CHAPTER 2 GEOLOGICAL AND SOIL MECHANICAL SURVEY

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2.1 Geological Profile

2.1.1 Introduction

(i) General

To anticipate flood control system in Semarang City and suburb. The Directorate General of Water Resources Development, Ministry of Public Works (PU) in association with JICA STUDY TEAM, Semarang, Indonesia is expanding Soil Mechanics Survey for the detailed design of Flood Control, Urban Drainage and Water Resources Development in Semarang, in Republic of Indonesia.

Referring to the above objective and relating to the sub-structure design, The JICA STUDY TEAM has appointed PT. Geo ACE, Bandung to perform the Soil Mechanic Survey at the project areas as mentioned above.

(ii) Location and Accessibility

The project site is located in Semarang City, Central Java. The site location could be reached by car through road condition.

(iii) Scope of Work

In order to fulfil the engineer requirement of soil parameters for detailed design purpose, some several items, such as core drilling, standard penetration test, undisturbed sampling, and laboratory testing were performed for this project.

2.1.2 GEOLOGY

(i) Regional Geology

(1) Physiography and Morphology

The Central Java physiographically can be divided into the Bogor Zone in the South and North Java coastal Plain in the North (Bemmelen, 1949).

The Bogor Zone at the surrounding of Semarang area presents as the west cape of Kendeng Ridge of East Java. This zone is expressed by low to high Undulating hills, with elevation between 10 m up to 300 m above mean sea level, with the slope ranges from 5% to 30%.

The Bogor Zone is mostly characterized and controlled by the folded sedimentary rock and Tertiary to Plio-pleistocene age, where partly is covered by young volcanic product of Quaternary.

The North Java Coastal Plain is characterized by flat areas, with the elevation ranges from 0 m to 10 m above mean sea level, and the slope is mostly less than 3%. This zone is covered by alluvial, consisting of river deposit, lake, swamp, and coastal deposit.

(2) Stratigraphy

Referring to the Regional Map of Magelang and Semarang Quadrangle, Central Java (Thaden, Sumadirdja, Richards, 1975), the stratigraphy of the project area and its vicinity consists of :

a. Alluvium Deposit

The deposit presents as Alluvium of the Holocene age, consisting of coastal plain deposit, stream, and Lake Deposit. Coastal plain deposit is mainly clay and sand, varying in thickness, but commonly it is 50 meters or thicker. The deltas of Garang River consist of interbedded sand and clay.

Alluvium along the stream is generally 1 m to 3 m thick, consisting of gravel with boulders. The boulders are mostly volcanic rock and andesite.

b. Sedimentary Rock

This rock is composed by Damar Formation, Volcanic Breccia, and Marine Beds of the Plio-Pleistocene age.

- *Damar Fornation* consists of Tuffaceous Sandstone, Conglomerate, Volcanic Breccia, and tuff. Most of tuff and sandstone are slightly consolidated, locally calcareous. Breccia is composed by basic volcanic rock, probably partly deposited as lahar. This formation is largely non-marine deposits with mollusks are found locally.
- *Volcnic Breccia* consists of volcanic Breccia lawa flows, tuff, tuffaceous Sandstone, and Claystone. Most of flow breccia and lahar are interbedded with small lava flows and fine to coarse grained tuff. This unit includes tuffaceous sandstone and claystone with mollusks, mainly in the bottom where mostly concealed by talus. This volcanic deposit was contributed from several centres of the volcanoes, such as Gunung Ungaran and Gunung Sundoro.
- *Marine Beds* consists of interbedded claystone, marl, sandstone, conglomerate, volcanic breccia, and limestone. The unit is locally fossiliferous, mostly foraminifer plankton with a few mollusks and colonial corals. Sandstone ranges from fine to coarse grained mostly tufaceous with bedding ranges from thin to thick. Thin beds of conglomerate, some with rounded quartz pebbles, occurred in claystone along Kali Kripik and else, where in sandstone.

(3) Geological Structure

The geological structure in this area presents as inferred fault, striking relatively northward – southward.

(ii) Geology of The Project Area

(1) Morphology

The morphology of the project area is Coastal Plain Morphological Units and covering 100% of the area, situated on the elevation between 0 m and 10 m above mean sea level with slopes is less than 3%.

(2) Stratigraphy

- Based on field observation and core drilling result along Banjir Kanal Barat (West Floodway), the stratigraphy of this area can be divided into :

- *Damar Formation* which is covered the hills in the upstream of Banjir Kanal Barat and Kali Garang and situated at the elevation between 5 m and 150 m above mean sea level.

It consists of tuffaceous sandstone interbedded with conglomerate, volcanic breccia, and tuff. Conglomerate an volcanic breccia are mostly composed by andesitic rocks component in the ground mass of sand, gravelly tuffaceous sand or tuffaceous sand, with diameter between 0.5 cm to 1 m. In general, this formation dips 5° to 15° to the Northward-North Eastward.

- *Alluvium* presents as the youngest deposit. It is stratigraphycally overlain the Damar Formation.

The unit is deposit along the wide valley of Kali Garang and covering the flat areas along the Coastal Plain in the North of Semarang.

It consists of river deposit, Lake Deposit, swamp deposit, and coastal plain deposit, such as unconsolidated sand, silt and clay.

Alluvium at the upstream of Kali Garang consists generally of gravel and boulders of andesitic rocks, sand and silt, where the downstream is dominated by fine sand silt and clay.

2.1.2 Geological Investigation

(i) Scope of Work

The Soil Mechanics Survey for the Detailed Design of Flood Control in Semarang consists of:

- Core drilling and testing in bore hole.
- Laboratory testing.

(ii) Core Drilling

(1) Purpose

The purpose of core drilling is to obtain the subsurface geology of the drilling area, i.e. soil type, thickness, sequence, physical condition, etc.

During the drilling, SPT (Standard Penetration Tests) are executed in order to gain the soil's consistency.

(2) Method

Core drilling is performed according to "Hydraulic feed rotary drilling" method, mounted appropriately on a platform. Single tube core barrels and tungsten bits are used in order to gain good quality of core samples.

The core samples are sequentially arranged into core boxes from top to bottom, representing soil types and layer distribution.

Standard Penetration Tests (SPT) are performed by dropping a 63.5 kg hammer from a height of 75 cm. The numbers of drop ti penetrate 45 cm depth are noted, and the drops for the last 30 cm is taken as SPT N value.

(3) Scope of Work

- West Floodway : 52 bore holes, with total depth of 870 m, Standard Penetration Test (SPT) performed in the bore hole every 1.0 meter depth, with total of 824 tests. Disturbed core samples taken for the total of 118 samples.

- Simongan Weir: 6 bore holes, with total 120 m, SPT in the borehole every 1.0 meter dept, total of 88 tests.

The detailed specification of each borehole is available in table 3.1

Table 2.1 THE SPECIFICATION OF CORE DRILLING

A. West Floodway / Garang River

No.	Hole	Depth (m)	SPT	UDS	Commenced	Completed
1	RB – 1	15	14	1	30 – Aug - 97	31 - Aug - 97
2	RB – 2	15	14	1	13 – Sep - 97	14 - Sep - 97
3	RB – 3	15	14	1	23 - Sep - 97	24 - Sep - 97
4	RB – 4	15	14	1	26 - Sep - 97	26 - Sep - 97
5	RB – 5	25	23	2	21 - Sep - 97	22 - Sep - 97
6	RB – 6	30	28	2	10 - Sep - 97	12 - Sep - 97
7	RB – 7	15	14	1	22 - Sep - 97	23 - Sep - 97
8	RB – 8	15	14	1	24 - Sep - 97	24 - Sep - 97
9	RB – 9	25	23	2	18 - Sep - 97	19 - Sep - 97
10	RB – 10	15	14	1	21 - Sep - 97	22 - Sep - 97
11	RB – 11	25	23	2	18 - Sep - 97	20 - Sep - 97
12	RB – 12	15	14	1	19 - Sep - 97	20 - Sep - 97
13	RB – 13	15	14	1	16 - Sep - 97	17 - Sep - 97
14	RB – 14	15	14	1	24 - Sep - 97	25 - Sep - 97
15	RB – 15	15	14	1	16 - Sep - 97	16 - Sep - 97
16	RB – 16	15	14	1	17 - Sep - 97	17 - Sep - 97
17	RB – 17	35	33	2	30 - Aug - 97	03 - Sep - 97
18	RB – 18	40	38	2	30 - Aug - 97	04 - Sep - 97
19	RB – 19	15	15	1	01 - Sep - 97	03 - Sep - 97
20	RB – 20	15	14	1	02 - Sep - 97	04 - Sep - 97
21	RB – 21	20	19	1	30 - Aug - 97	31 - Aug - 97
22	RB – 22	20	19	1	30 - Aug - 97	01 - Sep - 97
23	RB – 23	15	14	-	01 - Sep - 97	03 - Sep - 97
24	RB – 24	15	14	1	11 - Sep - 97	12 - Sep - 97
25	RB – 25	15	14	1	02 - Sep - 97	04 - Sep - 97
26	RB – 26	15	15	-	08 - Sep - 97	09 - Sep - 97
27	RB – 27	15	15	-	30 - Aug - 97	31 - Aug - 97
28	RB – 28	15	13	2	15 - Sep - 97	15 - Sep - 97
29	RB – 29	15	14	1	13 - Sep - 97	13 - Sep - 97
30	RB – 30	15	14	1	13 - Sep - 97	14 - Sep - 97
31	RB – 31	15	15	-	10 - Sep - 97	11 - Sep - 97
32	RB – 32	15	15	-	10 - Sep - 97	11 - Sep - 97
33	RB – 33	15	15	-	07 - Sep - 97	09 - Sep - 97
34	RB – 34	15	15	-	08 - Sep - 97	09 - Sep - 97
35	RB – 35	10	10	-	31 - Aug - 97	31 - Aug - 97
36	RB – 36	10	10	-	12 - Sep - 97	12 - Sep - 97
37	RB – 37	10	10	-	03 - Sep - 97	04 - Sep - 97
38	RB – 38	10	10	-	09 - Sep - 97	10 - Sep - 97
39	RB – 39	10	10	-	05 - Sep - 97	05 - Sep - 97
40	RB – 40	10	10	-	07 - Sep - 97	08 - Sep - 97
41	RB – 41	10	10	-	05 - Sep - 97	06 - Sep - 97
42	RB – 42	10	10	-	05 - Sep - 97	06 - Sep - 97
43	RB – 43	10	9	-	02 - Sep - 97	03 - Sep - 97
44	RB – 44	10	10	-	05 - Sep - 97	06 - Sep - 97
45	RB – 45	10	9	-	31 - Aug - 97	01 - Sep - 97
46	RB – 46	10	10	-	02 - Sep - 97	03 - Sep - 97
47	RB – 47	10	9	-	30 - Aug - 97	31 - Aug - 97
84	RB – 48	10	10	-	30 - Aug - 97	31 - Aug - 97
49	RB – 49	10	10	-	01 - Sep - 97	02 - Sep - 97
50	RB – 50	10	8	-	30 - Aug - 97	31 - Aug - 97
51	RB – 51	50	48	2	30 - Sep - 97	07 - Oct - 97
52	RB – 52	50	45	3	15 - Oct - 97	18 - Oct - 97
	TOTAL	870	824	39		

B. Simongan Weir

No.	Hole	Depth (m)	SPT	UDS	Commenced	Completed
1	SB – 1	20	18	3	01 – Sep - 97	03 - Sep - 97
2	SB – 2	20	14	3	30 – Aug - 97	31 - Aug - 97
3	SB – 3	20	20	3	01 – Sep - 97	03 - Sep - 97
4	SB – 4	20	20	-	09 – Sep - 97	12 - Sep - 97
5	SB – 5	20	9	1	26 – Sep - 97	28 - Sep - 97
6	SB – 6	20	7	-	16 - Sep - 97	21 - Sep - 97
		120	88	10		

(4) Result

The core drilling results at each bore hole, including information about the soil's type, thickness, physical condition, SPT values, etc. are tabulated in Drilling Logs which is attached in next section (2.2 Boring).

