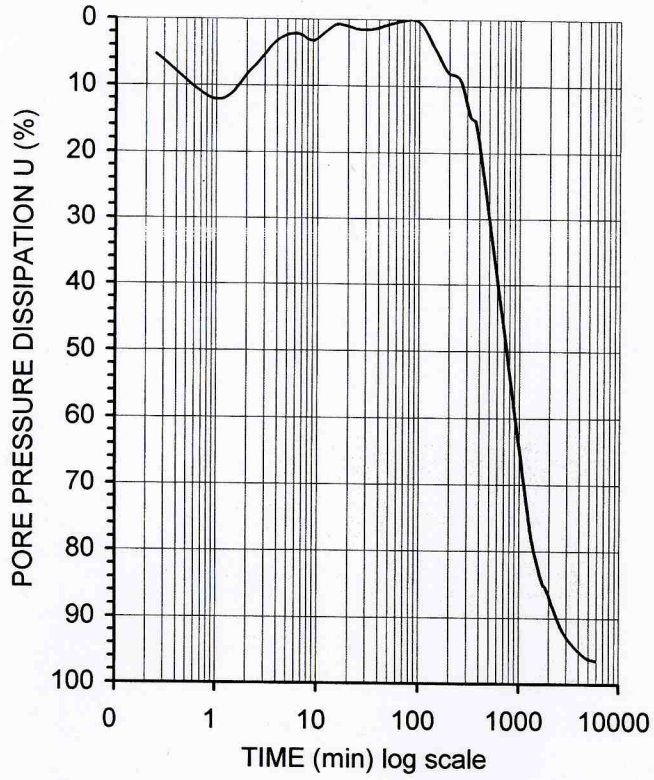
TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site.
TRIAL HOLE No.:

