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.

de Partir de Legista de la Vallación de encolo

- 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.

est kallida a menni kisa kisaran dibadih bada da

(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:

5.1. 医皮肤透透 医结膜 化放射剂

- Damar Fornation 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.

Alight for the court of the confidence of the confidence of

2.1.2 Geological Investigation of the wide special and have a figure in the found

(i) Scope of Work

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

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- Core drilling and testing in bore hole.
- Laboratory testing. The bar entry of the Lemman of the section was a section of the section of
- (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.

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- 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

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Table 2.1 THE SPECIFICATION OF CORE DRILLING

	ing figure 1				•	
No.	Hole	Depth (m)	SPT	UDS	Commenced	Completed
1	RB – 1	15	14	1	30 - Aug - 97	31 - Aug - 9
2	RB - 2	15] 14	1	13 Sep - 97	14 - Sep - 9
3	RB - 3	15	14	1	23 - Sep - 97	24 - Sep - 9
4	RB - 4	15	14	1	26 - Sep - 97	26 - Sep - 9
5	RB - 5	25	23	2	21 - Sep - 97	22 - Sep - 9
6	RB - 6	30	28	2	10 - Sep - 97	12 - Sep - 9
7	RB - 7	15	14	1	22 - Sep - 97	23 - Sep - 9
8	RB-8 .	15	14	i	24 - Sep - 97	24 - Sep - 9
ğ	RB - 9	25	23	2	18 - Sep - 97	19 - Sep - 9
10	RB - 10	15	14	ī	21 - Sep - 97	22 - Sep - 9
11	RB - 11	25	23	2	18 - Sep - 97	
12	RB – 12	15	14	1	19 - Sep - 97	20 - Sep - 9
13	RB – 13	15	14			20 - Sep - 9
13			14		16 - Sep - 97	17 - Sep - 9
	RB – 14	15			24 - Sep - 97	25 - Sep - 9
15	RB – 15	15	14	1	16 - Sep - 97	16 - Sep - 9
16	RB – 16	15	14	1	17 - Sep - 97	17 - Sep - 9
17	RB 17	35	33	2	30 - Aug - 97	03 - Sep - 9
18	RB - 18	40	38	2	30 - Aug - 97	04 - Sep - 9
19	RB – 19	15	15	1	01 - Sep - 97	03 - Sep - 9
20	RB – 20	15	14	1	02 - Sep - 97	04 - Sep - 9
21	RB – 21	20	19	1	30 - Aug - 97	31 - Aug - 9
- 22	RB – 22	20	19	1	30 - Aug - 97	01 - Sep - 9
23	RB – 23	15] 14		01 - Sep - 97	03 - Sep - 9
24	RB 24	15	14	<u> </u>	11 - Sep - 97	12 - Sep - 9
25	RB – 25	15	14	1	02 - Sep - 97	04 - Sep - 9
26	RB – 26	15	15	_	08 - Sep - 97	09 - Sep - 9
27	RB – 27	15	15		30 - Aug - 97	31 - Aug - 9
28	RB - 28	15	13	2	15 - Sep - 97	15 - Sep - 9
29	RB - 29	15	14	1	13 - Sep - 97	13 - Sep - 9
30	RB - 30	15	14	1	13 - Sep - 97	14 - Sep - 9
31	RB – 31	15	15		10 - Sep - 97	11 - Sep - 9
32	RB - 32	15	15	i	10 - Sep - 97	11 - Sep - 9
33	RB - 33	15	15	- 1	07 - Sep - 97	09 - Sep - 9
34	RB - 34	15	15		08 - Sep - 97	09 - Sep - 9
35	RB - 35	10	10		31 - Aug - 97	31 - Aug - 9
36	RB - 36	10	ΙĎ		12 - Sep - 97	12 - Sep - 9
37	RB – 37	10	iŏ	-	03 - Sep - 97	04 - Sep - 9
38	RB - 38	10	10		09 - Sep - 97	10 - Sep - 9
39	RB - 39	10	10	···	05 - Sep - 97	05 - Sep - 9
40	RB – 40	10	10		07 - Sep - 97	08 - Sep - 9
41	RB - 41	10	10		05 - Sep - 97	06 - Sep - 9
42	RB – 42	10	10		05 - Sep - 97	06 - Sep - 9
43	RB – 43	10	9		02 - Sep - 97	03 - Sep - 9
44	RB – 44	10	10			05 - 3cp - 5
45		10			05 - Sep - 97	06 - Sep - 9
	RB – 45		9		31 - Aug - 97	01 - Sep - 9
46	RB – 46	10	10		02 - Sep - 97	03 - Sep - 9
47	RB - 47	10	9	<u> </u>	30 - Aug - 97	31 - Aug - 9
84	RB - 48	10	10		30 - Aug - 97	31 - Aug - 9
49	RB – 49	10	10		01 - Sep - 97	02 - Sep - 9
50	RB – 50	10	8		30 - Aug - 97	31 - Aug - 9
51	RB - 51	50	48	2	30 - Sep - 97	07 - Oct - 9'
52	RB - 52	50	45	57. 3	15 - Oct - 97	18 - Oct - 9