2.2 Boring

BORING NO	LOCATION	DEPTH (m)	ELEVATION (m)	BORING NO	LOCATION	DEPTH (m)	ELEVATION (m)
RB – 1	LEFT BANK	15.00	1.293	RB – 36	RIGHT BANK	10.00	5.665
RB – 2	RIGHT BANK	15.00	0.214	RB – 37	LEFT BANK	10.00	9.736
RB – 3	LEFT BANK	15.00	0.849	RB – 38	LEFT BANK	10.00	7.173
RB – 4	RIGHT BANK	15.00		RB – 39	LEFT BANK	10.00	11.31
RB – 5	LEFT BANK	25.00	0.171	RB – 40	RIGHT BANK	10.00	10.859
RB – 6	RIGHT BANK	30.00	0.260	RB – 41	LEFT BANK	10.00	9.304
RB – 7	LEFT BANK	15.00	0.076	RB – 42	RIGHT BANK	10.00	11.064
RB – 8	RIGHT BANK	15.00	1.041	RB – 43	LEFT BANK	10.00	10.04
RB – 9	LEFT BANK	25.00	0.614	RB – 44	RIGHT BANK	10.00	11.61
RB – 10	RIGHT BANK	15.00	1.070	RB – 45	LEFT BANK	10.00	9.320
RB – 11	LEFT BANK	25.00	1.064	RB – 46	RIGHT BANK	10.00	11.457
RB – 12	RIGHT BANK	15.00	0.442	RB – 47	LEFT BANK	10.00	10.395
RB – 13	LEFT BANK	15.00	2.030	RB – 48	RIGHT BANK	10.00	9.711
RB – 14	RIGHT BANK	15.00	1.274	RB – 49	RIGHT BANK	10.00	9.268
RB – 15	LEFT BANK	15.00	1.436	RB – 50	RIGHT BANK	10.00	10.411
RB – 16	RIGHT BANK	15.00	1.524	RB – 51	GARANG RIVER	50.00	-
RB – 17	LEFT BANK	35.00	1.332	RB – 52	GARANG RIVER	50.00	-
RB – 18	RIGHT BANK	40.00	1.609	SB – 1	SIMONGAN WEIR, RIGHT BANK	20.00	8.502
RB – 19	LEFT BANK	15.00	2.027	SB – 2	SIMONGAN WEIR, RIGHT BANK	20.00	3.985
RB – 20	SIMONGAN WEIR, RIGHT BANK	15.00	2.302	SB – 3	SIMONGAN WEIR, LEFT BANK	15.00	8.634
RB – 21	LEFT BANK	20.00	0.610	SB – 4	SIMONGAN WEIR	20.00	-1.985
RB – 22	RIGHT BANK	20.00	1.992	SB – 5	SIMONGAN WEIR	20.00	-1.805
RB – 23	LEFT BANK	15.00	2.385	SB – 6	SIMONGAN WEIR	20.00	-2.005
RB – 24	RIGHT BANK	15.00	2.649				
RB – 25	LEFT BANK	15.00	3.679				
RB – 26	RIGHT BANK	15.00	3.107				
RB – 27	RIGHT BANK	15.00	3.476				
RB – 28	RIGHT BANK	15.00	1.520				
RB – 29	LEFT BANK	15.00	7.127				
RB – 30	RIGHT BANK	15.00	7.097				
RB – 31	LEFT BANK	15.00	8.869				
RB – 32	RIGHT BANK	15.00	8.787				
RB – 33	LEFT BANK	15.00	8.696				
RB – 34	RIGHT BANK	15.00	7.493				
RB – 35	LEFT BANK	10.00	10.45				

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SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 1 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date	: 26 SEPTEMBER 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Asep & Sobandi
Boring Depth : 15.00 meter	Angle : Bearing :	Logged by	: Rudy Mufranto
Elevation : + 1.293 meter	Drilling Machine : YBM - 3E	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

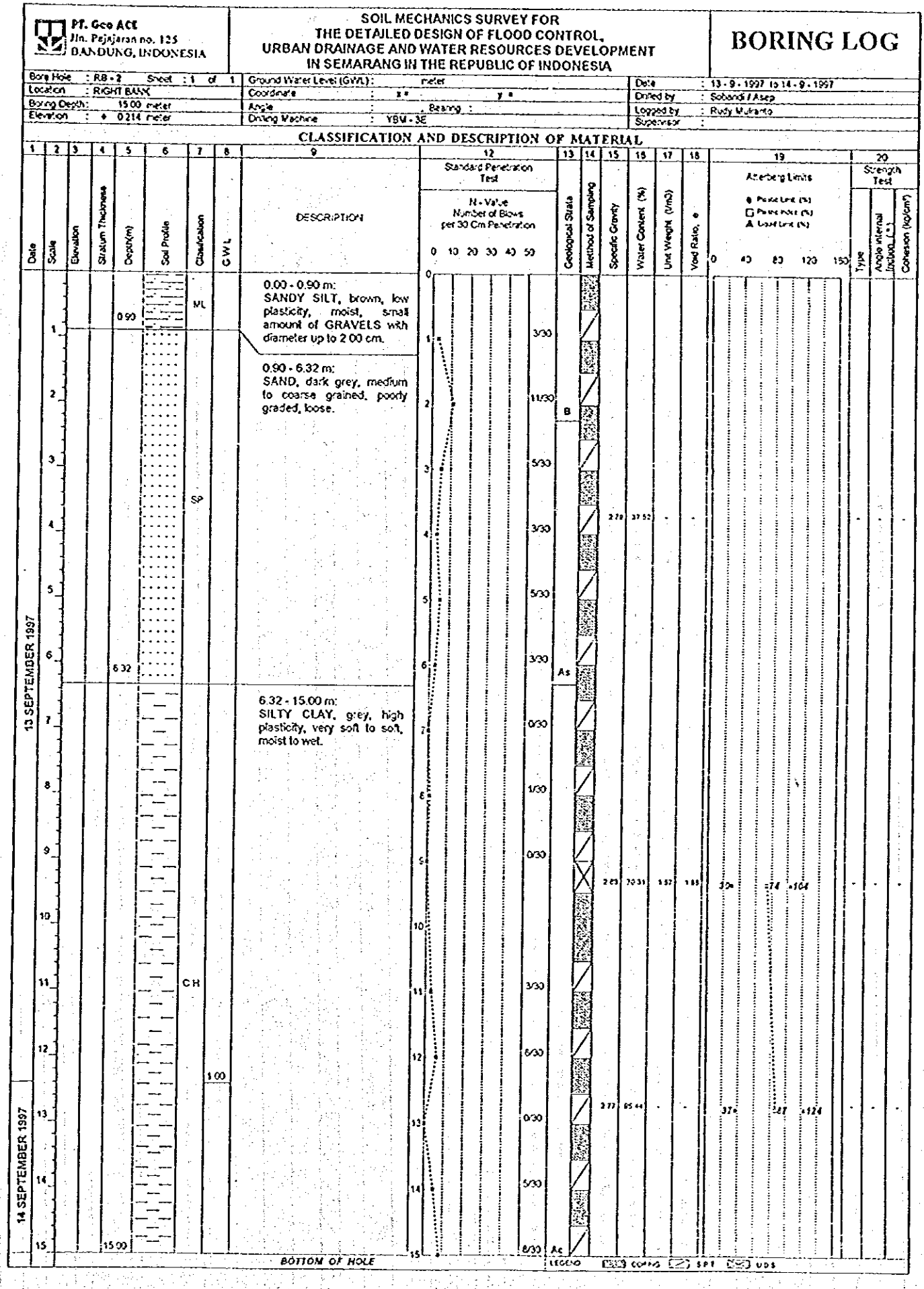
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G.W.L	DESCRIPTION
26 SEPTEMBER 1997				0.40		SP		0.00 - 0.40 m: SILTY SAND, brownish grey to grey, fine to medium grained, poorly to medium graded.
				3.10		CH		0.40 - 3.10 m: SILTY CLAY, brown, high plasticity, soft to firm, mois, having gravels in 1.80 - 2.00 m depth with diameter up to 3.00 cm.
				6.10		SW		3.10 - 6.10 m: SAND, grey, fine to coarse grained, well graded, loose, wet.
				10.70		SP		6.10 - 10.70 m: SILTY SAND, grey, very fine grained, poorly graded, loose, medium dense.
				15.00		CH	1.50	10.70 - 15.00 m: CLAY, grey, high plasticity, soft to firm, moist.

BOTTOM OF HOLE

Standard Penetration Test — N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)

Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (● Plastic Limit (%), □ Plastic Index, ▲ Liquid Limit (%); 0 40 80 120 160)	Strength Test: Type	Angle Internal Friction (°)	Cohesion (kg/cm²)
	3/30								
	> 50								
B	3/30								
	3/30								
	3/30								
As	3/30								
	7/30								
	3/30	2.70	40.36	1.85	1.05	26 28 51			
	3/30								
	3/30								
	3/30	2.86	74.56	1.56	1.97	36 58 94	CU	2.00	0.19
	3/30								
	6/30	2.64	50.36	1.68	1.51	39 85 125			
	6/30								
	3/30								
Ac									

LEGEND: BORING SPT UDS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BANDUNG, INDONESIA
SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA
BORING LOG
Bore Hole : RB - 2 Sheet : 1 of 1
Location : RIGHT BANK
Boring Depth : 15.00 meter
Elevation : + 0.214 meter
Ground Water Level (GWL) : meter
Coordinate : x = y =
Angle : Bearing :
Drilling Machine : YBM - 3E
Date : 13 - 9 - 1997 to 14 - 9 - 1997
Drilled by : Sobandi / Asep
Logged by : Rudy Mulianto
Supervisor :
CLASSIFICATION AND DESCRIPTION OF MATERIAL
Date
Scale
Elevation
Stratum Thickness
Depth (m)
Soil Profile
Classification
G.W.L
DESCRIPTION
Standard Penetration Test
N - Value
Number of Blows per 30 Cm Penetration
0 10 20 30 40 50
Geological Strata
Method of Sampling
Specific Gravity
Water Content (%)
Unit Weight (t/m3)
Void Ratio, e
Atterberg Limits
Plastic Limit (%)
Natural Moisture (%)
Liquid Limit (%)
0 40 80 120 150
Strength Test
Type
Angle of Internal Friction, (°)
Cohesion (kg/cm²)
13 SEPTEMBER 1997
14 SEPTEMBER 1997
0.00 - 0.90 m:
SANDY SILT, brown, low plasticity, moist, small amount of GRAVELS with diameter up to 2.00 cm.
ML
0.90
0.90 - 6.32 m:
SAND, dark grey, medium to coarse grained, poorly graded, loose.
SP
6.32
6.32 - 15.00 m:
SILTY CLAY, grey, high plasticity, very soft to soft, moist to wet.
CH
1.00
15.00
BOTTOM OF HOLE
B
As
Ac
LEGEND
CORING
SPT
UDS

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SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole	: RB - 3	Ground Water Level (GWL) :	meter	Date	: 23 - 9 - 1997 to 24 - 9 - 1997
Location	: LEFT BANK	Coordinate	: x = y =	Drilled by	: Tatang
Boring Depth :	15.00 meter	Angle	: , Bearing :	Logged by	: Rudy Mulyanto
Elevation	: + 0.849 meter	Drilling Machine	: YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

