



YAYASAN PERGURUAN "CIKINI"  
INSTITUT  
SAINS DAN TEKNOLOGI  
NASIONAL

5-3  
FAKULTAS TEKNIK SIPIL  
DAN PERENCANAAN  
JURUSAN TEKNIK SIPIL

PENUGASAN  
No : 6 -05/PM/LM/V/94

Ketua Program Studi Teknik Sipil, Fakultas Teknik Sipil dan Perencanaan Institut Sains dan Teknologi Nasional Jakarta menugaskan kepada :

Ir. Idrus, MSc                      Staff Jurusan Teknik Sipil

Untuk melakukan pekerjaan Penyelidikan Tanah sebagai bentuk kegiatan **Pengabdian Pada Masyarakat** pada :

Nama Pekerjaan        : Penyelidikan Tanah Waste Water Treatment Plant  
Lokasi                    : Jl. PLTU Suralaya, Merak, Banten, Jawa Barat  
Pemberi Tugas         : KPLM , Joint Operation

Dengan jadwal pelaksanaan pekerjaan selama 12 hari kerja ( 96 Jam), 2 hari di lapangan dan 10 hari di Laboratorium

Kepada Ir. Idrus MSc diberikan kepercayaan penuh untuk melakukan pekerjaan Pengabdian Pada Masyarakat tersebut dan bertanggung jawab atas segala sesuatu mengenai pekerjaan tersebut

Kepada pelaksana tugas ini akan diberikan honorarium sesuai dengan ketentuan yang berlaku di Laboratorium Mekanika Tanah Institut Sains dan Teknologi Nasional.

Penugasan ini berlaku sejak dikeluarkan sampai dengan berakhirnya jangka waktu penyusunan Laporan Akhir (Final Report) diterima oleh pemberi kerja dengan baik.

Jakarta, 06 Mei 1994  
Kaprodik Teknik Sipil



Ir. Ari Mulyo Diah Utami MT  
NIP : 01.83332

Tembusan :

1. Dekan FTSP-ISTN ( sbg laporan )
2. Ka. Lab. Mekanika Tanah ISTN
3. Arsip

# **LEMBAR PENGESAHAN PENGABDIAN PADA MASYARAKAT**



**PENYELIDIKAN TANAH WASTE WATER TREATMENT PLANT  
Lokasi : PLTU Suralaya, Merak, Banten, Jabar**

Oleh :  
Idrus Ir, M.Sc

Mengetahui :  
Ketua Jurusan Teknik Sipil



Ir. Arimulyo Diah Utami, M.T

**Program Studi Teknik Sipil  
Institut Sain dan Teknologi Nasional  
Jakarta 1994**

# THE HISTORY OF THE CITY OF BOSTON



THE HISTORY OF THE  
CITY OF BOSTON

BY  
JOHN H. COLE

VOLUME I.  
FROM 1630 TO 1780.

BOSTON: PUBLISHED BY

JOHN H. COLE, 10 NASSAU ST.  
AND S. B. LEE, 10 N. BOSTON ST.  
1881.

FINAL REPORT  
SOIL INVESTIGATION

PROJECT : WASTE WATER TREATMENT PLANT

LOCATION : P.L.T.U SURALAYA, MERAK

AFILIASI TEKNIK SIPIL & PERENCANAAN  
(SOIL MECHANICS LABORATORY)

INSTITUT SAIN DAN TEKNOLOGI NASIONAL

(A.T.S.P - I.S.T.N)

**AFILIASI TEKNIK SIPIL & PERENCANAAN**  
**( A.T.S.P - I.S.T.N )**

Jl. Moh. Kahfi II, Bhumi Srengseng Indah, Jakarta. Telp: 7270092, Fax: 7270090

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04-05/FR/LM/IV/94

Page 1

Jakarta, Mei 4 1994

No : 04-05.1/ATSP/IV/94  
Attch : 1 (one) document  
Subject : Submittal letter of the soil investigation work.

K.P.L.M Joint Operation  
P.L.T.U Suralaya Project , Merak  
Jawa Barat.

Attn : Mr. N. Katayama

Dear Sir,

We are pleased to submit herewith our Final Report on Soil Investigation for Waste Water Treatment Plant at your plant in P.L.T.U Suralaya, Merak.

This soil investigation was performed in accordance with our contract (work order).

We appreciated the opportunity to work on this project and please do not hesitate to call us if you have any question regarding this report.

Thank you for your kind attention and cooperation.

Your sincerely,  
AFILIASI TEKNIK SIPIL & PERENCANAAN

  
Ir. Idrus M.Sc.-----  
Operation Director.

## C O N T E N T S

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## LIST OF FIGURE

FIGURE 1 : LOCATION OF CPT AND BORING POINTS



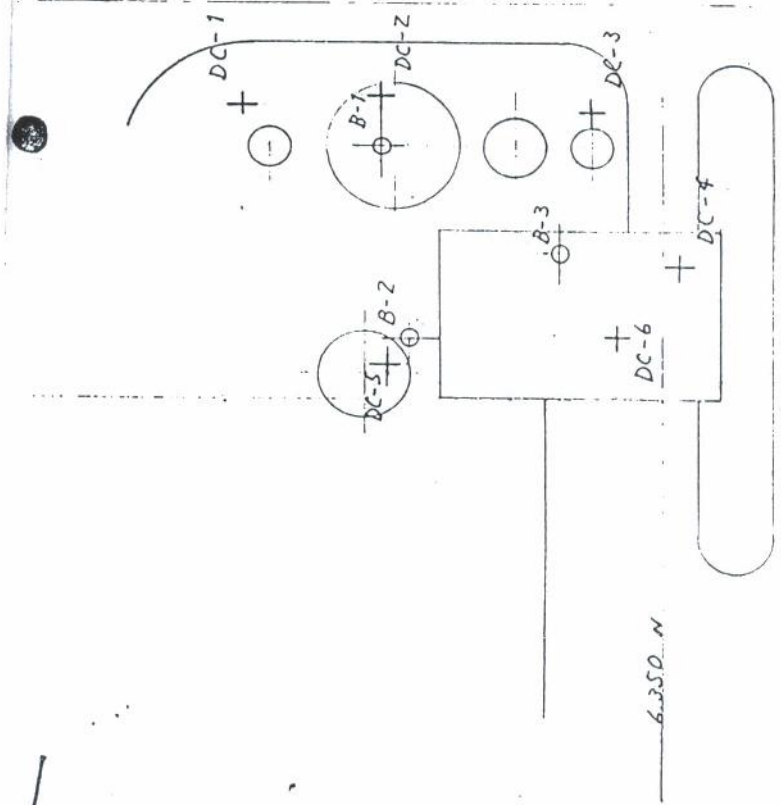
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W.W.T.

SOIL INVESTIGATION

LOCATION PLAN

Scaled from PLAN DRWG



6,350 M

6,370 M

6,370 M

6,350 M





K. P. L. M. Joint Operation  
P. L. U. Suralaya  
Jl. Raya Pulo Hida Merak, Desa Suralaya  
Kecamatan Pulo Merak, Kabupaten Serang, Jawa Barat

# K. P. L. M. Joint Operation

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Kecamatan Pulo Merak, Kabupaten Serang, Jawa Barat

Phone : (0254) -  
Fax : (0254) -

## PLAN OF

### WASTE WATER TREATMENT

| STA             | ELEVATION | COORDINATE |          |
|-----------------|-----------|------------|----------|
|                 |           | N          | E        |
| B <sub>1</sub>  | 6.508     | - 6329.885 | 6418.960 |
| B <sub>2</sub>  | 5.528     | - 6331.982 | 6404.562 |
| B <sub>3</sub>  | 5.898     | - 6342.652 | 6410.892 |
| Dc <sub>1</sub> | 6.607     | - 6320.115 | 6422.103 |
| Dc <sub>2</sub> | 6.628     | - 6330.023 | 6422.836 |
| Dc <sub>3</sub> | 6.168     | - 6344.955 | 6421.488 |
| Dc <sub>4</sub> | 5.978     | - 6350.911 | 6410.062 |
| Dc <sub>5</sub> | 5.628     | - 6330.302 | 6402.547 |
| Dc <sub>6</sub> | 5.778     | - 6346.816 | 6404.715 |

BORRINGS HOLE

DITCH CONE

ABOVE :

LIST OF POSITION OF TEST  
BORRINGS HOLES AND DITCH CONE  
IN WASTE WATER

SHEET TO :

FROM :

DATE :

CONVERT 25-1974

APPROVED BY :  
P.L.N.