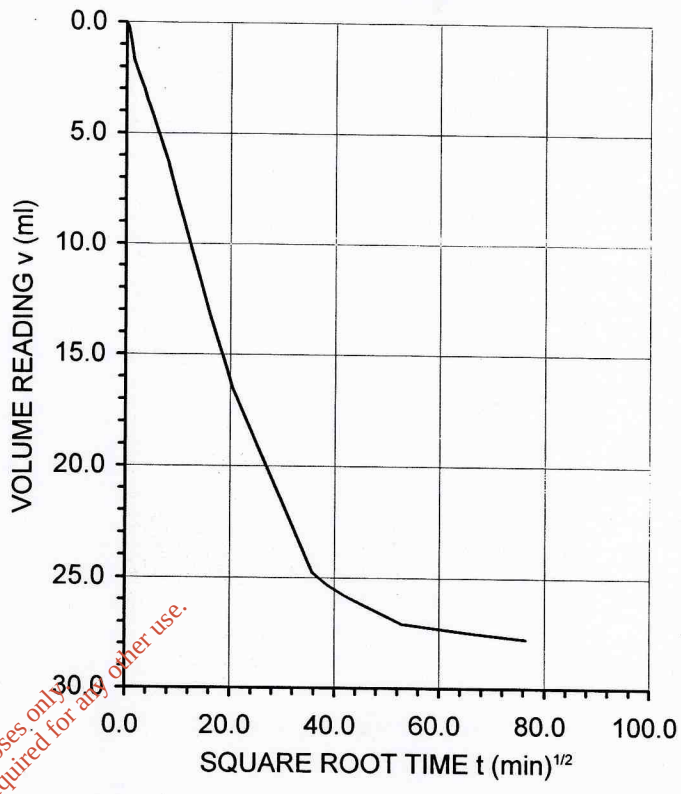
SAMPLE DEPTH:
SAMPLE No: TH1

TEST No.: 1
σ_3' (kPa): 25

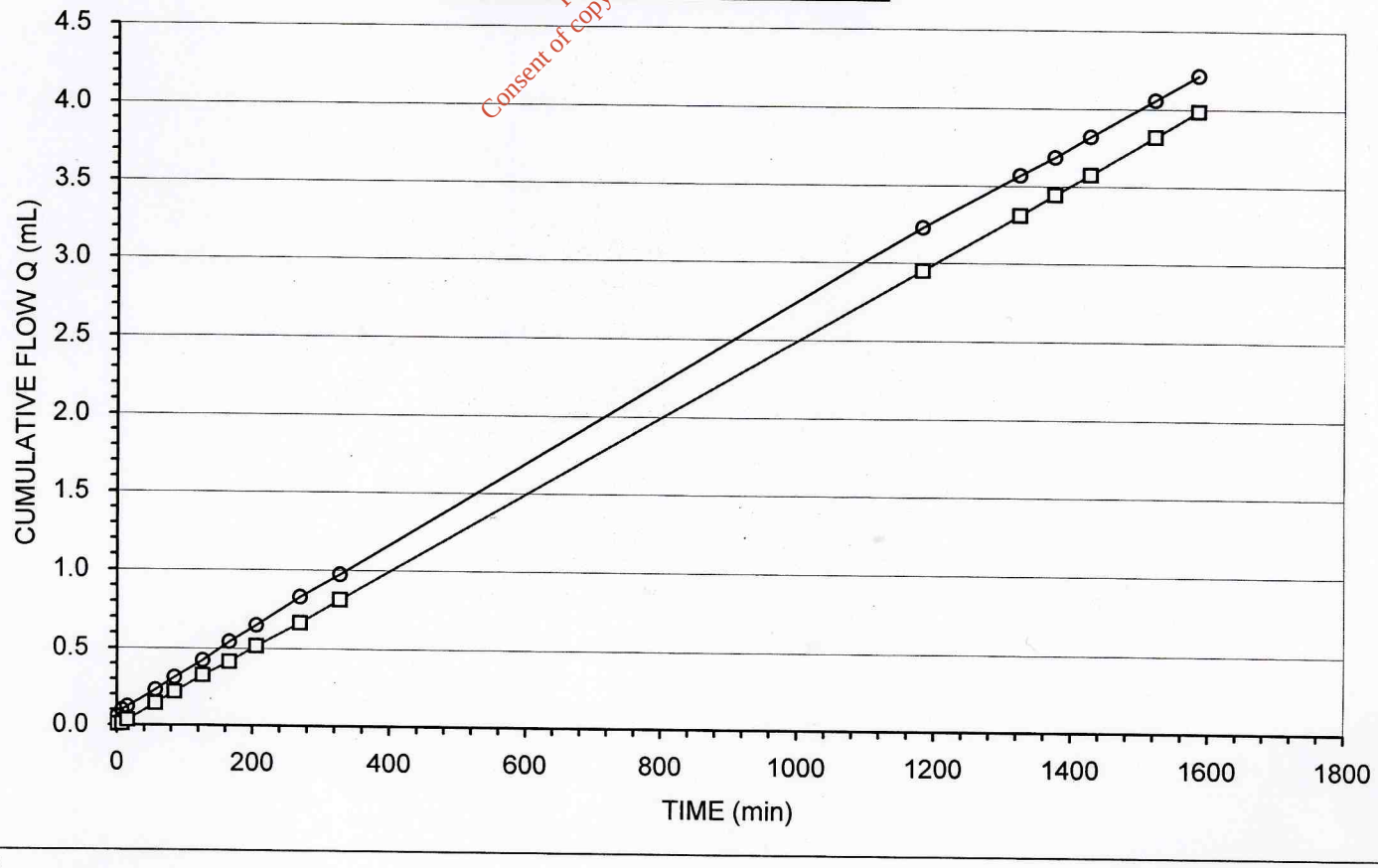
PRESSURE DISSIPATION v. LOG TIME



VOLUME CHANGE v. SQUARE ROOT TIME



CUMULATIVE FLOW v. TIME



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SAMPLE No: **(B)22/05/00**

TRIAXIAL CELL PERMEABILITY TEST

CONTRACT: Timahoe Site. **Location ID:** **Date Sampled:**
Sample Depth: **Sample No.:** TH1

SAMPLE DESCRIPTION:	Soft-soft/firm (after test) grey slightly sandy slightly gravelly CLAY containing occasional decayed roots and rootlets.

Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Casagrande Classification	

Constant Head Permeability Test in Triaxial Cell in accordance with Test 6 of BS 1377:Part 6:1990.

Type of Specimen:		Undisturbed U100 sample taken from compacted fill.			
Method of Preparation:					
Flow Conditions:		Vertical downwards			
Test No.		1			
Diameter (D)	mm	105.5			
Area (A)	mm^2	8741			
Length (L)	mm	109.6			
Initial Moisture Content	%	18.1			
Initial Bulk Density	kg/m^3	2170			
Initial Dry Density	kg/m^3	1838			
SATURATION STAGE:					
Method of Saturation		#			
Initial Cell Pressure	kPa	50			
Initial B Value		0.96			
Total Back-Pressure Applied	kPa	320			
Period of Saturation	hour	19			
Final B Value		1			
CONSOLIDATION STAGE:					
Cell Pressure (σ_3)	kPa	399			
Back-Pressure (u_b)	kPa	370			
Effective Consolidation Pressure (σ'_c)	kPa	29			
Period of Consolidation	hour	5849			
Time for 50% Dissipation (t_{50}):	mins	760			
Coefficient of Consolidation (c_{vi}):	m^2/year	6			
PERMEABILITY MEASUREMENT:					
Cell Pressure (σ_3)	kPa	399			
Inlet Pressure (p_1)	kPa	380			
Back Pressure (p_2)	kPa	370			
Pressure Difference (p_1-p_2)	kPa	10			
Mean Effective Stress (σ'_3)	kPa	24			
Test Temperature	°C	22			
Correction Factor (R_t)		0.95			
From graph of Volume of Flow (ml) v. Time (mins):					
Mean Rate of Steady Flow (q)	mL/min	0.00259			
Corresponding Head Loss (p_c)	kPa	2.01			
Hydraulic Gradient (i)		7.4			
Final Moisture Content	%	15.6			
Final Bulk Density	kg/m^3	2209			
COEFFICIENT OF PERMEABILITY:					
Mean Effective Stress (σ'_3)	kPa	24			
$\sigma'_3 = \sigma_3 - 0.5(p_1 + p_2)$					
Coefficient of Permeability in the Vertical direction (k_v) at 20°C	**m/s**	**6.3×10^{-10}**			
$k_v = \frac{1.63\ q\ L\ R_t \times 10^{-4}}{A\ ((p_1 - p_2) - p_c)}$					

REMARKS: # Increments of cell pressure and back pressure.

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