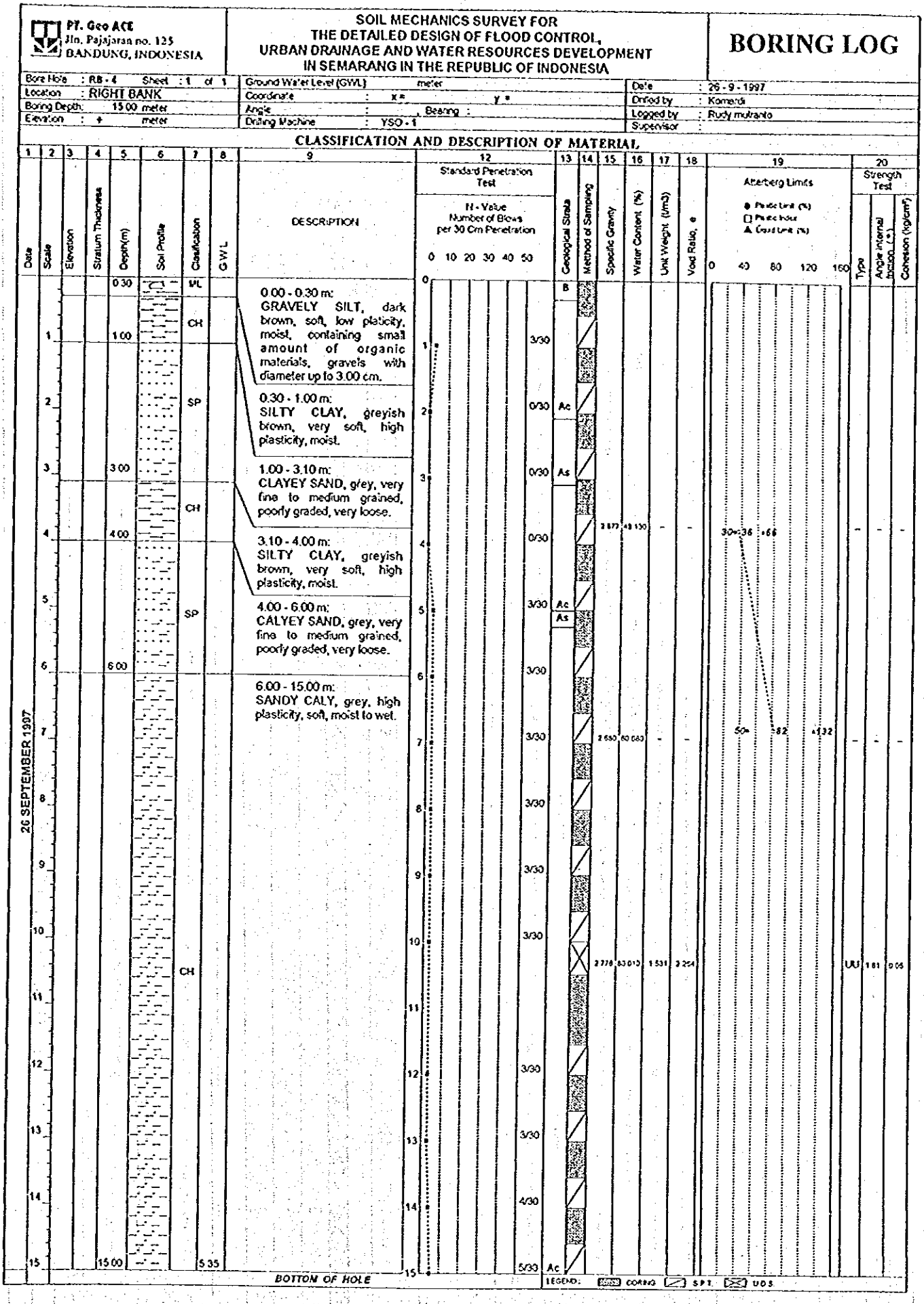
Depth (m)	Soil Profile	Classification	GWL	DESCRIPTION
1.30		SW		0.00 - 1.30 m: GRAVELY SAND, grey to greyish brown, coarse to very coarse grained, well graded, loose. GRAVELS: diameter up to 5.00 cm (embankment).
1.90		CH		1.30 - 1.90 m: SANDY CLAY, greyish brown, very soft, high plasticity, moist.
4.10		SP		1.90 - 4.10 m: CLAYEY SAND, grey, fine to medium grained, poorly to medium graded, very loose, moist to wet.
6.50		CH		4.10 - 6.50 m: SANDY CLAY, greyish brown, high plasticity, very soft, moist.
7.20		SP		6.50 - 7.20 m: SAND, grey, fine to medium grained, poorly graded, loose.
15.00		CH	0.30	7.20 - 15.00 m: CLAY, grey, high plasticity, very soft to firm, moist.

BOTTOM OF HOLE

Standard Penetration Test — N - Value, Number of Blows per 30 Cm Penetration: 0 10 20 30 40 50

Depth	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (0 40 80 120 160)	Strength Test: Type	Angle Internal Friction (°)	Cohesion (kg/cm²)
1		7/30								
2	B	0/30								
3		0/30								
4		0/30								
5		0/30	2.783	75.850	-	-	95 61 102	-	-	-
6		0/30								
7	Ac	1/30								
8	As	2/30								
9		1/30								
10		2/30	2.783	61.850	1.486	1.968	369 278 115	UU	5.25	0.62
11										
12		3/30								
13		6/30								
14		7/30								
15	Ac	6/30	2.713	83.320	-	-	324 177 109	-	-	-

LEGEND: CORING SPT UDS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BANDUNG, INDONESIA
SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA
BORING LOG
Bore Hole : RB - 4 Sheet : 1 of 1
Location : RIGHT BANK
Boring Depth : 15.00 meter
Elevation : + meter
Ground Water Level (GWL) meter
Coordinate : x = y =
Angle : , Bearing :
Drilling Machine : YSO - 1
Date : 26 - 9 - 1997
Drilled by : Komardi
Logged by : Rudy mulranto
Supervisor :
CLASSIFICATION AND DESCRIPTION OF MATERIAL
26 SEPTEMBER 1997
0.00 - 0.30 m: GRAVELY SILT, dark brown, soft, low plasticity, moist, containing small amount of organic materials, gravels with diameter up to 3.00 cm.
0.30 - 1.00 m: SILTY CLAY, greyish brown, very soft, high plasticity, moist.
1.00 - 3.10 m: CLAYEY SAND, grey, very fine to medium grained, poorly graded, very loose.
3.10 - 4.00 m: SILTY CLAY, greyish brown, very soft, high plasticity, moist.
4.00 - 6.00 m: CALYEY SAND, grey, very fine to medium grained, poorly graded, very loose.
6.00 - 15.00 m: SANDY CALY, grey, high plasticity, soft, moist to wet.
BOTTON OF HOLE
LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 6 Sheet : 1 of 2	Ground Water Level (GWL) : meter	Date	: 21 - 9 - 1997 to 22 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Tatang
Boring Depth : 25.00 meter	Angle : , Bearing :	Logged by	: Rudy Mukanto
Elevation : + 0.171 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plastic Index (%), Liquid Limit (%); 0 40 80 120)	Strength Test: Type	Angle of internal friction (°)	Cohesion (kg/cm²)
21 SEPTEMBER 1997	1			1.40		CH		0.00 - 1.40 m: SANDY CLAY, greyish brown, high plasticity, very soft, moist.	0/30										
	2			3.35		SW		1.40 - 3.35 m: SAND, grey to dark grey, fine to coarse grained, medium to well graded, loose, medium dense.	0/30	Ac									
	3								0/30	As									
	4			5.00		CH		3.35 - 5.00 m: SANDY CLAY, greyish brown, high plasticity, very soft, moist.	0/30										
	5								0/30	Ac		2.554	49.110	-	-	26 44 70	-	-	-
	6			6.80		SW		5.00 - 6.80 m: SAND, dark grey, medium to very coarse grained, well graded, loose.	1/30										
	7								1/30	As									
	8							6.80 - 25.00 m: SANDY CLAY, grey, high plasticity, soft to very soft, moist; having some amount of mollusca shell; become firm to very stiff in 18.05 meter depth.	1/30			2.705	77.150	1.545	2.103	34 78 153	-	-	-
	9								1/30										
	10								1/30										
	11					CH			1/30										
	12								0/30										
	13								0/30			2.733	71.570	1.563	1.992	28 46 64	UU	1.28	0.05
	14																		
	15						2.35		1/30										

LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

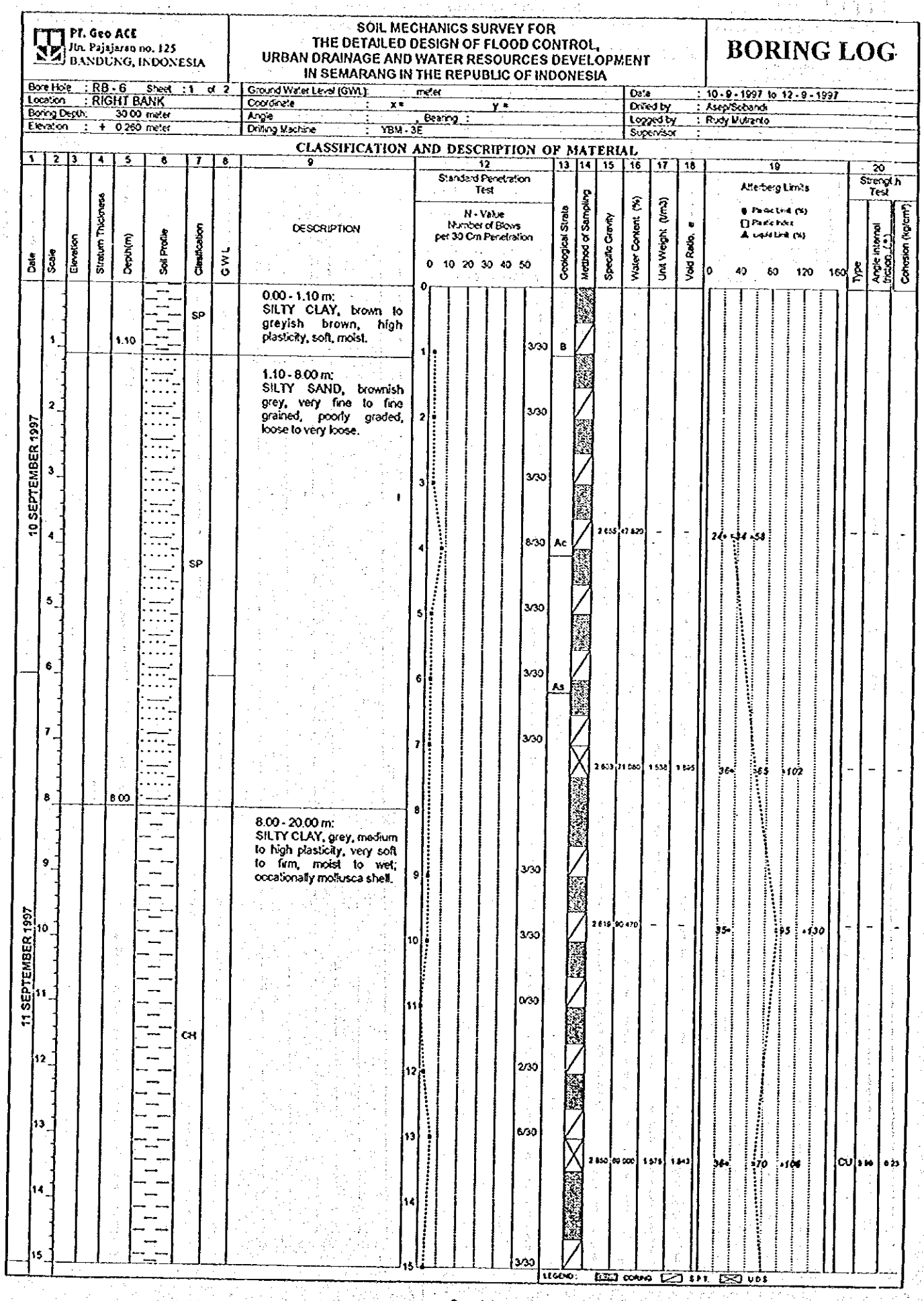
BORING LOG

Bore Hole : RB - 5 Sheet : 2 of 2	Ground Water Level (GWL) : meter	Date	: 21 - 9 - 1997 to 22 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Tatang
Boring Depth : 25.00 meter	Angle : Bearing :	Logged by	: Rudy Mukanto
Elevation : + 0.171 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Clasification	G.W.L	DESCRIPTION	Standard Penetration Test N - Value Number of Blows per 30 Cm Penetration 0 10 20 30 40 50	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits ● Plastic Limit (%) □ Plastic Index ▲ Liquid Limit (%) 0 40 80 120	Strength Test Type Angle internal friction, (°) Cohesion (kg/cm²)
22 SEPTEMBER 1997	15							6.80 - 25.00 m: SANDY CLAY, grey, high plasticity, soft to very soft, moist; having some amount of mollusca shell; become firm to very stiff in 18.05 meter depth.	1/30								
	16								0/30								
	17								4/30								
	18								3/30								
	19								7/30	Ac		2.750	38.900	-	-	32• 81 113	- - -
	20					CH			10/30								
	21								13/30								
	22								24/30								
	23								29/30			2.545	38.850	-	-	28• 63 91	- - -
	24								34/30								
	25			25.00			0.80		22/30	Dc							
								BOTTOM OF HOLE									
	26																
	27																
	28																
	29																
	30																

LEGEND: CORING SPT UDS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BANDUNG, INDONESIA
SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA
BORING LOG
Bore Hole : RB - 6 Sheet : 1 of 2
Location : RIGHT BANK
Boring Depth : 30.00 meter
Elevation : + 0.260 meter
Ground Water Level (GWL) : meter
Coordinate : x = y =
Angle : , Bearing :
Drilling Machine : YBM - 3E
Date : 10 - 9 - 1997 to 12 - 9 - 1997
Drilled by : Asep/Sobandi
Logged by : Rudy Mulranto
Supervisor :
CLASSIFICATION AND DESCRIPTION OF MATERIAL
Date
Scale
Elevation
Stratum Thickness
Depth(m)
Soil Profile
Classification
G W L
DESCRIPTION
Standard Penetration Test
N - Value
Number of Blows per 30 Cm Penetration
0 10 20 30 40 50
Geological Strata
Method of Sampling
Specific Gravity
Water Content (%)
Unit Weight (t/m3)
Void Ratio, e
Atterberg Limits
Plastic Limit (%)
Plastic Index
Liquid Limit (%)
0 40 80 120 160
Strength Test
Type
Angle internal friction, (°)
Cohesion (kg/cm²)
10 SEPTEMBER 1997
11 SEPTEMBER 1997
0.00 - 1.10 m:
SILTY CLAY, brown to greyish brown, high plasticity, soft, moist.
SP
1.10
1.10 - 8.00 m:
SILTY SAND, brownish grey, very fine to fine grained, poorly graded, loose to very loose.
SP
8.00
8.00 - 20.00 m:
SILTY CLAY, grey, medium to high plasticity, very soft to firm, moist to wet; occationally mollusca shell.
CH
B
Ac
As
3/30
8/30
0/30
2/30
6/30
2.655 47.820
2.603 31.080 1.538 0.805
2.618 90.470
2.650 80.000 1.575 1.643
CU 0.86 0.23
LEGEND: CORING SPT UDS

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BORING LOG

Bore Hole : RB - 6 Sheet : 2 of 2	Ground Water Level (GWL) : meter	Date	: 10 - 9 - 1997 to 12 - 9 - 1997
Location : RIGHT BANK	Coordinate : x = y =	Drilled by	: Asep/Sobandi
Boring Depth : 30.00 meter	Angle : Bearing :	Logged by	: Rudy Mulyanto
Elevation : + 0.260 meter	Drilling Machine : YBM - 3E	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (0 40 80 120 160)	Strength Test: Type / Angle of internal friction (°) / Cohesion (kg/cm²)
11 SEPTEMBER 1997	15								3/30								
	16								6/30								
	17								6/30			2.663	43.590	-	-	27	91 118
	18					CH			5/30								
	19								6/30								
	20			20.00				8.00 - 20.00 m: SILTY CLAY, grey, medium to high plasticity, very soft to firm, moist to wet; occationally mollusca shell.	12/30	Ac							
12 SEPTEMBER 1997	21								14/30								
	22								26/30								
	23								30/30								
	24								27/30								
	25					CH			26/30								
	26								27/30								
	27								25/30								
	28								25/30								
	29								29/30								
	30							20.00 - 30.00 m: CLAY, grey, high plasticity, stiff to very stiff, moist.	41/30	Dc							

BOTTOM OF HOLE

LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : R8 - 7 Sheet : 1 of 1	Ground Water Level (GWL) : meter		Date : 23 - 9 - 1997 to 24 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =		Drilled by : Uus K
Boring Depth : 15.00 meter	Angle : , Bearing :		Logged by : Rudy Mulranto
Elevation : + 0.076 meter	Drilling Machine : YBM - 3E		Supervisor :

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plastic Index (%), Liquid Limit (%); 0 40 80 120 160)	Strength Test: Type, Angle internal friction (°), Cohesion (kg/cm²)
22 SEPTEMBER 1997	1					CH		0.00 - 2.00 m: CLAY, greyish brown to brown, high plasticity, soft to firm, moist; containing small amount of plant roots.	6/30								
	2			2.00					3/30								
	3							2.00 - 6.05 m: SILTY SAND, grey, very fine to fine grained, poorly graded, loose, moist to wet; containing some amount of mollusca shell.	2/30								
	4					SP			3/30			2.657	27.243	-	-	26• 57 82	- - -
	5						1.20		4/30								
	6			6.05					7/30								
23 SEPTEMBER 1997	7							6.05 - 15.00 m: CLAY, grey, high plasticity, very soft to firm, moist to wet, occationally mollusca shells.	3/30								
	8								3/30								
	9								3/30								
	10								2/30			2.661	68.833	1.450	2.445	39• 82 123	UU 4.71 0.05
	11					CH											
	12								2/30								
	13								5/30								
	14								6/30								
	15			15.00			5.20	BOTTOM OF HOLE	4/30	Ac		2.636	68.350	-	-	25• 80 104	- - -

LEGEND: CORING, SPT, UDS

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SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 8 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date	: 24 - 9 - 1997
Location : RIGHT BANK	Coordinate : x = y =	Drilled by	: Komardi
Boring Depth : 15.00 meter	Angle : ° Bearing :	Logged by	: Rudy Mulranto
Elevation : + 1.041 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test — N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plasticity Index, Liquid Limit (%)) (0 40 80 120)	Strength Test: Type, Angle of internal friction (°), Cohesion (kg/cm²)
24 SEPTEMBER 1997	0 – 15			1.10		VL		0.00 - 1.10 m: SANDY SILT, light brown, low plasticity, firm to stiff, moist to dry; containing small amount of GRAVELS with diameter up to 0.50 cm, and some amount of plant roots.	14/30	B							
				6.15		CH		1.10 - 6.15 m: SANDY CLAY, brown to light brown, high plasticity, soft, moist; occationally GRAVELS with diameter up to 1.00 cm.	3/30			2.750	58.509	-	-	22.4 46.68	- - -
				10.00		SP		6.15 - 10.00 m: SILTY SAND, grey, very fine to fine grained, poorly graded, loose, moist to wet.	3/30			2.724	53.290	-	-	21.9 35.0 47.1	- - -
				15.00		CH	3.50	10.00 - 15.00 m: CLAY, grey, high plasticity, very soft to soft, moist to wet, containing some amount of mollusca shell.	3/30	Ac		2.772	72.660	1.543	2.045	36.4 27.5 16.1	UU 1.67 0.62
								BOTTOM OF HOLE									

LEGEND: CORING SPT UDS

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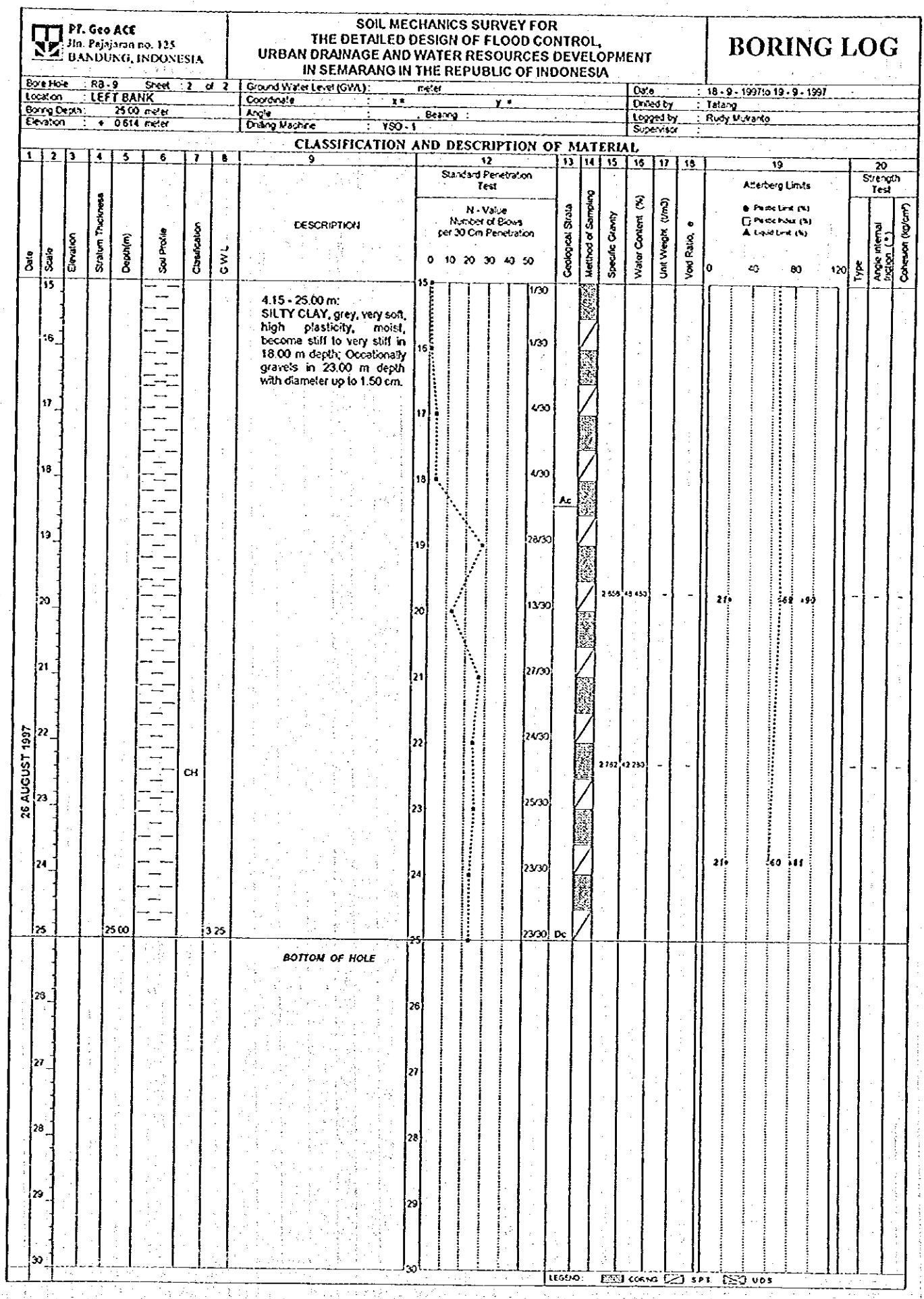
BORING LOG