K.P.L.M. JOINT OPERATION

## LIST OF APPENDIX

1. Geological Boring Log
2. Diagram of Cone Penetrometer Test
3. Summary Of Laboratory Result Test
4. Index Properties of Soil
5. Atterberg limits of Soil
6. Grained Sizes Distribution of Soil
7. Plastisity Chart
8. Unconfined Compression Test
9. Consolidation Test
10. Power Hydrogen Test (Ph Test)



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## I. INTRODUCTION

This Soil Investigation was meant to fulfil a work agreement between Soil Mechanics Laboratory of ISTN Jakarta on behalf Afiliasi Teknik Sipil & Perencanaan (ATSP - ISTN) and K.P.L.M Joint Operation, to carry out site and laboratory investigation for Waste Water Treatment Plant in PLTU Project , Suralaya, Merak.

This soil investigation is to obtain the technical data result of subsurface soil condition especially surrounding the bearing capacity of soil to design the foundation of the water treatment utilities.

The soil investigation consisted of 6 (six) points of CPT Test with 2,5 tons capacity and 3 (three) points of drillings (Depth boring).

The duties of Soil Mechanics Laboratory of ISTN were to carry out Geotechnical Investigation such as field work, laboratory testing and also evaluate the soil condition and parameter design.

Field investigation activities were started on 25 April 1994 and finished on 28 April 1994.



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## II. SCOPE OF WORK

The scope of work consist of 6 (six) points of 2,5 tons CPT Test (Cone Penetration Test) and 3 (three) point of Boring with insitu test such as Standard Penetration Test (SPT) interval 1,50 meter and taking undisturbed/ core sample and disturbed for soil description and laboratory test.

3 (three) points of boring.

| Code | Depth (m) | Number of N SPT | UD Sampling |
|------|-----------|-----------------|-------------|
| DB-1 | 4.50      | 3               | -           |
| DB-2 | 4.50      | 3               | 1           |
| DB-3 | 4.50      | 4               | 1           |

6 (Six) oint of CPT Test

| Code | The max.depth<br>qc > 100 kg/cm <sup>2</sup> | GWL | Total Friction |
|------|----------------------------------------------|-----|----------------|
| S 1  | -3.40 m                                      | -   | 426            |
| S 2  | -0.60 m                                      | -   | 178            |
| S 3  | -2.00 m                                      | -   | 446            |
| S 4  | -1.80 m                                      | -   | 396            |
| S 5  | -3.20 m                                      | -   | 595            |
| S 6  | -2.20 m                                      | -   | 525            |



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### III. METHODE OF TESTING

In generally this investigation were carry out in two stage of work in example : Field work and laboratory testing.

Detail of investigation methods were as follows :

#### 3.1. Field Work.

To Achieve the representative geotechnical properties, 3 (three) poins of booring and 6 (six) point CPT test were carry out which the location were shown in figure 1 and figure 2.

##### a. Boring by using the coring system

The aim of this boring was to obtain the accurate information on the soil condition beneath the surface regarding it's engineering viewpoint either obtained from visual description, insitu testing such as SPT and taking undisturbed samples for laboratory testing on an undisturbed samples to find out the index and engineering properties.

The Nx sixe boring had been used during site investigation. The obtained core samples were stored in 1.00 meter length core boxes and complete recordings



were noted there to.

The mentioned boring was carry out by using rotary boring machnine with a hydraulic power machine with a hydraulic power system of YBM machine.

During boring, the following testings were executed :

- . Standard Penetration Test (SPT) and
- . Taking Undisturbed sample.

b. Standard Penetration Test :

The purpose of the Standard Penetration Test was to obtain the kind of density of coarse soil fractions and consistency of fines soil fractions. This test has been carry out by using equipment and following the ASTM D.1586 procedures, with the following detailed criterias:

- Hammer weight : 63.50 kgf
- Falling distance of hammer : 76 cm

The Number of hammer blows were set at 45 cm penetration.

The total hammer-blows (N Value) was fixed for the last 30 cm whereas the first 15 cm was for correction or "protection" for the possibility ox existing cutting remainnings.





Prior to executing the testing, efforts were made in order that the boring hole was as clean as possible (free cutting sediments), using water circulation. The SPT Values obtained were expressed in Geological Boring Log.

c. Taking of Undisturbed Samples.

The taking of undisturbed samples were meant to obtain relative original soil samples. samples were taken by using special equipment, passed to the desired soil depth by using the hydraulic pressure from the boring machine. Equipment used was the thin wall tube sample, according to ASTM Standard No: D.1587.

Sealing was immediately effected on obtained soil samples, by applying parafine at both ends of the tube and soonest send to the laboratory.

d. Cone Penetration Test (CPT).

Dutch Cone Penetration Test had been carried out in accordance with the requirements of ASTM Standard D.3441, of 2,5 tonf capacity, equipped with rod and friction cone. The CPT had been performed continuously from the ground surface to the top of hard layer soil with cone penetration resistance ( $q_c$ ) value exceeding



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200 kg/cm<sup>2</sup> or 20 meters maximum depth.

The recording had been taken every 20 cm penetration rate.

The data obtained from the test had been of cone penetration resistance and total friction as well.

### 3.2. Laboratory Test and Analysis

All laboratory test had been performed in Soil Mechanics Laboratory of National Institute of Science and Technology at Jakarta (ISTN). The all test had been conducted in accordance with ASTM requirements.

For Undisturbed sampling, following index properties tests had been carried out :

- . Determination of Natural water content
- . Determination of Specific gravity
- . Determination of Atterberg limits.
- . Determination of Plasticity index
- . Determination of Grained sizes distribution by sieve analysis and Hydrometer analysis.



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And also the engineering properties test had been carried out in addition to the test listed above :

- . Determination of wet density and dry density
- . Determination of degree of saturation
- . Determination shear strength by Unconfined Compression Test.
- . Determination of Compression Index with consolidation test



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## IV. GEOTECHNICAL CONDITION

## 4.1. The subsoil condition

From the field exploratory test data with CPT test and boring test, the subsoil condition could be explained as follows :

- From the existing ground surface down to -2.00 meter (average), was found a layer greyish brown sandy silt with very stiff consistency, and sometimes it was found greyish brown sand and some gravel with dense to very dense consistency.
- From -2.00 meter depth (average) down to -4.00 meter, was found Brown to Yellowish brown sandy silt with some cemented Very stiff to hard consistency, and sometimes it was found consist some gravel.
- A very hard layer was found at -4.00 meter depth from ground surface. And It was a rock with very hard consistency, The n Value of SPT Test more than 60. ( Estimated more than 100 ).



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## 4.2. The Ground Water Level

From the bore hole test, it was found the ground water level as follows :

| Code | Ground water level from ground surface |
|------|----------------------------------------|
| DB-1 | -0.60 meter                            |
| DB-2 | -2.00 meter                            |
| DB-3 | -1.60 meter                            |





## V. RECOMMENDATION

With the subsoil condition as described above, it was recommended to use parameter design, especially the allowable bearing capacity to use the foundation design.

| Depth<br>(m) | The allowable soil bearing capacity<br>Kg/cm |
|--------------|----------------------------------------------|
| -1.00        | 0.65                                         |
| -1.50        | 1.00                                         |
| -2.00        | 1.50                                         |
| -3.00        | 2.00 (maximum)                               |