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 :	ş <u>1</u> :	26 – Sep - 97	28 - Sep - 97
6	SB - 6	20	7	-	16 - Sep - 97	21 - Sep - 97
1,7 1 7,5		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		DEPTH	ELEVATION	BORING	T	DEPTH	ELEVATION
NO	LOCATION	(m)	(m)	NO	LOCATION	(m)	(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
<u>RB - 4</u>	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	<u>RB - 48</u>	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	<u>RB - 50</u>	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	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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	20.00	3,985
I KB 17		15.00	2.027	3D – 2	BANK	20.00	3,963
10 10 10 10	SIMONGAN			118 113 11	SIMONGAN		
RB – 20	WEIR, RIGHT BANK	15.00	2.302	SB – 3	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			: 1	
RB – 25	LEFT BANK	15.00	3.679			NEW Y	
	RIGHT BANK	15.00	3.107	3 3 3 3		44 (4 7	
÷	RIGHT BANK	15.00	3.476		era e filo de filo		1213
	RIGHT BANK	15.00	1,520				
RB – 29	LEFT BANK	15.00	7.127				
	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		<u> </u>		
	RIGHT BANK	15.00	7,493	1991 14			
RB - 35	LEFT BANK	10.00	10.45				

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24 SEPTEMBER 1997					::- <u>:</u> -:	SP	1	SANDY CLAY, greyish brown, very soft, high plasticity, moist.		0/3							***************************************						
24 SEPTEMBER 1997				10	·· ··			CLAYEY SAND, grey, fine to medium grained, poorly to medium graded, very loose, moist to wet.	3										***************************************				
24 SEPTEMBER 1997			+	10				4.10 - 6.50 m; SANDY CLAY, grevish	4	0/3													
24 SEPTEMBER 1897						сн		brown, high plasticity, very soft, moist.	5	0/3		/ "	13 75 210		-7	350	6	102	***************************************	-	-	-	
24 SEPTEMBER 1897			6	50					ε	073	Ac						***************************************	***************************************	***************************************				
24 SEPTEMBER 1897			,;	20		SP		6.50 - 7.20 m; SAND, grey, fine to medium grained, poorly graded,	7	1/30	As						**************						
24 SEPTEMBER 1997								loose.			(A)												
24 SEPTEMBER 1997								7.20 - 15.00 m: CLAY, grey, high plasticity, very soft to firm, moist.	8	2/30													
24 SEPTEMBER 1897									9	1/30						***************************************							
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SOIL MECHANICS SURVEY FOR P7. Geo ACE
Jin. Pajajaran no. 125
BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL **BORING LOG** URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA Bore Hole : RB -4 Sheet Location : RIGHT BANK Borng Depth: 1500 meter Evention : + meter Ground Water Level (GWL) : 26 - 9 - 1997 Coordinate Orried by : Komerdi : Bearing : Angle Draing Machine Logged by : Rudy muranto CLASSIFICATION AND DESCRIPTION OF MATERIAL 5 13 14 15 16 17 18 19 Standard Penetration Strength Test Attertierg Limits Method of Sampling Content (%) Ê H - Value Number of Blows per 30 Cm Perietration Geological Strata • Personal (%) Specific Granty Directour A Countrie (%) Confication DESCRIPTION Unit Weight (Soil Profile Void Ratio, Depth(m) G W L Scale 0 10 20 30 40 50 40 0 30 V. ____ 0.00 - 0.30 m:
GRAVELY SILT, dark brown, soft, low platicity, moist, containing small amount of organic materials, grave's with diameter up to 3.00 cm. В CH 100 0.30 · 1.00 m: SILTY CLAY, greyish brown, very soft, high plasticity, moist. ŞP 030 3 00 1.00 - 3.10 m; 0/30 CLAYEY SAND, grey, very fine to medium grained, poorly graded, very loose. 2 877 43 130 400 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. 3/30 ŞP As 6_ 600 3/30 6.00 - 15.00 m. SANDY CALY, grey, high plasticity, soil, moist to wet. SEPTEMBER 1997 132 3/30 8 3/30 3/33 10 10 3/30 UU 181 1905 СН ü 12 BOTTON OF HOLE