Bore Hole : RB - 9 Sheet : 1 of 2	Ground Water Level (GWL) : meter	Date	: 18 - 9 - 1997 to 19 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Talang
Boring Depth : 25.00 meter	Angle : , Bearing :	Logged by	: Rudy Mulyanto
Elevation : + 0.614 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test N - Value Number of Blows per 30 Cm Penetration 0 10 20 30 40 50	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits Plastic Limit (%) Plastic Index Liquid Limit (%) 0 40 80 120	Strength Test Type	Angle internal friction (°)	Cohesion (kg/cm²)
18 SEPTEMBER 1997	1			1.00		ML		0.00 - 1.00 m: CLAYEY SILT, brown to moderately plasticity, firm moist; containing some amount of plant roots.	0 1 5/30										
	2					CH		1.00 - 3.50 m: SANDY CLAY, grey, very soft, high plasticity, moist.	2 3/30										
	3			3.50					3 0/30	Ac									
	4			4.15		SP		3.50 - 4.15 m: SAND, grey, fine to medium grained, poorly graded, loose.	4 1/30	As									
	5							4.15 - 25.00 m: SILTY CLAY, grey, very soft, high plasticity, moist, become stiff to very stiff in 18.00 m depth; Occationally gravels in 23.00 m depth with diameter up to 1.50 cm.	5 1/30			2.778	31.580	-	-	22• 81 102	-	-	-
	6								6 0/30										
	7								7 3/30			2.639	31.870	1.673	1.864	27• 53 89	-	-	-
	8								8										
	9								9 3/30										
	10					CH			10 3/30										
	11								11 3/30										
	12								12 4/30										
	13						2.30		13 0/30			2.723	23.000	1.561	2.018	33• 64 97	UU	1.84	0.05
19 SEPT. 1997	14								14										
	15								15 1/30		Ac								

LEGEND: CORING S.P.T. U.D.S.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BANDUNG, INDONESIA
SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA
BORING LOG
Bore Hole : RB - 9 Sheet : 2 of 2
Location : LEFT BANK
Boring Depth : 25.00 meter
Elevation : + 0.614 meter
Ground Water Level (GWL) : meter
Coordinate : x = y =
Angle : Bearing :
Drilling Machine : YSO - 1
Date : 18 - 9 - 1997 to 19 - 9 - 1997
Drilled by : Tatang
Logged by : Rudy Mulyanto
Supervisor :
CLASSIFICATION AND DESCRIPTION OF MATERIAL
Date
Scale
Elevation
Stratum Thickness
Depth(m)
Soil Profile
Classification
G W L
DESCRIPTION
Standard Penetration Test
N - Value
Number of Blows per 30 Cm Penetration
0 10 20 30 40 50
Geological Strata
Method of Sampling
Specific Gravity
Water Content (%)
Unit Weight (t/m3)
Void Ratio, e
Atterberg Limits
Plastic Limit (%)
Liquid Limit (%)
0 40 80 120
Strength Test
Type
Angle internal friction (°)
Cohesion (kg/cm²)
26 AUGUST 1997
4.15 - 25.00 m:
SILTY CLAY, grey, very soft, high plasticity, moist, become stiff to very stiff in 18.00 m depth; Occationally gravels in 23.00 m depth with diameter up to 1.50 cm.
CH
Ac
Dc
25.00
3.25
BOTTOM OF HOLE
LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 10 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date	: 21 - 9 - 1997 to 22 - 9 - 1997
Location : RIGHT BANK	Coordinate : x = y =	Drilled by	: Komardi
Boring Depth : 15.00 meter	Angle : , Bearing :	Logged by	: Rudy Mulranto
Elevation : + 1.070 meter	Drilling Machine : YSQ - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits: Plastic Limit (%), Plastic Index (%), Liquid Limit (%) (0 40 60 120 160)	Strength Test: Type	Angle Internal Friction (°)	Cohesion (kg/cm²)
21 SEPTEMBER 1997	1			1.70		ML		0.00 - 1.70 m: SANDY SILT, brown, low plasticity, firm to stiff, moist; occationally gravels with diameter up to 2.50 cm.	9/30		B								
	2								4/30										
	3								4/30										
	4								26/30			2.775	52.850	-	-	20 - 77.497	-	-	-
	5								4/30										
	6								3/30										
	7								3/30										
	8					CH	4.50	1.70 - 15.00 m: SILTY CLAY, grey, high plasticity, stiff, moist to wet, become very soft in 4.10 m depth.	3/30										
22 SEPTEMBER 1997	9								3/30										
	10								3/30			2.754	78.050	1.531	2.214	36 - 84 - 120	UU	1.17	0.82
	11								3/30										
	12								3/30										
	13								3/30										
	14								3/30										
	15			15.00			4.50	BOTTOM OF HOLE	6/30		Ac								

LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 11 Sheet : 1 of 2	Ground Water Level (GWL) : meter	Date	: 18 - 9 - 1997 to 20 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Uus K.
Boring Depth : 25.00 meter	Angle : Bearing :	Logged by	: Rudy Mulianto
Elevation : + 1.064 meter	Drilling Machine : YBM - 35	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N-Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plastic Index (%), Liquid Limit (%); 0 40 80 120)	Strength Test: Type; Angle internal friction (°); Cohesion (kg/cm²)
18 SEPTEMBER 1997				1.30		ML		0.00 - 1.30 m: CLAYEY SILT, brown, firm, low to medium plasticity, moist; containing some amount of plant roots and organic materials.	7/30								
							2.10	1.30 - 25.00 m: CLAY, grey, very soft to firm, high plasticity, moist; become stiff to hard in 16.00 m depth.	5/30	B		2.655	82.450	-	-	30+ 67 97	- - -
									3/30								
									1/30								
									1/30								
									1/30			2.547	68.650	1.511	2.180	36+ 73 107	- - -
									1/30								
						CH			2/30								
									3/30								
									3/30								
									3/30								
									1/30								
									3/30			2.745	57.820	1.618	1.562	31+ 64 95	UU 2.47 0.04
19 SEPTEMBER 1997																	

LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 11 Sheet : 2 of 2	Ground Water Level (GWL) : meter	Date	: 18 - 9 - 1997 to 20 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Uus K.
Boring Depth : 25.00 meter	Angle : Bearing :	Logged by	: Rudy Mulyanto
Elevation : + 1.064 meter	Drilling Machine : YBM - 3E	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits: Plastic Limit (%), Plastic Index (%), Liquid Limit (%) (0 40 80 120 160)	Strength Test: Type	Angle Internal Friction (°)	Cohesion (kg/cm²)
	15								3/30										
	16							1.30 - 25.00 m: CLAY, grey, very soft to firm, high plasticity, moist; become stiff to hard in 16.00 m depth.	4/30											
	17								10/30										
	18						2.10		16	Ac		2.645	54.980	-	-	224 651 476	-	-	-
	19								26/30										
	20					CH			44/30										
	21								51/30			2.650	34.890	-	-	264 661 486	-	-	-
	22								22/30										
	23								23/30										
	24								24/30										
19 SEPTEMBER 1997 / 20 SEPTEMBER 1997	25			25.00			1.45		27/30	Dc									
	26							BOTTOM OF HOLE											
	27																		
	28																		
	29																		
	30																		

LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB-12 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date	: 19 - 9 1997 to 20 - 9 - 1997
Location : RIGHT BANK	Coordinate : x = y =	Drilled by	: Komardi
Boring Depth : 15.00 meter	Angle : Bearing	Logged by	: Rudy Mulranto
Elevation : + 0.442 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits: Plastic Limit (%), Plastic Index, Liquid Limit (%) (0 40 80 120)	Strength Test: Type; Angle Internal Friction (°); Cohesion (kg/cm²)
19 SEPTEMBER 1997								0.00 - 15.00 m: SILTY CLAY, brown to grey, high plasticity, very soft to soft, moist to wet.	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	B		2.792	69.270	-	-	26• 48 74	- - -
20 SEPTEMBER 1997					CH		7.20		3/30			2.561	97.120	1.473	2.561	32• 73 105	UU 0.425 0.005
				15.00			7.20	BOTTOM OF HOLE		Ac		22.656	74.650	-	-		- - -

LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

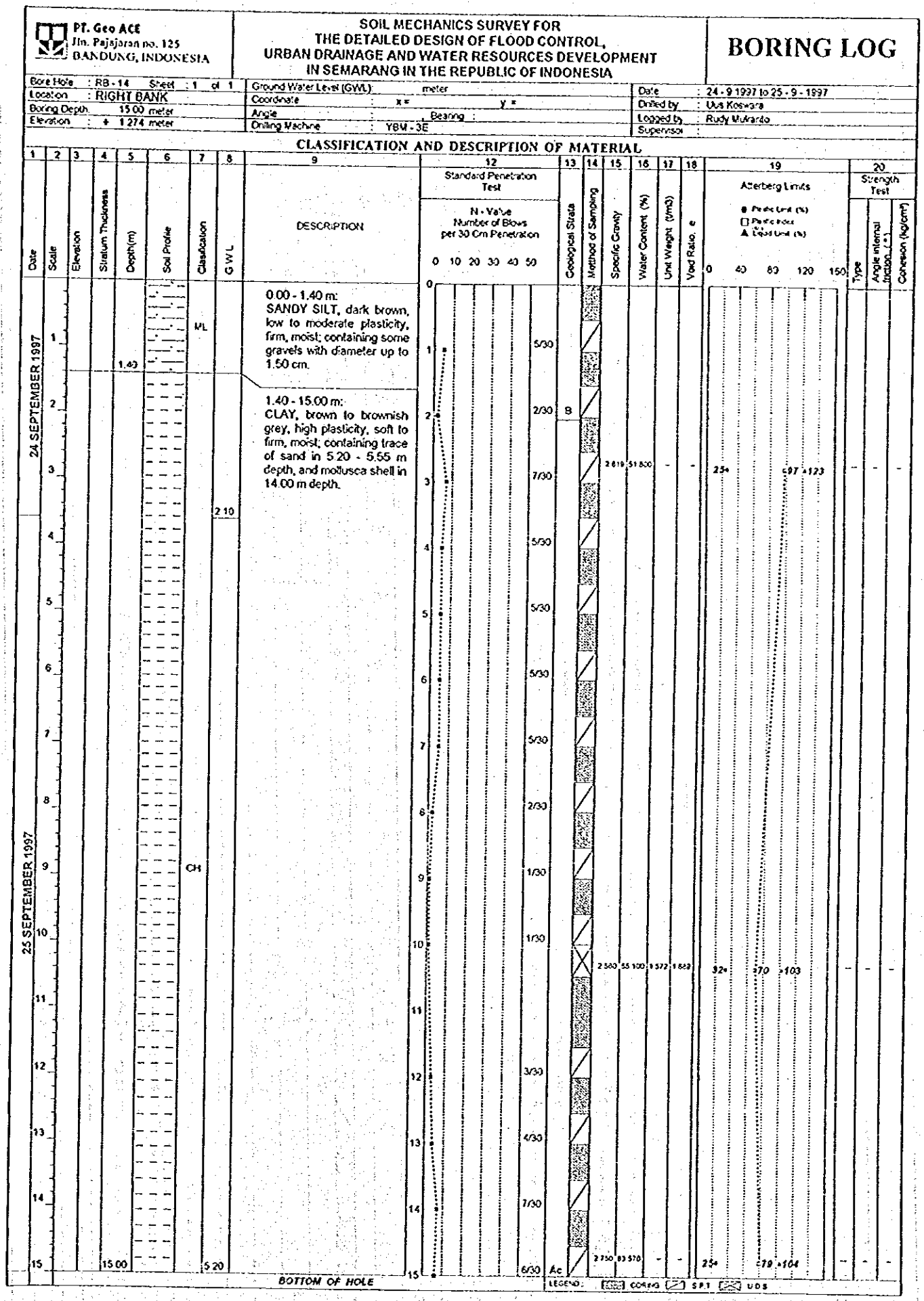
Bore Hole : RB - 13 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date	: 16 - 9 - 1997 to 17 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Tatang
Boring Depth : 15.00 meter	Angle : , Bearing :	Logged by	: Rudy Mukarto
Elevation : + 2.030 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N-Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plastic Index, Liquid Limit (%)) (0 40 80 120 160)	Strength Test: Type	Angle internal friction (°)	Cohesion (kg/cm²)
16 SEPTEMBER 1997	1			1.90		ML		0.00 - 1.90 m: SANDY SILT, light brown to brown, low to medium plasticity, firm, moist.	11/30										
	2								7/30										
	3							1.90 - 6.05 m: CLAY, brown to grey, high plasticity, firm to stiff, moist.	7/30	B									
	4					CH			9/30										
	5								3/30			2.65	75.57	-	-	29.0	-	-	-
	6			6.05			2.00		3/30	Ac						52			
						SP		6.05 - 6.55 m: SAND, grey, fine to medium grained, poorly graded, loose, wet.		As						121			
				6.55								2.67	74.63	-	-	33.0	-	-	-
17 SEPTEMBER 1997	7							6.55 - 15.00 m: CLAY, grey, high plasticity, very soft to firm, moist to wet, having some amount of molusca shell in 9.00 m depth.	3/30							83			
	8								3/30							116			
	9								3/30										
	10								4/30										
	11					CH						2.67	77.74	1.56	2.04	84.0	UU	5.84	0.12
	12								4/30							81			
	13								5/30							115			
	14								6/30										
	15			15.00			2.45		7/30	Ac									