Jakarta 4 Mei 1994

SOIL MECHANICS LABORATORY OF ISTN

Chief Executive

-----  
Ir. Idrus M.Sc  
Geotechnical Engineer



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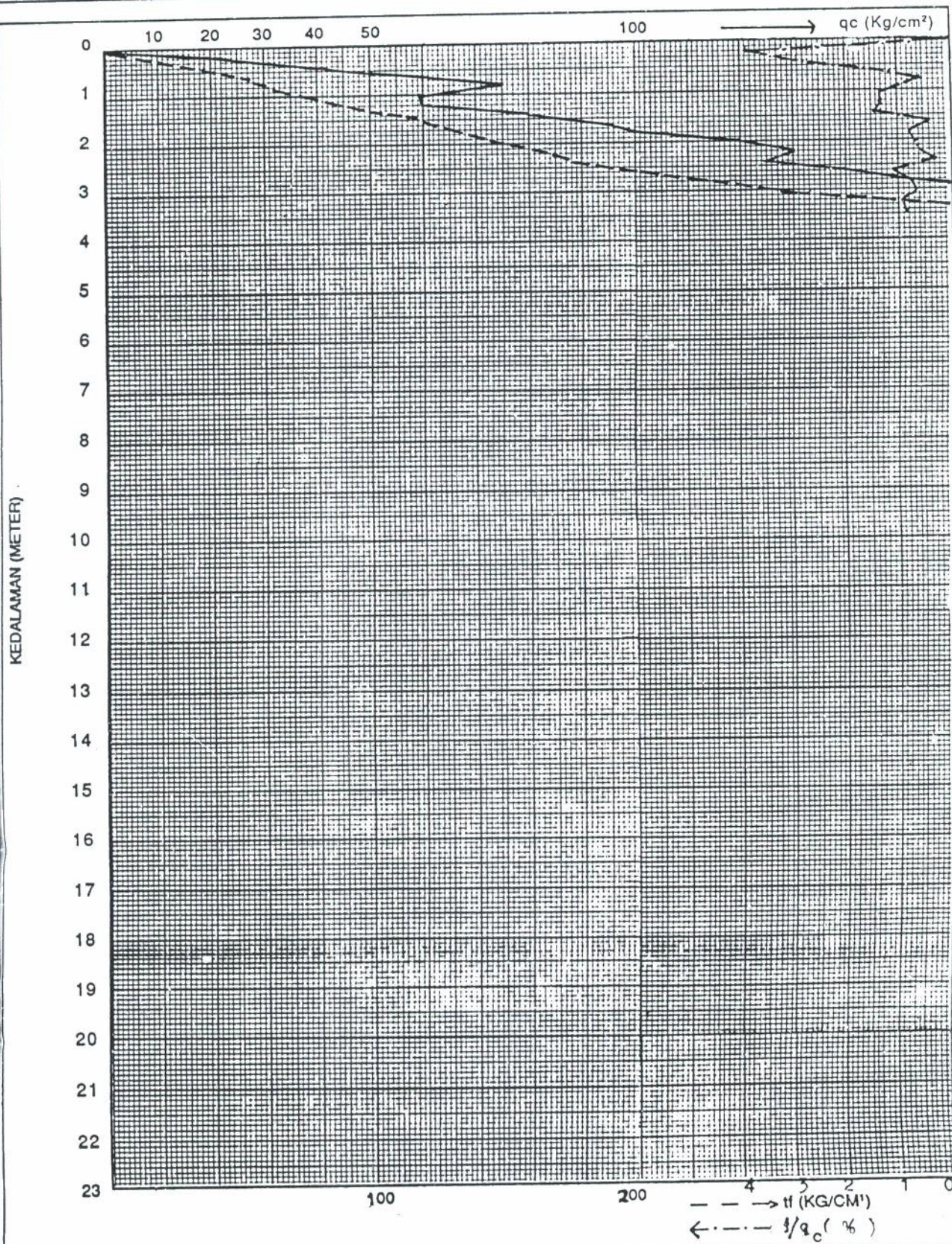


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## DIAGRAM SONDIR

PROYEK : WWTU PTU SURABAYA  
LOKASI : MERAK JAWA BARAT  
SONDIR : S. 1  
KEDALAMAN : 3.40 m

DIKERJAKAN : Ir. Nasir Jalili.  
TANGGAL : 27 April 1994.  
AIR TANAH :  
ELEVASI :





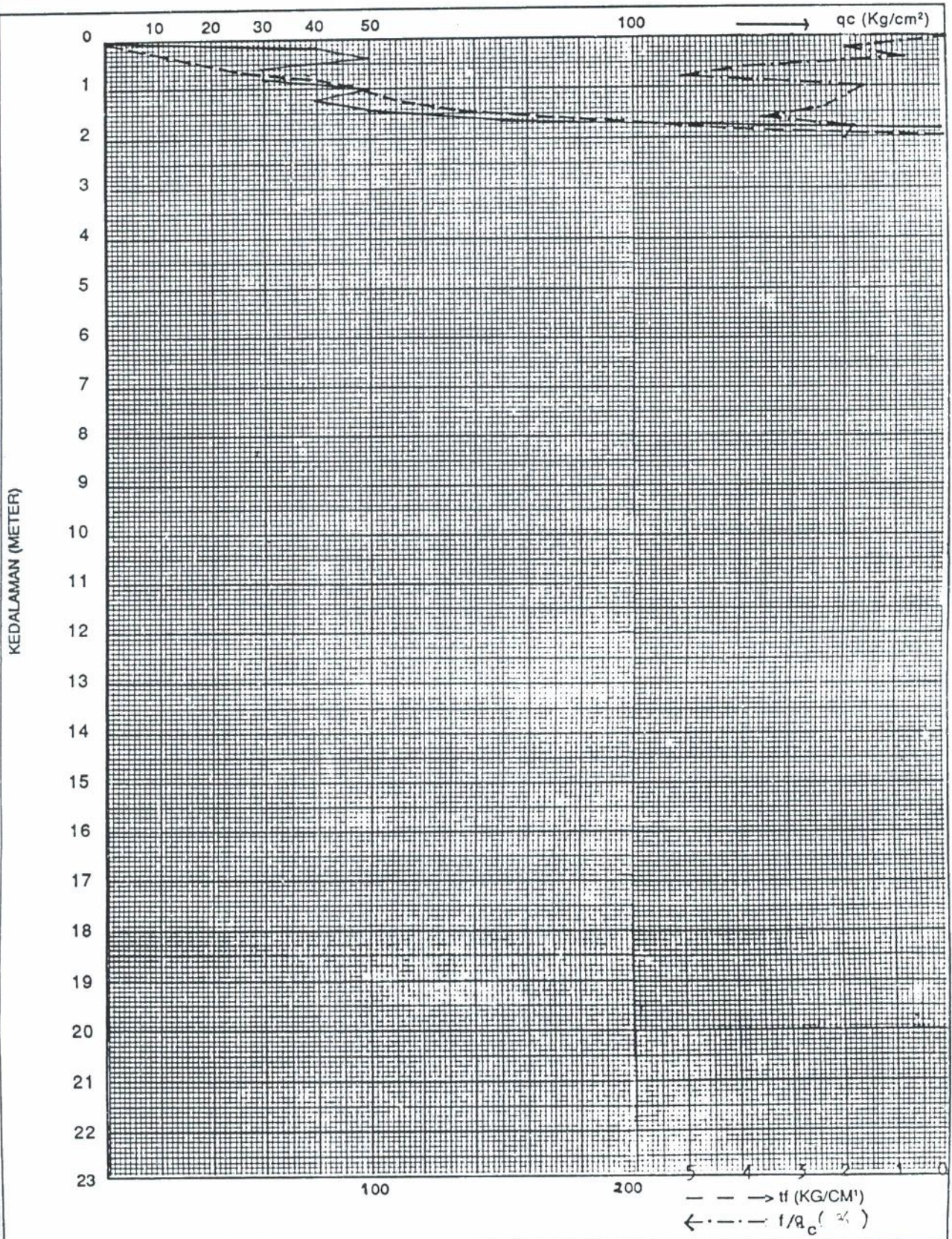


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## DIAGRAM SONDIR

PROYEK : WWTP PITU SURALAYA  
LOKASI : MERAK JAWA BARAT  
SONDIR : S . 3  
KEDALAMAN : 2.00 m

DIKERJAKAN : Ir. Nasir Jalili.  
TANGGAL : 27 April 1994.  
AIR TANAH :  
ELEVASI :