					no. 125 NDONE			THE DETAILED I URBAN DRAINAGE AND IN SEMARANG IN	CHANICS SURVEY FOR DESIGN OF FLOOD CONTE WATER RESOURCES DEV THE REPUBLIC OF INDON	VELOPM	ENT		BOR	ING L	O	\mathbf{G}
ze i Kali			RB . Lef	G FBAN	Sheet :	1 (4 5	Ground Water Level (GWL) Coordinate x =	meter y *		Dele Drifec		: 21 - 9 - 1997 to	22 - 9 - 1997		
oring	Dec	th:		25 00	meter			Angle	Bearing :		Logge	d by	: Talang : Rudy Muliranto			-
eva.	or_	<u>-:</u> -	<u>. t</u>	0.1/1	use		 .	Drilling Machine : YSO			Super	visor				
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		,	Stratum Thickner	Ê	ogle	atton		DESCRIPTION	N - Value Rumber of Brows Per 30 Cm Penetration 8	Method of Sompling Specific Granty	orion (Unit Weight (Vm3) Void Ratio, e	⊕ Perset □ Perset ▲ Ugorti	des (%)	i di	
Ses.	\$50 per 12	100.00	Stratur	Oepth(m)	Soll Profile	Closification	S & L		0 10 20 30 40 50	Method	Water Content	Void Ra	0 40	80 120	Type	Inction (*)
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								5.00 - 6.80 m; SAND, dark grey, medium to very coarse grained, well	5							
6	1		,			SW		graded, loose	6 1/30				, , , , , , , , , , , , , , , , , , ,			
7	1	-		5 50				6.80 - 25.00 m:	1/30 As							
8	1						1	SANDY CLAY, grey, high plasticity, soft to very soft, most; having some amount		X,	7.150 1	545 2100	34*	78 113	- -	-
8	7							of moliusca shell, become firm to very stiff in 18.05 meter depth.	8				111111111111111111111111111111111111111			
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SOIL MECHANICS SURVEY FOR P7. Geo ACE Jin. Pajajaran no. 125 BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA **BORING LOG** Sheet : 2 of : 21 - 9 - 1997 to 22 - 9 - 1997 : Tatang Coordinate Drifted by Rearing : Loggestry Supervisor CLASSIFICATION AND DESCRIPTION OF MATERIAL 12 13 14 15 16 20 Strength Test Standard Penetration Test Atterberg Limits Method of Sampling ŝ S S Stratum Thickness N - Value Number of Blows per 30 Cm Penetration a Paretire (4) Geological Stata Water Content Specific Gravity Type Angle internal friction (*) DESCRIPTION Classification Unit Weight (Sou Profile Void Ratio ولاع الاحداد والا Devation .. ≷ Scale Scale 10 20 30 40 50 40 80 15 6.80 - 25.00 m: SANDY CLAY, grey, high plasticity, soft to very soft, most, having some amount of mollusca shelf; become firm to very stiff in 18.05 meter depth. 16 030 17 4/30 13 3/30 32. į, 7/30 20 CH 1073 X 21 13/30 22 24/30 The section of the se 2 545 38 880 455 080 BOTTOM OF HOLE