BOTTOM OF HOLE

LEGEND: CORING SPT UDS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BANDUNG, INDONESIA
SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA
BORING LOG
Bore Hole : RB - 14 Sheet : 1 of 1
Location : RIGHT BANK
Boring Depth : 15.00 meter
Elevation : + 1.274 meter
Ground Water Level (GWL) : meter
Coordinate : x = y =
Angle : Bearing :
Drilling Machine : YBM - 3E
Date : 24 - 9 1997 to 25 - 9 - 1997
Drilled by : Uus Koswara
Logged by : Rudy Mukarto
Supervisor :
CLASSIFICATION AND DESCRIPTION OF MATERIAL
Date
Scale
Elevation
Stratum Thickness
Depth (m)
Soil Profile
Classification
G W L
DESCRIPTION
Standard Penetration Test
N - Value
Number of Blows per 30 Cm Penetration
0 10 20 30 40 50
Geological Strata
Method of Sampling
Specific Gravity
Water Content (%)
Unit Weight (t/m3)
Void Ratio, e
Atterberg Limits
Plastic Limit (%)
Plastic Index
Liquid Limit (%)
0 40 80 120 150
Strength Test
Type
Angle internal friction, (°)
Cohesion (kg/cm²)
24 SEPTEMBER 1997
25 SEPTEMBER 1997
0.00 - 1.40 m:
SANDY SILT, dark brown, low to moderate plasticity, firm, moist; containing some gravels with diameter up to 1.50 cm.
1.40 - 15.00 m:
CLAY, brown to brownish grey, high plasticity, soft to firm, moist; containing trace of sand in 5.20 - 5.55 m depth, and mollusca shell in 14.00 m depth.
ML
CH
1.40
2.10
5.20
15.00
5/30
2/30
7/30
5/30
5/30
5/30
5/30
2/30
1/30
1/30
3/30
4/30
7/30
6/30
B
Ac
2.819 51.800
2.580 55.100 1.572 1.663
2.750 83.570
25+ 97 123
32+ 70 103
25+ 79 104
BOTTOM OF HOLE
LEGEND: CORING SPT UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : R3 - 15 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date	: 16 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Uus K
Boring Depth : 15.00 meter	Angle : Bearing :	Logged by	: Rudy Mukanto
Elevation : + 1.435 meter	Drilling Machine : YBM - 3S	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1 Date	2 Scale	3 Elevation	4 Stratum Thickness	5 Depth(m)	6 Soil Profile	7 Classification	8 G.W.L	9 DESCRIPTION
10 SEPTEMBER 1997				0.90		ML		0.00 - 0.90 m: CLAYEY SILT, dark brown, low plasticity, moist.
				3.20		CH		0.90 - 3.20 m: SILTY CLAY, brown, high plasticity, firm, moist.
				4.30		SP		3.20 - 4.30 m: CLAYEY SAND, grey, very fine to medium grained, poorly graded, loose.
						CH		4.30 - 15.00 m: SANDY-SILTY CLAY, grey, high plasticity, soft to firm, moist; containing some amount of mollusca shell in 6.15 m depth.
								8.00 - 11.15 m: SANDY CLAY, greyish brown to grey, high plasticity, firm to stiff, moist.
								11.15 - 13.80 m: CLAYEY SAND, grey, very fine to medium grained, poorly graded, medium dense.
								13.80 - 15.00 m: SAND, grey, medium to coarse grained, well graded, dense to very dense; containing some amount of GRAVELS with diameter up to 3.00 cm.
			15.00			5.08		BOTTOM OF HOLE

12 Standard Penetration Test (N - Value, Number of Blows per 30 Cm Penetration)	13 Geological Strata	14 Method of Sampling	15 Specific Gravity	16 Water Content (%)	17 Unit Weight (t/m3)	18 Void Ratio, e	19 Atterberg Limits (Plastic Limit (%), Plastic Index, Liquid Limit (%))	20 Strength Test: Type	Angle internal friction (°)	Cohesion (kg/cm²)
0 10 20 30 40 50							0 40 80 120 160			
8/30		B								
8/30										
9/30	Ac									
3/30	As		2.671	45.68	-	-	34.0 83 117	-	-	-
2/30										
3/30										
2/30										
4/30										
3/30										
2/30			2.644	69.20	1.585	1.872	77.0 80 104	UU	6.81	0.10
6/30										
3/30										
5/30										
5/30										
24/30	Ac	Dc	2.668	48.48	-	-	25.6 65.7 82	-	-	-

LEGEND: ECRMS, SPT, UDS

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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : BB - 16 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date	: 17 - 9 - 1997
Location : RIGHT BANK	Coordinate : x = y =	Drilled by	: Komardi
Boring Depth : 15.00 meter	Angle : , Bearing :	Logged by	: Rudy Mulrento
Elevation : + 1.524 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N-Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plasticity Index (%), Liquid Limit (%); 0 40 80 120)	Strength Test: Type; Angle Internal Friction (°); Cohesion (kg/cm²)
17 September 1997				1.55		ML		0.00 - 1.55 m: CLAYEY SILT, dark brown, low to medium plasticity, firm, moist.	5/30								
								1.55 - 12.10 m: SILTY CLAY, brown to greyish brown, high plasticity, soft to firm, moist; occationally some mollusca shell.	5/30 7/30 3/30 3/30 3/30 1/30 3/30 1/30 3/30 3/30 3/30 8/30	B		2.75	82.83	-	-	33+ 63 95	- - -
				12.10		CH											
						SP		12.10 - 13.80 m: CLAYEY SAND, grey, very fine to fine grained, poorly graded, loose.				2.743	78.54	1.577	2.105	28+ 74 102	UU 2.19 0.04
				13.80													
						CH		13.80 - 15.00 m: CLAY, high plasticity, firm to stiff, moist.		Ac		2.655	59.85	-	-	28+ 56 82	- - -
				15.00				BOTTOM OF HOLE									

LEGEND: CORING SPT UDS

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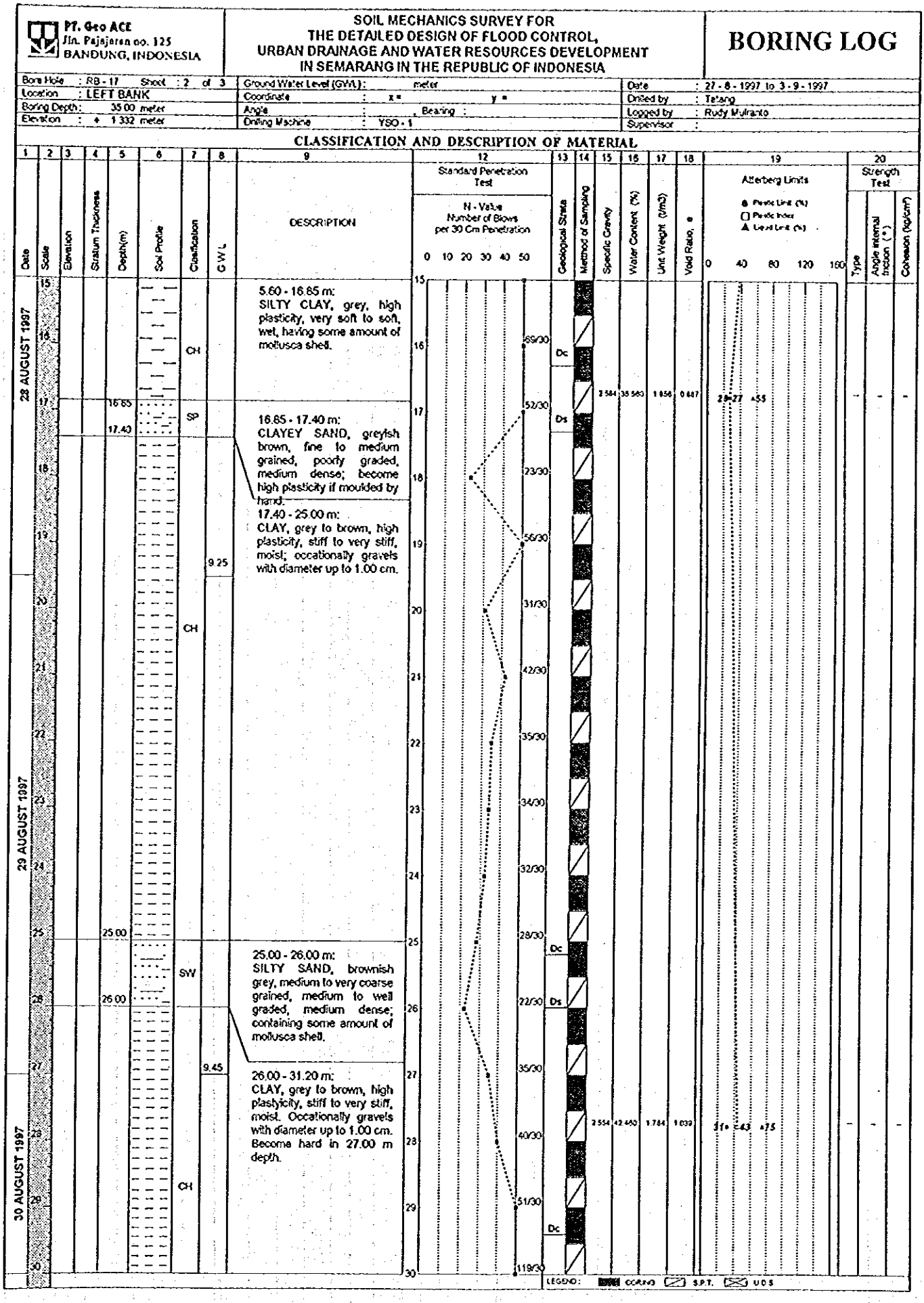
BORING LOG