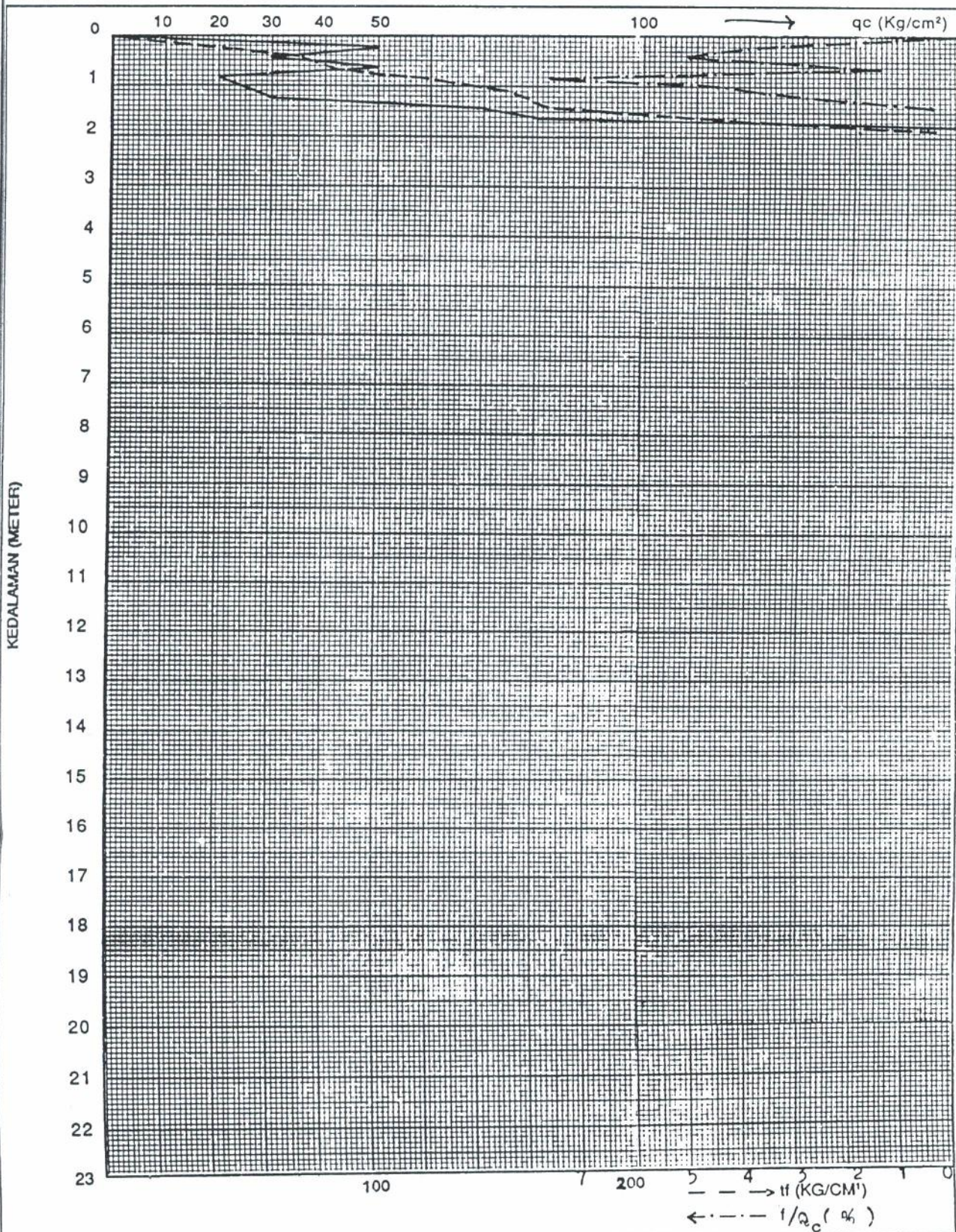


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## DIAGRAM SONDIR

PROYEK : WWTP PLTU SURALAYA  
LOKASI : WEDAK JAWA BARAT  
SONDIR : S. 4  
KEDALAMAN : 1.80 m

DIKERJAKAN : Ir. Nasir Jalili.  
TANGGAL : 27 April 1994 .  
AIR TANAH :  
ELEVASI :





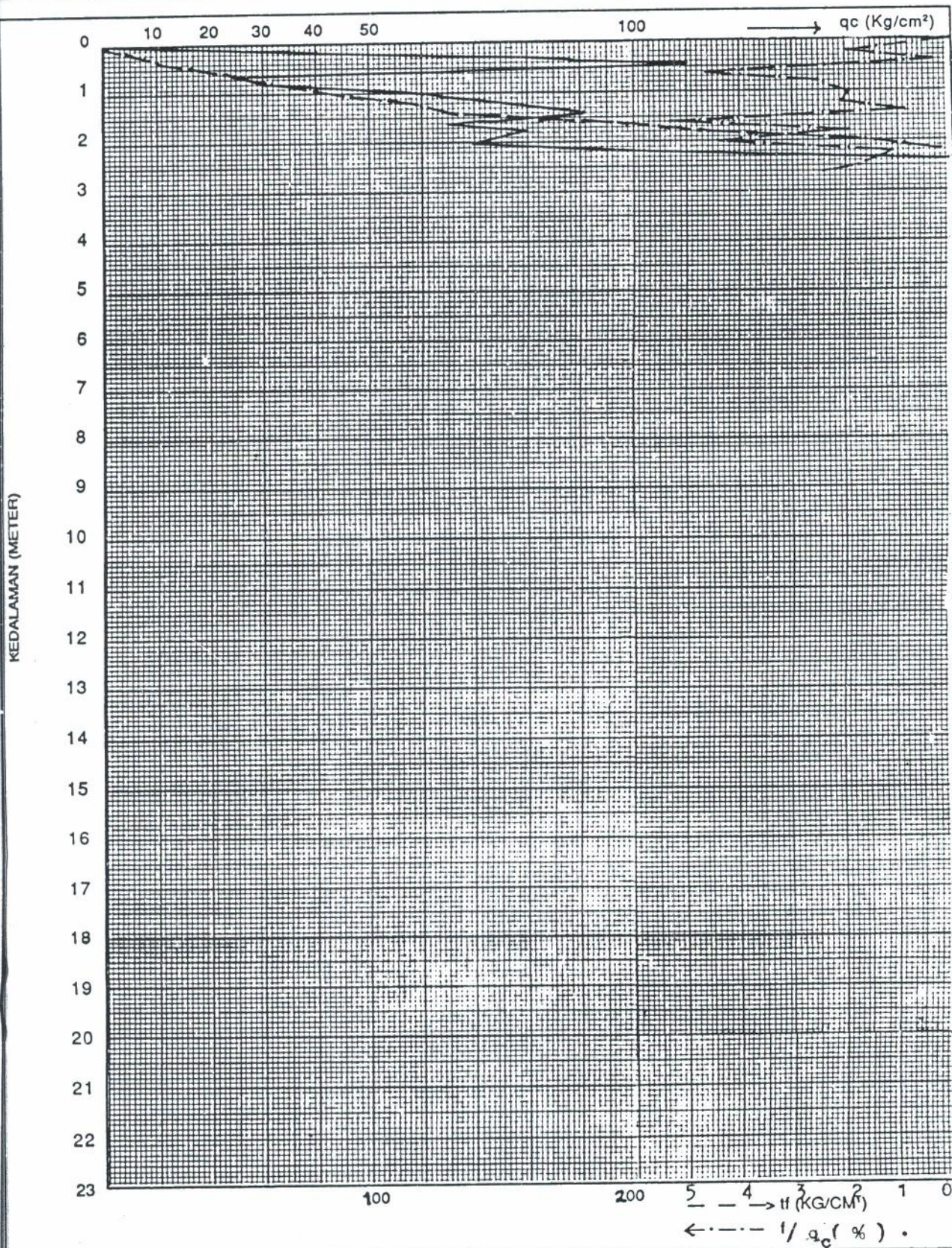


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## DIAGRAM SONDIR

PROYEK : WWTP PLTU SURALAYA  
LOKASI : MERAK JAWA BARAT  
SONDIR : S . 5  
KEDALAMAN : 2.60 m

DIKERJAKAN : Ir. Nasir Jalili .  
TANGGAL : 27 April 1994 .  
AIR TANAH :  
ELEVASI :