	7		BA	NDI.		no. 125 INDON		- 1	THE DETAILED URBAN DRAINAGE AND IN SEMARANG IN	HANICS SURVEY FOR ESIGN OF FLOOD CONTROL, VATER RESOURCES DEVELOPMENT THE REPUBLIC OF INDONESIA BORING LOG	
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å	5	5	Elevation	Strata	Depth(m)	Soli Prothe	9	S W L		N - Value N -	Cohosion (kg/cm?)
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SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT PT. Geo ACE Jln. Pajajaran Bo. 125 BANDUNG, INDONESIA **BORING LOG** IN SEMARANG IN THE REPUBLIC OF INDONESIA Bore Hote : RB - 6 Sheet : 2 of 2 Location : RIGHT BANK Borrig Depth 30:00 meter Elevation : + 0,260 meter Ground Water Level (GWL) ineler 10-9-1997 to 12-9-1997 Coordinate Angle Drifed by : Asep/Sobandi : Rudy Mulranto Logged by Supervisor Bearing : YBY . 3E CLASSIFICATION AND DESCRIPTION OF MATERIAL 1 2 3 4 5 6 12 Standard Penetration 13 14 15 16 Alterberg Limits Method of Sampling Stratum Thickness Ş N - Value Number of Blows per 30 Cm Penetration Geological Strata & Posetes (%) Water Content ☐ Perfectors ▲ Louistons (%) Unk Weight (t DESCRIPTION Classication Soil Profile Elevation Scale ر ≷ 300 0 10 20 30 40 50 0 40 80 15 8.00 - 20.00 m; SILTY CLAY, grey, medium to high plasticity, very soft to firm, moist to wet; occationally mollusca shell. 16 11 SEPTEMBER 1997 2 363 43 590 27. ég1 4118 СH 20.00 20.00 - 30,00 m; CLAY, grey, high plasticity, stiff to very stiff, moist. 22 Terretter eine Der Sterretter eine Sterretter 22 27/30 12 SEPTEMBER 1987 CH 27/30 - -- -

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BOTTOM OF HOLE

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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

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SOIL MECHANICS SURVEY FOR P7. Geo ACE
Jin. Pajajaran no. 125
BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL, **BORING LOG** URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA 18 - 9 - 1997 to 19 - 9 - 1997 Talang | Bore Hote | : R8 - 9 | Sheet | : 1 | of 2 | Location | : LEFT BANK | | Boring Depth | 25 00 meter | Elevation | : + 0 614 meter | Ground Water Level (GWL) Drived by Logged by : Rudy Multerial Supervisor : Bearing : CLASSIFICATION AND DESCRIPTION OF MATERIAL 20 Strength Test 12 Standard Penetration Yest 13 14 15 16 Atterberg Limits Metthod of Sampling Type
Angle internal
Indian (1)
Cohesion (kg/cm?) (Sm2) a Partire (%) N - Value Number of Blows Geological Strata O Parteriors A liquidirit (%) Unit Weight (DESCRIPTION Void Rake. per 30 Cm Penetration Classification Sot Profile Stratum T ر ک 3 0 10 20 30 40 50 40 80 Š 0.00 - 1.00 m: CLAYEY SILT, brown to moderately plasticity, firm moist; containing some ٧L amount of plant roots. 1.00 - 3.50 m: SANDY CLAY, grey, very soft, high plasticity, moist. CH 0/30 3 50 -- ·-.... 3.50 - 4.15 m: 1/30 SAND, grey, fine to medium grained, poorly graded, loose. 22 18 103 4.15 - 25.00 m. SILTY CLAY, grey, very 1/30 soft, high plasticity, moist, become stiff to very stiff in 18.00 m depth; Occationally gravels in 23.00 m depth 18 SEPTEMBER 1997 with diameter up to 1.50 19 9 OH. 10 3/30 4/30 12 2 30