Bore Hole : RB - 17 Sheet : 1 of 3	Ground Water Level (GWL) : meter		Date : 27 - 8 - 1997 to 3 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =		Drilled by : Tatang
Boring Depth : 35.00 meter	Angle : , Bearing :		Logged by : Rudy Mulranto
Elevation : + 1.332 meter	Drilling Machine : YSO - 1		Supervisor :

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test N - Value Number of Blows per 30 Cm Penetration 0 10 20 30 40 50	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits ● Plastic Limit (%) □ Plastic Index (%) ▲ Liquid Limit (%) 0 40 80 120	Strength Test Type	Angle Internal friction (°)	Cohesion (kg/cm²)
27 AUGUST 1997	0							0.00 - 5.00 m: SILTY CLAY, brown, very soft to firm, high plasticity, moist to wet; containing some amount of plant roots.	0 1 1/45 2 1/45 3 6/30 4 3/30 5 3/30		Ac As	2.537	79.800	1.645	1.706	39+ 62 101	-	-	-
	5			5.00		CH													
				5.60		SP		5.00 - 5.60 m: CLAYEY SAND, grey, very fine to fine grained, poorly graded, loose, moist to wet. Become paltics if moulded by hand; containing some mollusca shell.				2.661	52.770	1.780	1.510	28+ 41 70	-	-	-
28 AUGUST 1997	6						3.75		6 4/30										
	7							5.60 - 16.85 m: SILTY CLAY, grey, high plasticity, very soft to soft, wet, having some amount of mollusca shell.	7 2/30			2.704	52.640	1.700	1.426	27+ 41 68	-	-	-
	8								8 3/30										
	9								9 2/30										
	10					CH			10 4/30										
	11								11			2.720	60.250	1.583	2.067	34+ 62 96	CU	7.21	0.20
	12								12 2/30										
	13								13 6/30										
	14								14 5/30		Ac								
	15								15 56/30										

LEGEND: COARG S.P.T. UDS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SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA
BORING LOG
Bore Hole : RB - 17 Sheet : 2 of 3
Location : LEFT BANK
Boring Depth : 35.00 meter
Elevation : + 1.332 meter
Ground Water Level (GWL) : meter
Coordinate : x = y =
Angle : Bearing :
Drilling Machine : YSO - 1
Date : 27 - 8 - 1997 to 3 - 9 - 1997
Drilled by : Tatang
Logged by : Rudy Mulranto
Supervisor :
CLASSIFICATION AND DESCRIPTION OF MATERIAL
Date
Scale
Elevation
Stratum Thickness
Depth(m)
Soil Profile
Classification
G.W.L
DESCRIPTION
Standard Penetration Test
N - Value
Number of Blows per 30 Cm Penetration
0 10 20 30 40 50
Geological Strata
Method of Sampling
Specific Gravity
Water Content (%)
Unit Weight (t/m3)
Void Ratio, e
Atterberg Limits
Plastic Limit (%)
Plastic Index
Liquid Limit (%)
0 40 80 120 160
Strength Test
Type
Angle internal friction (°)
Cohesion (kg/cm²)
28 AUGUST 1997
29 AUGUST 1997
30 AUGUST 1997
16.85
17.40
25.00
26.00
9.25
9.45
CH
SP
SW
5.60 - 16.85 m:
SILTY CLAY, grey, high plasticity, very soft to soft, wet, having some amount of mollusca shell.
16.85 - 17.40 m:
CLAYEY SAND, greyish brown, fine to medium grained, poorly graded, medium dense; become high plasticity if moulded by hand.
17.40 - 25.00 m:
CLAY, grey to brown, high plasticity, stiff to very stiff, moist; occationally gravels with diameter up to 1.00 cm.
25.00 - 26.00 m:
SILTY SAND, brownish grey, medium to very coarse grained, medium to well graded, medium dense; containing some amount of mollusca shell.
26.00 - 31.20 m:
CLAY, grey to brown, high plasticity, stiff to very stiff, moist. Occationally gravels with diameter up to 1.00 cm. Become hard in 27.00 m depth.
Dc
Ds
LEGEND: CORING S.P.T. U.D.S

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THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 17 Sheet : 3 of 3	Ground Water Level (GWL) : meter	Date	: 27 - 8 - 1997 to 3 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Tirtang
Boring Depth : 35.00 meter	Angle : Bearing :	Logged by	: Rudy Mulianto
Elevation : + 1.332 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Core Barrel Type	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plastic Index (%), Liquid Limit (%)) (0 40 80 120 160)	Strength Test: Type; Angle internal friction (°); Cohesion (kg/cm²)
3 SEPTEMBER 1997	30								50/30								
	31			31.20		CH		26.00 - 31.20 m: CLAY, grey to brown, high plasticity, stiff to very stiff, moist. Occationally gravels with diameter up to 1.00 cm. Become hard in 27.00 m depth.	30/30								
	32					SW		31.20 - 33.30 m: GRAVELY SAND, grey, fine to coarse grained, very dense, well graded, some amount of GRAVELS, subangular to subrounded, diameter up to 7.00 cm.	30/30								
	33			33.30					29/30								
	34					CH		33.30 - 35.00 m: SANDY CLAY, dark grey, firm to stiff, high plasticity, moist; occationally Gravels, diameter up to 2.00 cm.	23/30								
	35						9.20		16/30	Dg							
								BOTTOM OF HOLE									
	36																
	37																
	38																
	39																
	40																
	41																
	42																
	43																
	44																
	45																

LEGEND: BOR BORING SPT UDS

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BORING LOG

Bore Hole : BB - 18 Sheet : 1 of 3	Ground Water Level (GWL) : meter	Date	: 29 - 8 - 1997 to 3 - 9 - 1997
Location : RIGHT BANK	Coordinate : x = y =	Drilled by	: Komardi
Boring Depth : 40.00 meter	Angle : , Bearing :	Logged by	: Rudy Mukarto
Elevation : + 1.609 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G.W.L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits: Plastic Limit (%), Plastic Index (%), Liquid Limit (%) (0 40 80 120 160)	Strength Test: Type, Angle Internal Friction (°), Cohesion (kg/cm²)
29 AUGUST 1997				3.70		CH		0.00 - 3.70 m: SILTY CLAY, brown to grey, high plasticity, soft to firm, moist; containing some amount of plant roots.	9/30, 6/30, 3/30	Ac							
				5.60		SP		3.70 - 5.60 m: SILTY SAND, grey, very fine to fine grained, poorly graded, loose, moist to wet; containing mollusca shell.	3/30	As		2.566	50.990	1.733	1.226	25 51 74	- - -
				15.00		CH		5.60 - 15.00 m: SILTY CLAY, grey, medium to high plasticity, soft, wet.	3/30, 3/30, 3/30, 3/30, 3/30, 4/30, 8/30, 50/30	Ac		2.595	80.920	1.743	1.395	24 53 87	- - -
												2.604	83.660	1.668	1.656	33 53 88	CU 13.51 0.05
												2.546	87.430	1.576	1.703	36 61 97	CU 12.62 0.28

LEGEND: CORING S.P.T. U.D.S.

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URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

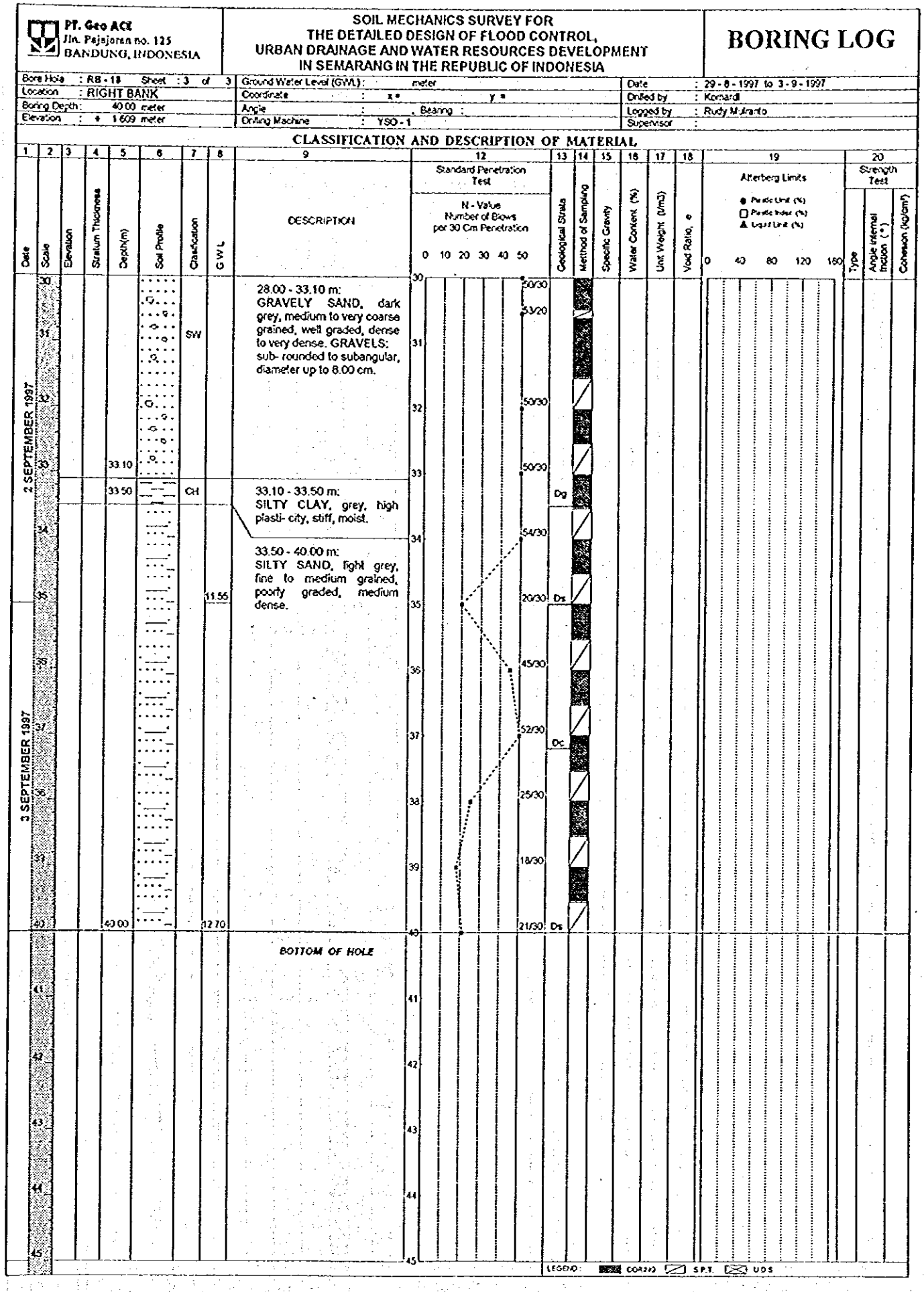
BORING LOG

Bore Hole : R3 - 18 Sheet : 2 of 3	Ground Water Level (GWL) : meter		Date : 29 - 8 - 1997 to 3 - 9 - 1997
Location : RIGHT BANK	Coordinate : x = y =		Drilled by : Komardi
Boring Depth : 40.00 meter	Angle : , Bearing :		Logged by : Rudy Mulranto
Elevation : + 1.609 meter	Drilling Machine : YSO - 1		Supervisor :