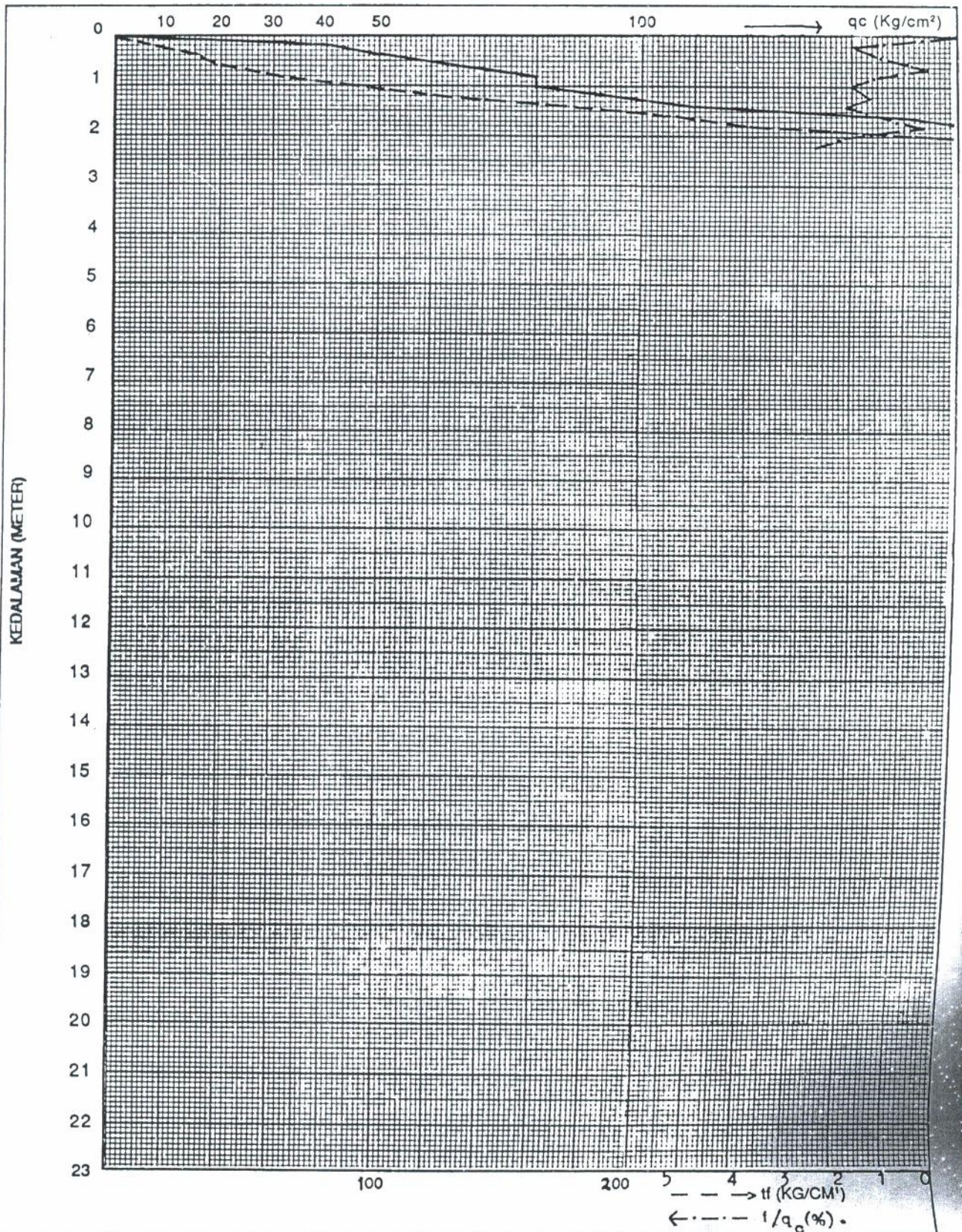


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## DIAGRAM SONDIR

PROYEK : WWTU PLTU SURALAYA .  
LOKASI : MERAK JAWA BARAT  
SONDIR : S . 6  
KEDALAMAN : 2.20 m

DIKERJAKAN : Ir. Nasir Jalili .  
TANGGAL : 27 April 1994 .  
AIR TANAH :  
ELEVASI :





## LABORATORY TESTING RESULTS

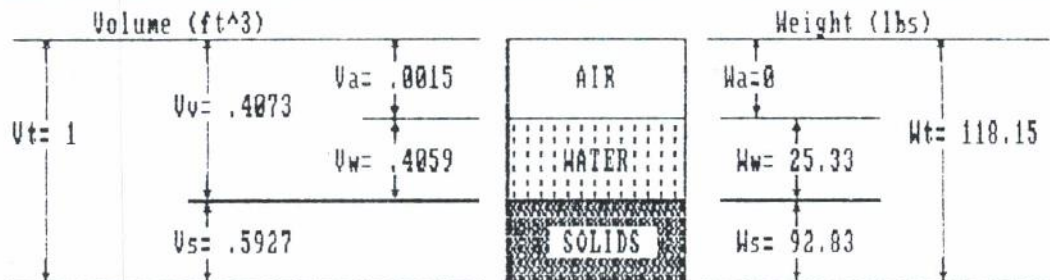
PROJECT : WWTP PLTU SURALAYA  
 LOCATION : MERAK JAWA BARAT.  
 BORING :

| SAMPLE<br>DEPTH<br>( m ) | sample<br>type<br>U D | classification<br>symbol | INDEX PROPERTIES    |                                                  |                |   |                     |                     |                     |                     |            |            |
|--------------------------|-----------------------|--------------------------|---------------------|--------------------------------------------------|----------------|---|---------------------|---------------------|---------------------|---------------------|------------|------------|
|                          |                       |                          | W <sub>n</sub><br>% | $\gamma_{m \frac{wet}{dry}}$<br>t/m <sup>3</sup> | G <sub>s</sub> | e | S <sub>r</sub><br>% | W <sub>p</sub><br>% | W <sub>L</sub><br>% | P <sub>I</sub><br>% | GRAIN SIZE |            |
|                          |                       |                          |                     |                                                  |                |   |                     |                     |                     |                     | SIEVE<br>% | HYDRO<br>% |
| DB 2<br>100-150          |                       |                          | 27,282              |                                                  | 2,51           |   |                     | 39,84               | 59,44               | 19,6                | 28,5       | 71,5       |
| DB 3<br>350-360          |                       |                          | 27,264              |                                                  | 2,508          |   |                     |                     |                     |                     | 88,5       | 11,5       |



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|                        |                   |                            |
|------------------------|-------------------|----------------------------|
| Boring No. = DB 2      | Depth = 100-150   | Number = PLTU SURALAYA     |
| Mass Unit Weight (pcf) | Water Content (%) | Specific Gravity of Solids |
| 118.154                | 27.282            | 2.51                       |



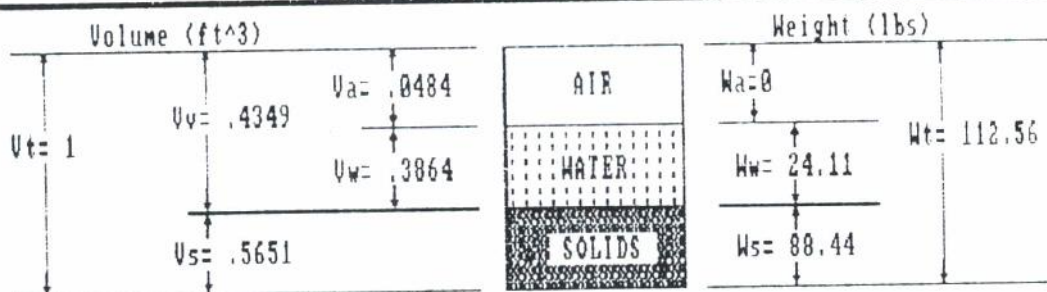
|                    |        |                     |       |
|--------------------|--------|---------------------|-------|
| Void Ratio         | 0.6872 | % Saturation        | 99.64 |
| Porosity (%)       | 40.73  | Dry Unit Wt (pcf)   | 92.83 |
| Sat. Unit Wt (pcf) | 118.25 | Bouy. Unit Wt (pcf) | 55.85 |