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SOIL MECHANICS SURVEY FOR Pr. Geo ACE Jin. Pajajaran no. 125 BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL. **BORING LOG** URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA Bore Hole RB-9 Sheet 2 of 2 Location | LEFT BANK | Borng Depth 2500 moles | Elevation + 0.614 moles Ground Water Level (GVAL): : 18 - 9 - 1997to 19 - 9 - 1997 meter Oata Coordinate Angle Drilling Machine : Yatang : Rudy Mukanto Drived by Logged by Supervisor : YSO-1 CLASSIFICATION AND DESCRIPTION OF MATERIAL 12 13 14 15 16 17 18 Standard Penetration Test Strength Test Atterberg Limits Metthod of Sampling 3 (Sm2) N - Value Number of Blows per 30 Cm Penetration · Parceline (%) Geological Strata Specific Gravity Prochag (1) A Equation (6) Water Content DESCRIPTION Cosufcator Unit Weight Sou Proble Elevation Depth(m) Strates SW L Angle int Series Series 0 10 20 30 40 50 8 en. 80 15 4.15 - 25.00 m: SILTY CLAY, grey, very soft, high plasticity, moist, become stiff to very stiff in 18.00 m depth; Occationally grave's in 23.00 m depth. 1/30 with diameter up to 1.50 cm. 18 4/30 28/30 21 20 13/30 21 27/30 26 AUGUST 1997 74/30 CH 160 3 25 BOTTON OF HOLE

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SOIL MECHANICS SURVEY FOR Pr. Geo ACE Ilo. Pajajaran no. 125 BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA **BORING LOG** Bore Hole : R3 - 11 Sheet tooston : LEFT BANK Boring Depth: 25 00 meter Ground Water Level (GWL): : 18-9-1997 to 20-9-1997 : UUS K. Coordinate Dones by Angle Drilling Machine Logged by : Rudy Vultanto Supervisor : 1.064 meter YBM - 3E CLASSIFICATION AND DESCRIPTION OF MATERIAL 13 14 15 16 17 18 19 20 Strength Yest Standard Penetration Test Atertery Limits Method of Sampling Stratum Thickness Water Content (%) (Sm3) Angle internal friction (*) Cohesion (kg/cm²) N - Value Geological Strata Number of Blows per 30 Cm Panelration Specific Granty Dente hour (%) A liquid line (%) DESCRIPTION Unt Weight (Classification Soit Profile Void Ratio, Oepth(m) .₁ ≷ ט Scale Š 10 20 30 40 50 8 50 120 160 15 1.30 - 25.00 m: CLAY, grey, very soft to firm, high plasticity, moist; become stiff to hard in 16.00 m đeợth. 16 2 10 119 20 20 SEPTEMBER 1997 23/30 BOTTOM OF HOLE

SOIL MECHANICS SURVEY FOR-THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT

P1. Geo ACE

Jin. Pajajaran no. 125

BANDUNG, INDONESIA **BORING LOG** IN SEMARANG IN THE REPUBLIC OF INDONESIA Bore Hole : RB-12 Sheet : 1 of 1 Location : RIGHT BANK Borry Depth 1500 meter Elevation : + 0.442 meter Ground Water Level (GWL) rreter Date Onled by 19 - 9 1337 to 20 - 9 - 1997 Coordinate
Angle
Drilling Vachine : Komardi Logged by Supervisor Rudy Mukanto : Y\$O-1 CLASSIFICATION AND DESCRIPTION OF MATERIAL 5 6 7 13 14 15 16 17 18 12 Standard Penetration Test 19 Atterberg Limits lest Metthod of Sampling Stratum Thickness Water Content (%) (SmS) N - Value Number of Blows per 30 Cm Penetration Geological Strata Specific Gravity Principous A Distaller (N) Type Angle Internal Inction, (*) DESCRIPTION Unit Weight (Countration Depth(m) Soil Profite . 1 × ∪ Sele Set e 0 10 20 30 40 50 4) 80 0.00 - 15.00 m: SILTY CLAY, brown to grey, high plasticity, very soft to soft, moist to wet. 2 3/30 19 SEPTEMBER 1997 3 3/30 3/30 3/30 7 20 СН 8 9 10 3/30 20 SEPTEMBER 1997 105 12 13 8 13