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test — N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plastic Index, Liquid Limit (%)) (0 40 80 120 160)	Strength Test: Type; Angle internal friction (°); Cohesion (kg/cm²)
30 AUGUST 1997	15					CH		15.00 - 16.20 m: CLAY, dark brown, high plasticity, very stiff to hard, moist; containing some amount of GRAVELS, diameter up to 2.00 cm.	15 — 50/30								
	16			16.20		SP		16.20 - 16.85 m: SILTY SAND, greyish brown, fine to medium grained, poorly graded, medium dense, moist.	16 — 30/30	Dc							
	17			16.85					17 — 45/30	Ds							
	18							16.85 - 23.30 m: CLAY, greyish brown, high plasticity, very stiff to hard, moist.	18 — 52/30			2.617	45.673	1.768	1.562	416 243 >124	- - -
	19								19 — 24/30								
	20					CH			20 — 21/30								
	21								21 — 30/30								
	22								22 — 25/30								
	23								23 — 24/30	Dc							
	24						4.75	23.30 - 28.00 m: CLAYEY SAND, grey, fine to medium grained, poorly graded, very dense.	24 — 74/30								
	25								25 — 41/30								
	26					SP			26 — 60/30	Ds							
	27								27 — 36/30								
31 AUGUST 1997	28			28.00					28 — 53/30	Dc							
	29					SW		28.00 - 33.10 m: GRAVELY SAND, dark grey, medium to very coarse grained, well graded, dense to very dense. GRAVELS: sub- rounded to subangular, diame- ter up to 8.00 cm.	29 — 87/30								
	30								30 — 113/30								

LEGEND: CORING SPT UDS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BANDUNG, INDONESIA
SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA
BORING LOG
Bore Hole : RB - 18 Sheet : 3 of 3
Location : RIGHT BANK
Boring Depth : 40.00 meter
Elevation : + 1.609 meter
Ground Water Level (GWL) : meter
Coordinate : x = y =
Angle : Bearing :
Drilling Machine : YSO - 1
Date : 29 - 8 - 1997 to 3 - 9 - 1997
Drilled by : Komardi
Logged by : Rudy Mulranto
Supervisor :
CLASSIFICATION AND DESCRIPTION OF MATERIAL
Date
Scale
Elevation
Stratum Thickness
Depth(m)
Soil Profile
Classification
G W L
DESCRIPTION
Standard Penetration Test
N - Value
Number of Blows per 30 Cm Penetration
0 10 20 30 40 50
Geological Strata
Method of Sampling
Specific Gravity
Water Content (%)
Unit Weight (t/m3)
Void Ratio, e
Atterberg Limits
Plastic Limit (%)
Plastic Index (%)
Liquid Limit (%)
0 40 80 120 160
Strength Test
Type
Angle internal friction (°)
Cohesion (kg/cm²)
2 SEPTEMBER 1997
3 SEPTEMBER 1997
28.00 - 33.10 m:
GRAVELY SAND, dark grey, medium to very coarse grained, well graded, dense to very dense. GRAVELS: sub- rounded to subangular, diameter up to 8.00 cm.
SW
33.10
33.10 - 33.50 m:
SILTY CLAY, grey, high plasti- city, stiff, moist.
CH
33.50
33.50 - 40.00 m:
SILTY SAND, light grey, fine to medium grained, poorly graded, medium dense.
11.55
12.70
40.00
BOTTOM OF HOLE
50/30
53/20
50/30
50/30
54/30
20/30
45/30
52/30
25/30
18/30
21/30
Dg
Ds
Dc
Ds
LEGEND: CORING SPT UDS

PT. Geo ACE
Jln. Pajajaran no. 125
BANDUNG, INDONESIA

SOIL MECHANICS SURVEY FOR
THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole	: RB - 19 Sheet : 1 of 1	Ground Water Level (GWL) :	meter	Date	: 21 - 9 - 1997 to 22 - 9 - 1997
Location	: LEFT BANK	Coordinate	: x = y =	Drilled by	: Tatang
Boring Depth	: 15.00 meter	Angle	: Bearing :	Logged by	: Rudy Mulranto
Elevation	: + 2.027 meter	Drilling Machine	: YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G W L	DESCRIPTION
21 SEPTEMBER 1997				0.40		ML		0.00 - 0.40 m: CLAYEY SILT, light brown to brown, firm - stiff, low to medium plasticity, moist; containing some plant roots.
				3.50		CH		0.40 - 3.50 m: SILTY CLAY, brown to greyish brown, firm - stiff, high plasticity, moist to wet.
				4.55		SP		3.50 - 4.55 m: SILTY SAND, grey, fine to very fine grained, loose, poorly graded; containing some mollusca shell.
				7.05		CH	2.05	4.55 - 7.05 m: CLAY, grey, firm, high plasticity, moist to wet; in 6.00 m depth containing some mollusca shell..
				8.50		SP		7.05 - 8.50 m: SILTY SAND, grey, very fine to fine grained, loose, poorly graded,; containing mollusca shell.
22 SEPTEMBER 1997				10.55		CH		8.50 - 10.55 m: SILTY CLAY, grey, stiff, high plasticity, moist to wet.
				11.55		SP		10.55 - 11.55 m: SILTY SAND, grey, very fine to fine grained, loose, poorly graded; occationally mollusca shell.
				13.32		CH		11.55 - 13.32 m: CLAY, grey, soft to firm, high plasticity, moist to wet.
				13.55		SP		13.32 - 13.55 m: SILTY SAND, grey, very fine to fine grained, medium graded, medium dense, moist.
				15.00		CH	2.40	13.55 - 15.00 m: CLAY, grey, soft to firm, high plasticity, moist to wet.
								BOTTOM OF HOLE

	Standard Penetration Test N - Value Number of Blows per 30 Cm Penetration	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits ● Plastic Limit (%) □ Plastic Index (%) ▲ Liquid Limit (%)	Strength Test Type	Angle Internal friction (°)	Cohesion (kg/cm²)
	0 10 - 20 30 40 50							0 40 80 120			
0											
1	12/30										
2	9/30	B									
3	6/30										
4	7/30	Ac									
		As									
5	7/30			2.73	48.85	1.70	1.35	27● 56 83	—	—	—
6	6/30										
7	7/30										
8	6/30	Ac									
9	13/30			2.71	45.64	1.78	1.26	42● 454	—	—	—
10	8/30	Ac									
				2.67	58.43	1.64	1.54	35● 59 95	—	12.47	0.08
11	6/30										
12	6/30										
13	7/30										
14	19/30										
15	19/30	As		2.62	58.29	1.73	1.61	4396 681	—	—	—

LEGEND: CORING SPT UDS

PT. Geo ACE
Jln. Pajajaran no. 125
BANDUNG, INDONESIA

SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole	: RB-20 Sheet : 1 of 1	Ground Water Level (GWL) : meter	Date : 23 - 9 - 1997 to 24 - 9 - 1997
Location	: SIMONGAN WEIR, RIGHT BANK	Coordinate : x = y =	Drilled by : Komardi
Boring Depth :	15.00 meter	Angle : , Bearing :	Logged by : Rudy Mulyanto
Elevation	: + 2.302 meter	Drilling Machine : YSO - 1	Supervisor :

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth (m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits (Plastic Limit (%), Plasticity Index (%), Liquid Limit (%); 0 40 80 120)	Strength Test: Type	Angle of Internal Friction (°)	Cohesion (kg/cm²)
23 SEPTEMBER 1997	1					ML		0.00 - 1.00 m: CLAYEY SILT, brown to light brown, low plasticity, soft to firm, moist, containing some amount of plant roots.	4/30										
				1.00		ML		1.00 - 1.55 m: CLAYEY SILT, black, low plasticity, soft, moist to wet, con- taining some amount of organic and anorganic matters.											
	2								6/30										
	3			1.55		ML		1.55 - 3.55 m: SANDY SILT, grey, low plasti- city, firm, moist to wet.	6/30	Ac		2.63	43.24	1.60	1.17	23.4 53 +7.6	-	-	-
	4			3.55		SW		3.55 - 6.10 m: SAND, grey with orange, speckling, fine to very coarse grained, well graded, loose, some amount of GRAVELS, diameter up to 1.50 cm; con- taining some amount of mollusca shell.	5/30										
	5								6/30										
	6			6.10					5/30	As									
	7					ML		6.10 - 9.05 m: CLAYEY SILT, grey, low plasticity, soft to firm, moist, having some amount of GRAVELS with diameter up to 0.50 cm.	3/30			2.66	48.77	1.72	1.23	23.4 +3.7	-	-	-
	8								3/30										
	9			9.05					3/30										
	10						3.70	9.05 - 15.00 m: SILTY CLAY, grey high plasticity, soft, moist to wet, containing occationally of mollusca shell. Become firm to stiff, in 14.00 m depth.	3/30			2.74	60.54	1.61	1.73	34.81+ 50.07 +84.88	CU	8.02	0.13
24 SEPTEMBER 1997	11								3/30										
	12					CH			3/30										
	13								3/30			2.60	57.41	1.67	1.45	30.52+ 43.27 +73.79	-	-	-
	14								3/30										
	15			15.00			3.70	BOTTOM OF HOLE	19/30	Ac									

LEGEND: CORING S.P.T. UDS.

PT. Geo ACE
Jln. Pajajaran no. 125
BANDUNG, INDONESIA

SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

BORING LOG

Bore Hole : RB - 21 Sheet : 2 of 2	Ground Water Level (GWL) : meter	Date	: 24 - 9 - 1997 to 26 - 9 - 1997
Location : LEFT BANK	Coordinate : x = y =	Drilled by	: Tatang
Boring Depth : 20.00 meter	Angle : , Bearing :	Logged by	: Rudy Mulranto
Elevation : + 0.610 meter	Drilling Machine : YSO - 1	Supervisor	:

CLASSIFICATION AND DESCRIPTION OF MATERIAL

1	2	3	4	5	6	7	8	9	12	13	14	15	16	17	18	19	20		
Date	Scale	Elevation	Stratum Thickness	Depth(m)	Soil Profile	Classification	G W L	DESCRIPTION	Standard Penetration Test: N - Value, Number of Blows per 30 Cm Penetration (0 10 20 30 40 50)	Geological Strata	Method of Sampling	Specific Gravity	Water Content (%)	Unit Weight (t/m3)	Void Ratio, e	Atterberg Limits: Plastic Limit (%), Plastic Index (%), Liquid Limit (%) (0 40 80 120 160)	Strength Test: Type	Angle Internal Friction (°)	Cohesion (kg/cm²)
26-9-1997	15																		
	16					SP	0.65	12.00 - 16.35 m: SILTY-CLAYEY SAND, grey, very fine to medium grained, poorly graded, loose, moist (in 14.40 m depth getting medium dense and containing gravels with diameter up to 1.00 cm).	10/30										
				16.35					23/30										
	17			17.00		SW			41/30	As									
26 SEPTEMBER 1997	18							16.35 - 17.00 m: GRAVELY SAND, grey, medium to very coarse grain- ed, well graded. GARAVELS: grey, hard, subangular to sub- rounded, diameter up to 5.00 cm.	32/30										
	19					Cl			30/30			2.624	40.530	1.655	1.229	30	46	77	-	-	-
	20			20.00			0.75	17.00 - 20.00 m: CLAY, greyish brown to brown, stiff to very stiff, high plactisity, moist.	76/30	Dc									
								BOTTOM OF HOLE											
	21																		
	22																		
	23																		
	24																		
	25																		
	26																		
	27																		
	28																		
	29																		
	30																		

LEGEND: CORING SPT UDS