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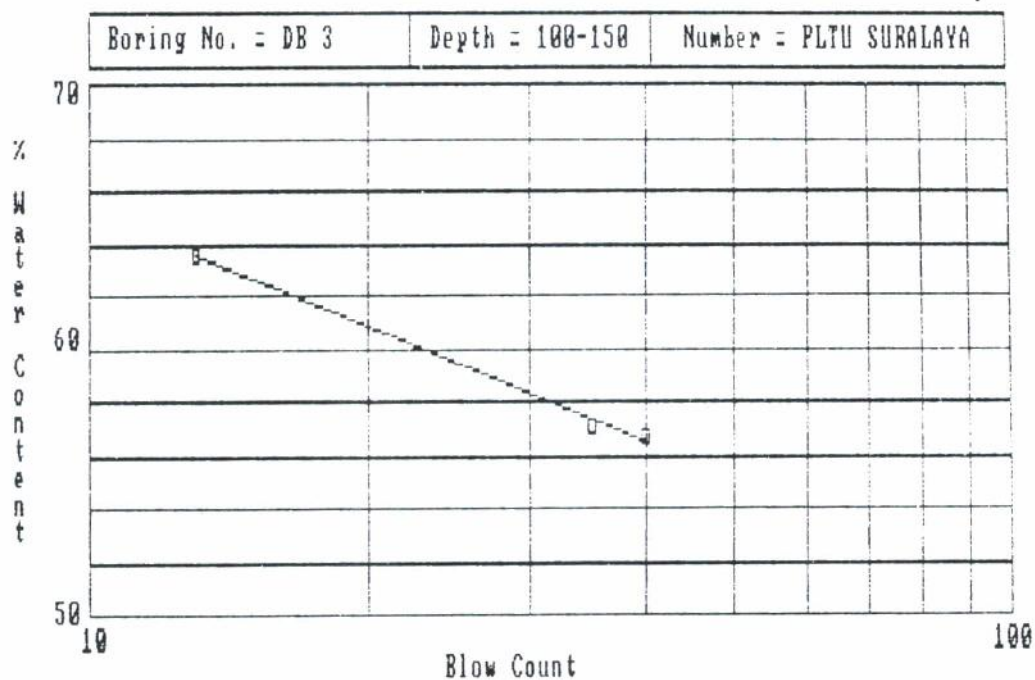
|                        |                   |                            |
|------------------------|-------------------|----------------------------|
| Boring No. = DB 3      | Depth = 358-360   | Number = PLTU SURALAYA     |
| Mass Unit Weight (pcf) | Water Content (%) | Specific Gravity of Solids |
| 112.555                | 27.264            | 2.588                      |



|                    |        |                     |       |
|--------------------|--------|---------------------|-------|
| Void Ratio         | 0.7695 | % Saturation        | 88.86 |
| Porosity (%)       | 43.49  | Dry Unit Wt (pcf)   | 88.44 |
| Sat. Unit Wt (pcf) | 115.58 | Bouy. Unit Wt (pcf) | 53.18 |



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|                                      |       |       |                 |  |                                 |                        |  |  |  |
|--------------------------------------|-------|-------|-----------------|--|---------------------------------|------------------------|--|--|--|
| Sample no.                           | 1     | 2     | 3               |  |                                 |                        |  |  |  |
| % Water content                      | 56.68 | 57.14 | 63.55           |  |                                 |                        |  |  |  |
| Blow count                           | 40    | 35    | 13              |  |                                 |                        |  |  |  |
| Regression equation                  |       |       |                 |  | Coefficient of determination    |                        |  |  |  |
| $W = -14.3844 * \log N + 79.5512$    |       |       |                 |  | $R^2 = .9976$ ** Excellent Test |                        |  |  |  |
| Liquid limit = 59.44                 |       |       |                 |  | Flow index = -14.38             |                        |  |  |  |
| Input plastic limit = 39.84          |       |       |                 |  | Toughness index = -1.36         |                        |  |  |  |
| Plasticity index = 19.6              |       |       |                 |  | Shrinkage limit = 28.92         |                        |  |  |  |
| Input natural water content = 27.282 |       |       |                 |  | Liquidity index = -.64          |                        |  |  |  |
| Boring No. = DB 2                    |       |       | Depth = 100-150 |  |                                 | Number = PLTU SURALAYA |  |  |  |

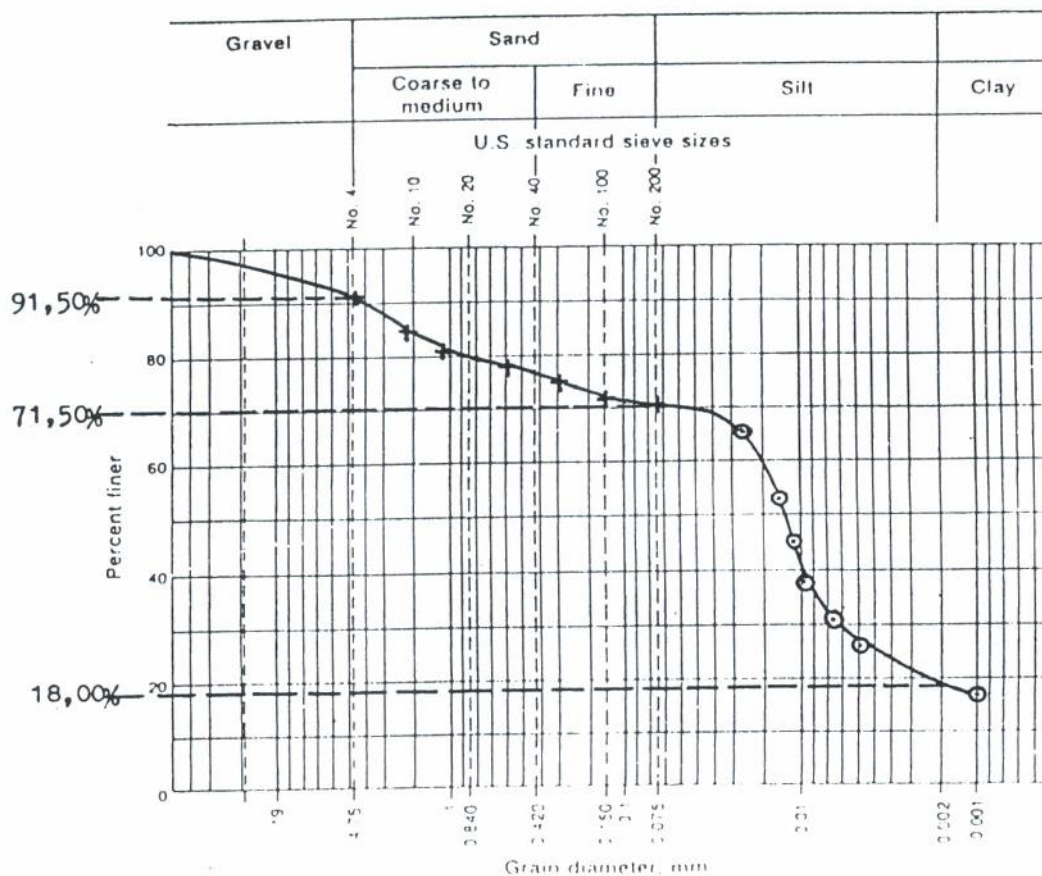


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 JURUSAN TEKNIK SIPIL - FTSP.  
 INSTITUT SAINS DAN TEKNOLOGI NASIONAL - JAKARTA  
 Kampus ISTN Bhumi Srengseng Telp. 7270092, Fax. 7270090



# GRAIN SIZE DISTRIBUTION

Project WWTP BLTU SURALAYA Job No. \_\_\_\_\_  
 Location of Project MERAK JABAR Boring No. DB. 2 Sample No. \_\_\_\_\_  
 Description of Soil \_\_\_\_\_ Depth of Sample 100 - 150  
 Tested By. Ir. Nasir Jalili. Date of Testing 2 Mei 1994



Visual soil description \_\_\_\_\_

Soil classification

Silt-sand-clay System Sieve analysis and hidrometer

Gravel ; 8,50 %

sand = 20,00 %.

silt = 53,50 %.

clay = 18,00 %.