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Pf. Geo ACE
Jin. Pajajaran no. 125
BANDUNG, INDONESIA SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL. **BORING LOG** URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA Bore Hole : RB-14 Sheet :1 of 1
Location : RIGHT BANK
Boring Depth 1500 meter
Elevation : + 1274 meter Ground Water Level (GWL) meter Date : 24 • 9 1997 to 25 • 9 • 1997 Dated by : Usa Koswara Coordinate Bearing : YBM - 3E Logged by Rudy Vulrando Supervisor : CLASSIFICATION AND DESCRIPTION OF MATERIAL

9 12 13 14 15 16 17 18 1 2 3 4 5 6 Standard Penetration Test Atterberg Limits Method of Sampling Stratum Thickness (SmS) Content (%) 120 150 K N - Value Number of Blows per 30 Cm Penetration # Profetor (%) Goological Strate Specific Granty Perferon A l'épitum (%) DESCRIPTION Water Content Unit Weight () Void Ratio, e Classification Elevation Soil Profile Scale Scale 0 ¥ 0 10 20 30 40 50 ١ö 40 0.00 - 1.40 m: SANDY SILT, dark brown, low to moderate plasticity, firm, moist; containing some ٧L 5/30 gravels with diameter up to 1.50 cm. 1.43 SEPTEMBER _. _ _ _ 1.40 - 15.00 m; CLAY, brown to brownish _ _ _ 2/30 8 grey, high plasticity, soft to firm, moist; containing trace of sand in 5.20 - 5.55 m depth, and mollusca shell in C97 -123 7/30 14.00 m depth. - -- -- - -- - -2 10 - - -5/30 - - -5/30 6 5/30 <u>-</u> - -7 5/30 _ - _ 8 - - -2/30 ____ 25 SEPTEMBER 1997 - - -- - -9_ СН 1/30 - - -· .-- --1/30 15 100 1 572 1 662 103 4/30

BOTTOM OF HOLE

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SOIL MECHANICS SURVEY FOR PT. Geo ACE
Jin. Pajajaran no. 125
BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL,
URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT
IN SEMARANG IN THE REPUBLIC OF INDONESIA **BORING LOG** Ground Water Level (GWL) : Coordinate : Oare Orded by 17 - 9 - 1997 Komardi Logged by Supervisor : Rudy Vulranto CLASSIFICATION AND DESCRIPTION OF MATERIAL 2 3 4 5 6 12 13 14 15 16 17 18 Standard Penetration Test Strength Test Atterberg Limits Metthod of Sampling Stratum Thickness $\widehat{\mathfrak{S}}$ (Vm3) a Parksten (S) Goological Strata Specific Gravity Conlent Describe (%) Number of Blows per 30 Cm Penetration DESCRIPTION 7ype
Angle internal
fination (*)
Coherion (total Unit Wengh (Soll Profile Void Ratio. Elevation Closufcati Stake Stake 3 ₹ Water (10 20 30 40 50 40 80 0.00 - 1.55 m; CLAYEY SILT, dark brown, low to medium plasticity. M firm, moist 1.55 1.55 - 12.10 m; 5 SILTY CLAY, brown to 5/30 greyish brown, high plasticity, soil to firm, most; occationally some mollusca shell 760 3/30 275 223 ٠,٠ 263 3/30 6 3/30 17 Sentember 1997 СН 1/30 8 3/30 9 1/30 10 3/30 102 28+ 12 12.10 12.10 - 13.80 m. CLAYEY SAND, grey, very fine to fine grained, poorly 13 graded, loose. \$2 13 60 8/30 13.80 - 15.00 m; CLAY, high plasticity, firm to stiff, moist. CH