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# GRAIN SIZE DISTRIBUTION

Project WWTP PLTU SURALAYA

Job No. \_\_\_\_\_

Location of Project MERAK JABAR

Boring No. IB. 3

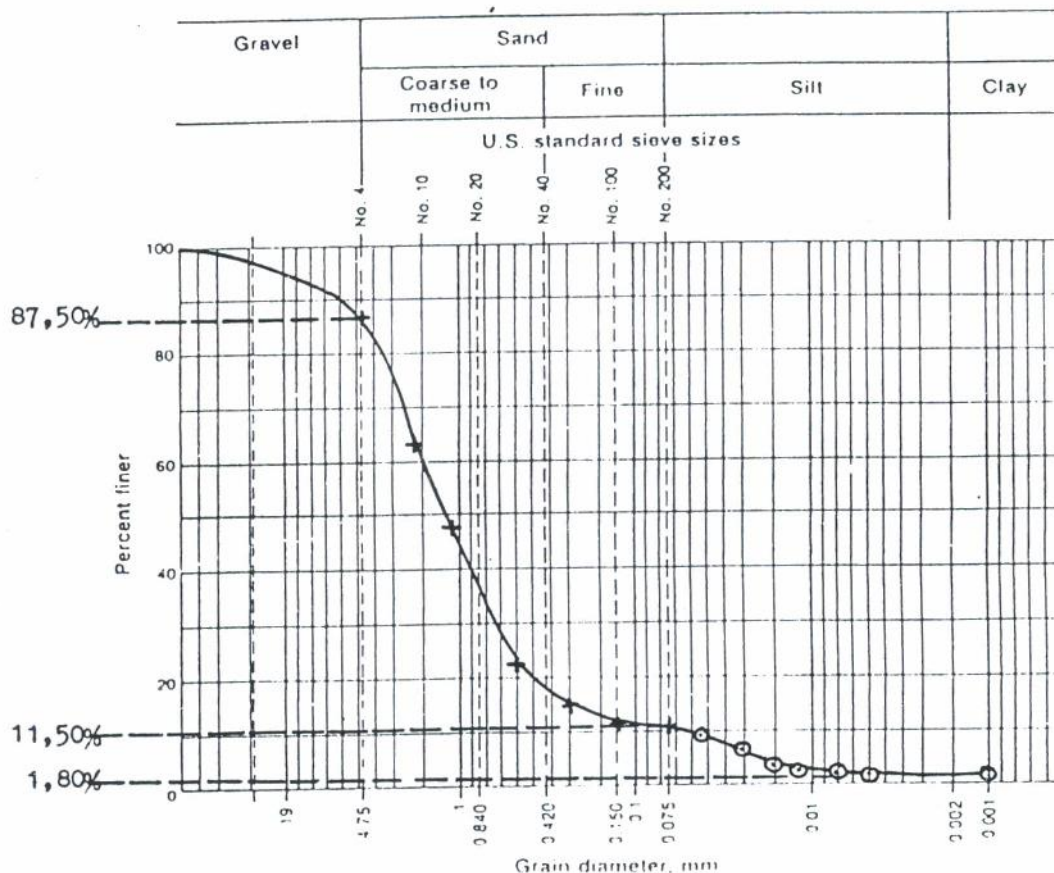
Sample No. \_\_\_\_\_

Description of Soil \_\_\_\_\_

Depth of Sample 350 - 360

Tested By Ir, Nasir Jalili.

Date of Testing 2 Mei 1994



Visual soil description \_\_\_\_\_

Soil classification \_\_\_\_\_

Sand-Gravel-silt

System \_\_\_\_\_

Sieve analysis and hydrometer

Gravel = 12,50 %.

Sand = 76,00 %.

Silt = 9,70 %

Clay = 1,80 %.

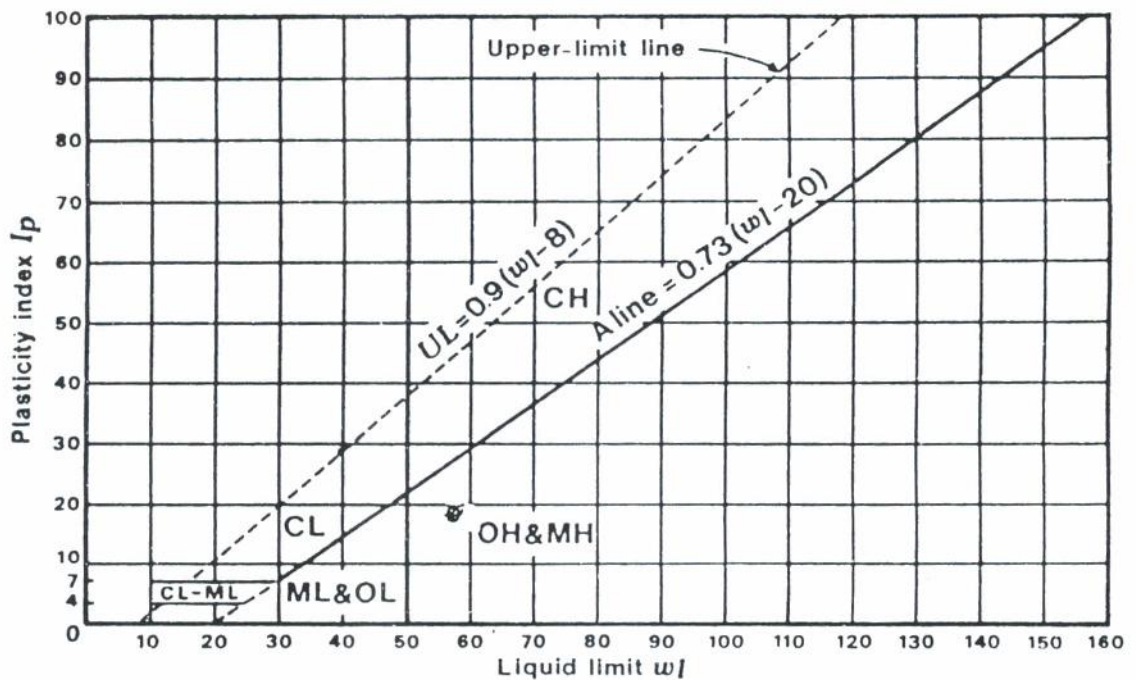


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Project : PLTU SURALAYA.  
 Location : SURALAYA - JAWA BARAT.  
 Test By : Ir. Rahardjo S  
 Date of Test : MEI 1994.

# PLASTICITY CHART



| Boring No. | Depth (M) | Symbol | WL (%) | WP (%) | IP (%) | Unified Classification |
|------------|-----------|--------|--------|--------|--------|------------------------|
| DB 3       | 100-160   | ⊙      | 59,44  | 39,84  | 19,60  | OH & MH                |
|            |           |        |        |        |        |                        |
|            |           |        |        |        |        |                        |
|            |           |        |        |        |        |                        |
|            |           |        |        |        |        |                        |
|            |           |        |        |        |        |                        |



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# SOIL MECHANICS LABORATORY OF I.S.T.N JAKARTA

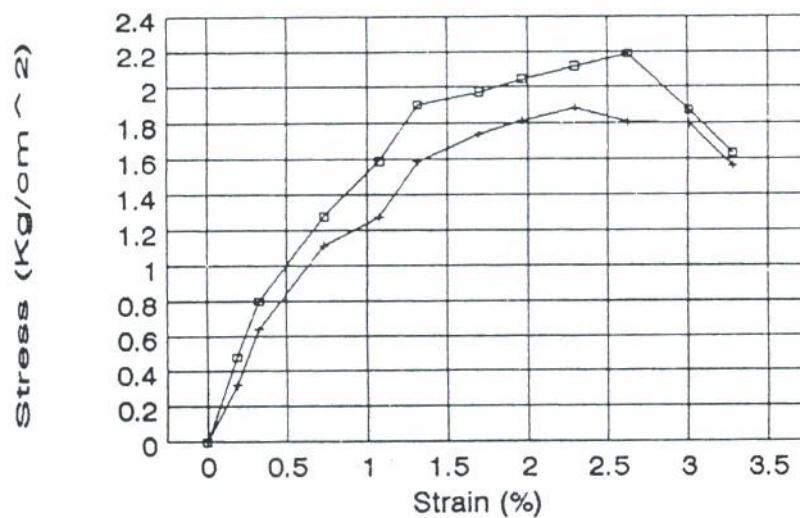
## UNCONFINED COMPRESSION TEST

|              |                         |  |  |  |                       |            |  |               |
|--------------|-------------------------|--|--|--|-----------------------|------------|--|---------------|
| Project      | Waste Water Treatment   |  |  |  | Diam. of Sample (Cr   | 4.73       |  | Calibration : |
| Location     | P.L.T.U Suralaya, Merak |  |  |  | Height of Sample (C   | 9.15       |  | 2.82          |
| Bor Number   | DB-2                    |  |  |  | Initial Area (Cm ^ 2) | 17.56272   |  |               |
| Depth        | 1.00 - 1.80 M           |  |  |  | Tested by             | Amin.S     |  | Sensitivity : |
| Date of Test | April 30 1994           |  |  |  | Checked by            | Ir. Faol B |  | 1.16          |