BOTTOM OF HOLE

IIa. 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

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ABER 1897	32 33				.Ç				m depth. 31.20 - 33.30 m; GRAVELY SAND, grey, fine to coarse grained, yery	32	9050								
3 SEPTEN	33			33 39	3				dense, well graded, some amount of GRAVELS, subangular to subrounded, diameter up to 7.00 cm.	33	79/30								
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FF. Geo ACE SOIL MECHANICS SURVEY FOR THE DETAILED DESIGN OF FLOOD CONTROL, **BORING LOG** Jin. Pajajorea po. 125 BANDUNG, INDONESIA URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA Bore Hole : R8 - 18 Shoot : 1 of 3 Location : RIGHT BANK Boring Depth: 40 to meter Denston : + 1 609 meter Ground Water Level (GYAL): meter : 29 - 8 - 1997 to 3 - 9 - 1997 : Komardi Coordinate Dated by Angle Onling Machine Logged by Supervisor : Rudy Wulranto YSO - 1 CLASSIFICATION AND DESCRIPTION OF MATERIAL 13 14 15 16 17 18 12 20 Svength Test Standard Penetration Test Atterberg Limits Method of Sampling Type Angle Internal Incline (*) Correction (Noturn) Ş Water Content (%) ∰ Persolina (%) ☐ Persolition (%) ▲ Care Unit (%) N - Value Number of Blows per 30 Cm Penetration Geological Strate Specific Gravity DESCRIPTION Unat Weight (Clasification Soil Profile Void Ratio, Stratum 7 .. ⊗ ¥ Scale 0 10 20 30 40 50 0 40 80 120 0.00 - 3.70 m: 0.00 - 3.70 m; SILTY CLAY, brown to grey, high plasticity, soft to firm, moist; containing some amount of plant roots. ĊН 3/30 3.70 1733 1236 23 3.70 + 5.60 m; 3/30 SiLTY SAND, grey, very fine to fine grained, poorly graded, loose, moist to wet, containing motiusca shell. S۶ 3/30 560 1713 5.60 - 15.00 m: 3/30 SILTY CLAY, grey, medium to high plasticity, soft, wet. 29 AUGUST 1997 3/3) 3 CU 1351 005 3/30 СН 10 61 1576 1.703 CU 12 02 2 544 87.433

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PT. Geo ACE Jin. Pajajoran 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

N Z				no. 125 INDONE			THE DETAILED URBAN DRAINAGE AND IN SEMARANG I	D Y N T	ATER RESO IE REPUBLI	URCES	DEV	ELOPA				BORING	LOC
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SOIL MECHANICS SURVEY FOR Pr. Geo ACE
Jin. Pajajaran no. 125
BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL **BORING LOG** URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA meter 21-9-1997 to 22-9-1997 : Talang : Rudy Mulranto Dričed by Bearing : Angle Driling Machine Logged by Supervisor CLASSIFICATION AND DESCRIPTION OF MATERIAL 13 14 15 16 17 18 12 Standard Penetration 19 Strength Test Alterberg Limits Test Method of Sampling $\widehat{\mathfrak{E}}$ (Vm2) Parke Urit (%) Cohesion (lig/cm?) State N - Value Specific Gravity Denselver (s) Water Content Number of Blows DESCRIPTION Cinefication per 30 Cm Penetration Unit Weight Ratio, Soil Profile Geological Elevation Statum 1 Angle II. ŠÝ Scale 10 - 20 30 49 50 120 8 8 lo 40 80 0.00 - 0.40 m; 0 40 ML CLAYEY SILT, light brown to brown, firm - stiff, low to medium plasticity, moist; containing some plant roots. 12/30 0.40 - 3.50 m: СН SILTY CLAY, brown to 9/30 greyish brown, firm + stiff, high plasticity, moist to wet. R 1997 6/30 3 50 3.50 • 4.55 m: 3.50+4.50 m: SILTY SAND, grey, fine to very fine grained, loose, poorty graded; containing some molfusca shelf. Ñ -7/30 se 4.55 ٨s **≈**5 273 4885 1.70 135 27. :83 7/30 4.55 - 7.06 m. CLAY, grey, firm, high plasticity, moist to wet; in 6.00 m depth containing СН 6 2 05 6/30 some moliusca shell... 7.05 7/30 7.05 - 8.50 m; 4 SILTY SAND, grey, very fine to fine grained, loose, SP ٤ poorly graded; containing moltusca shell. 6/30 Ac 8 850 9 8.50 - 10.55 m; 😘 271 45 64 1.76 1.26 42 42 SILTY CLAY, grey, stiff, 13/30 high plasticity, moist to wel. СН 10.55 - 11.55 m: 1997 iČ SILTY SAND, grey, very fine to fine grained, loose, poorly graded; occationally mollusca shell. 8/30 ٨ 35+ £ؤ. 164 154 12 42 0 00 SEPTEMBER 10.55 11 6/30 SP 11.55 - 13.32 m: 22 CLAY, grey, soft to firm, high plasticity, moist to wet. - - -12 6/33 S 5 13 - - -13.32 - 13.55 m: СН SILTY SAND, grey, very fine to fine grained, medium graded, medium dense, ----7/30 13.32 moist. 13.55 Se 13.55 - 15.00 m; 14 19/30 CLAY, grey, soft to firm, high plasticity, moist to wet. СН

LEGOID.

BOTTOM OF HOLE

SOIL MECHANICS SURVEY FOR Pr. Geo ACE Jin. Pajajaran 60, 125 BANDUNG, INDONESIA THE DETAILED DESIGN OF FLOOD CONTROL, **BORING LOG** URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA Bore HC4 : RB-70 Sheet : 1 of 1 Ground Weter Level (GWL): Location : SHUCHICAN WEIR RIGHT BLACK Coordinate : E-elet 23-9-1997 to 24-9-1997 Drilled by YSO-1 Boring Depth: 1500 meter Elevation : +2,302 meter Logged by Supervisor : Rudy Multanto CLASSIFICATION AND DESCRIPTION OF MATERIAL - 6 7 8 12 13 14 15 16 17 18 Strength Test Standard Penetration Attention Limits Method of Sampling 3 Sa3 a Parcette (%) N - Value Number of Blows per 30 Cm Penetration Geological Strata Perchangu A Garaner (N) Specific Granity Water Content Type Angle internal friction (*) DESCRIPTION Unit Weight Classification Ratio, Depth(m) Soil Profile Devator Stratum 1 3 Scoke Scoke 0 10 20 30 40 50 8 43 80 0.00 - 1.00 m: CLAYEY SILT, brown to ML. light brown, low plasticity, soft to firm, moist, containing some amount of 100 4/30 *== piant roots. ML 1.00 - 1.55 m; Dack, low plasticity, soft, moist to wet, con-taining some amount of 6/30 **⊸**• organic and anorganic DI. mallers. 30 283 4124 180 117 23. 6/30 1.55 - 3.55 m: SANDY SILT, grey, low plasti- city, firm, moist to 3 55 wei 5/30 3.55 - 6.10 m: SAND, grey with orange, specking, fine to very coarse grained, well graded, loose, some amount of SW GRAVELS, diameter up to 1.50 cm; con-taining some amount of mollusca shell. 6.10 5/30 ٨s 6.10 - 9.05 m: Ñ CLAYEY SILT, grey, low plasticity, soft to firm, moist, having some amount of 288 4977 172 125 3/30 GRAVELS with diameter up IJΙ to 0.50 cm. 9 9 05 300 9.05 - 15.00 m: SILTY CLAY, grey high plasticity, soft, moist to wet, 3 70 containing occationally of mollusca shell. Become firm 3/30 50.07 +84.88 to stiff, in 14.00 m depth. 1.73 36.810 CU 802 013 274 6054 181 1997 3/30 СН

BOTTOM OF HOLE

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