| TIME<br>MINUTE | STRAIN      |        |           |        | LOADING     |           |           |           | AREA<br>(CM ^ 2) |        | STRESS<br>KG/CM ^ 2 |       |
|----------------|-------------|--------|-----------|--------|-------------|-----------|-----------|-----------|------------------|--------|---------------------|-------|
|                | UNDISTURBED |        | REMOULDED |        | UNDISTURBED |           | REMOULDED |           | UD-S             | RE-M   | UD-S                | RE-M  |
|                | DIAL        | %      | DIAL      | %      | PROV.       | LOAD (Kg) | PROV.     | LOAD (Kg) |                  |        |                     |       |
| 0              | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 17.583           | 17.583 | 0.000               | 0.000 |
| 0.25           | 17          | 0.1857 | 18        | 0.1748 | 3           | 8.46      | 2         | 5.64      | 17.595           | 17.593 | 0.481               | 0.321 |
| 0.5            | 30          | 0.3278 | 28        | 0.3060 | 5           | 14.1      | 4         | 11.28     | 17.620           | 17.617 | 0.800               | 0.640 |
| 1              | 87          | 0.7322 | 65        | 0.7103 | 8           | 22.58     | 7         | 19.74     | 17.692           | 17.688 | 1.275               | 1.116 |
| 1.5            | 98          | 1.0710 | 95        | 1.0382 | 10          | 28.2      | 8         | 22.56     | 17.750           | 17.747 | 1.588               | 1.271 |
| 2              | 120         | 1.3114 | 110       | 1.2021 | 12          | 33.84     | 10        | 28.2      | 17.796           | 17.778 | 1.902               | 1.588 |
| 2.5            | 155         | 1.6939 | 145       | 1.5846 | 12.5        | 35.25     | 11        | 31.02     | 17.865           | 17.846 | 1.973               | 1.738 |
| 3              | 180         | 1.9672 | 170       | 1.8579 | 13          | 36.68     | 11.5      | 32.43     | 17.915           | 17.895 | 2.046               | 1.812 |
| 3.5            | 210         | 2.2950 | 200       | 2.1857 | 13.5        | 38.07     | 12        | 33.84     | 17.975           | 17.955 | 2.118               | 1.885 |
| 4              | 240         | 2.6229 | 220       | 2.4043 | 14          | 39.48     | 11.5      | 32.43     | 18.036           | 17.995 | 2.189               | 1.802 |
| 4.5            | 275         | 3.0054 | 260       | 2.8415 | 12          | 33.84     | 11.5      | 32.43     | 18.107           | 18.078 | 1.869               | 1.794 |
| 5              | 300         | 3.2786 | 280       | 3.0601 | 10.5        | 29.81     | 10        | 28.2      | 18.158           | 18.117 | 1.831               | 1.557 |
| 5.5            | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 6              | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 6.5            | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 7              | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 7.5            | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 8              | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 8.5            | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 9              | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 9.5            | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |
| 10             | 0           | 0      | 0         | 0      | 0           | 0         | 0         | 0         | 0.000            | 0.000  | ERR                 | ERR   |

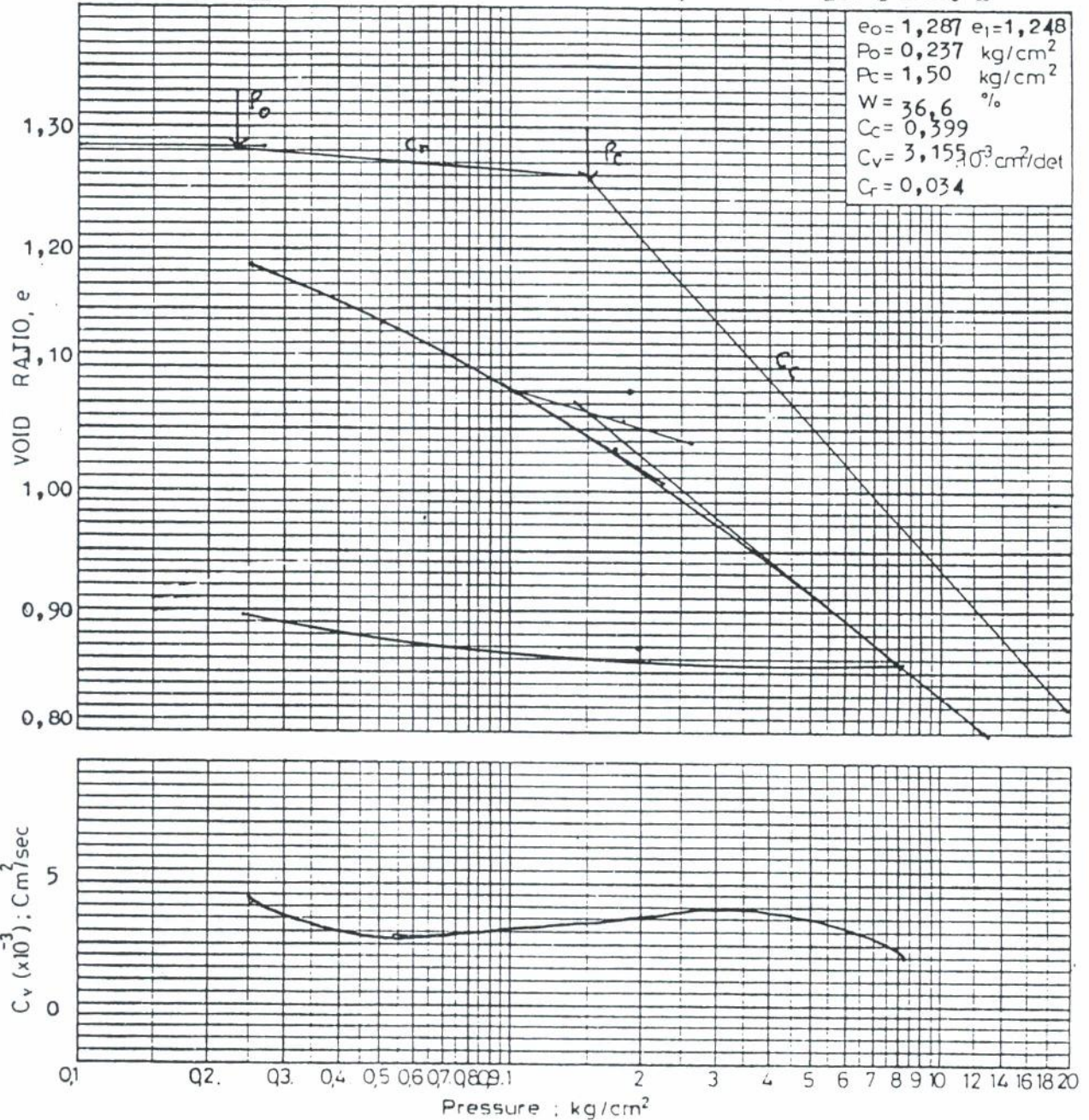
STRESS STRAIN CURVE





## CONSOLIDATION TEST

Project : WWTP PLTU SURALAYA      Depth of sample : 100 - 150  
 Location : MERAK JAWA BARAT      Date of test : 27 April 1994.  
 Boring no : DB. 2      Test by : Ir. Shanny E



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# POWER HYDROGEN ( PH ) TEST OF SOIL

Project : Waste Water Treatment Plant  
Location : P.L.T.U Suralaya, Merak  
Date of test : April 30, 1994  
Tested by : Mr. Ir. M.A. Ontowiryo

| Bor Hole Number | Depth (meter) | Ph  |
|-----------------|---------------|-----|
| DB-1            | 1.50 - 1.95   | 8.2 |
| DB-1            | 2.50 - 2.82   | 8.2 |
| DB-1            | 3.50 - 3.58   | 8.1 |
| DB-1            | 4.00 - 4.50   | 7.8 |
| DB-2            | 1.00 - 1.50   | 7.7 |
| DB-2            | 1.50 - 1.95   | 7.6 |
| DB-2            | 2.50 - 2.83   | 8.3 |
| DB-2            | 3.50 - 3.80   | 8.4 |
| DB-2            | 4.00 - 4.50   | 8.2 |
| DB-3            | 1.00 - 1.10   | 8.2 |
| DB-3            | 1.50 - 1.60   | 8.0 |
| DB-3            | 2.50 - 2.60   | 8.3 |
| DB-3            | 3.50 - 3.60   | 7.7 |
| DB-3            | 4.00 - 4.50   | 8.4 |



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