

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF SETTLEMENT AND REGIONAL DEVELOPMENT
THE REPUBLIC OF INDONESIA

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

FINAL REPORT

COMPONENT B:
JATIBARANG MULTIPURPOSE DAM CONSTRUCTION

VOLUME VIII ANNEX

AUGUST 2000

CTI ENGINEERING INTERNATIONAL CO., LTD.

IN ASSOCIATION WITH

PACIFIC CONSULTANTS INTERNATIONAL

AND

PASCO INTERNATIONAL INC.



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CONSTITUTION OF THE REPORT

1. SUMMARY
2. COMPONENT A : WEST FLOODWAY/GARANG RIVER IMPROVEMENT

VOLUME I	MAIN REPORT
VOLUME II	DESIGN CRITERIA
VOLUME III	DESIGN NOTES
VOLUME IV	WORK QUANTITY CALCULATION
VOLUME V	CONSTRUCTION PLANNING
VOLUME VI	COST ESTIMATE
VOLUME VII	DATA BOOK

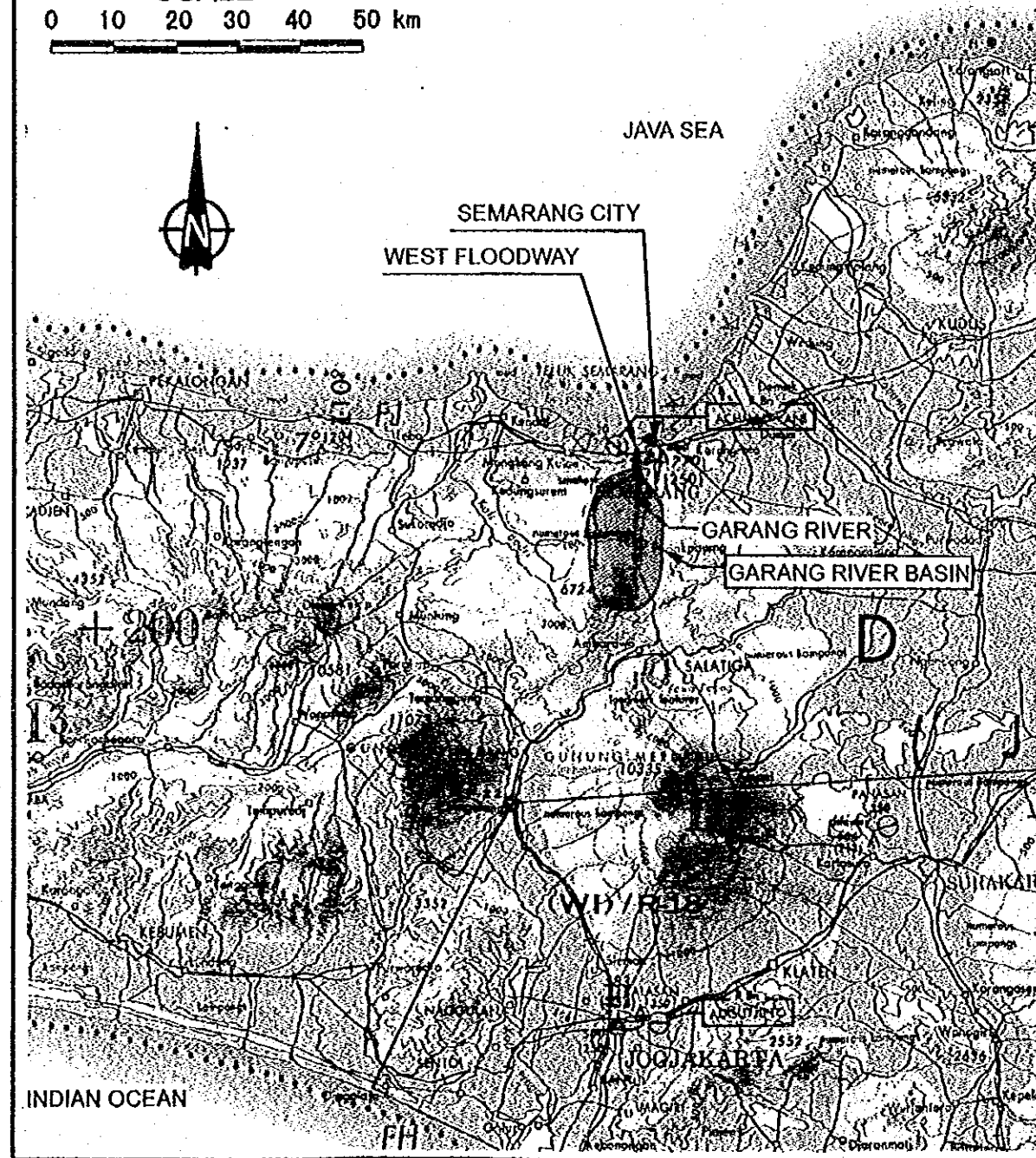
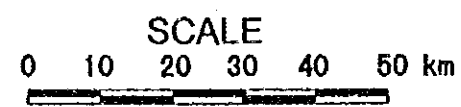
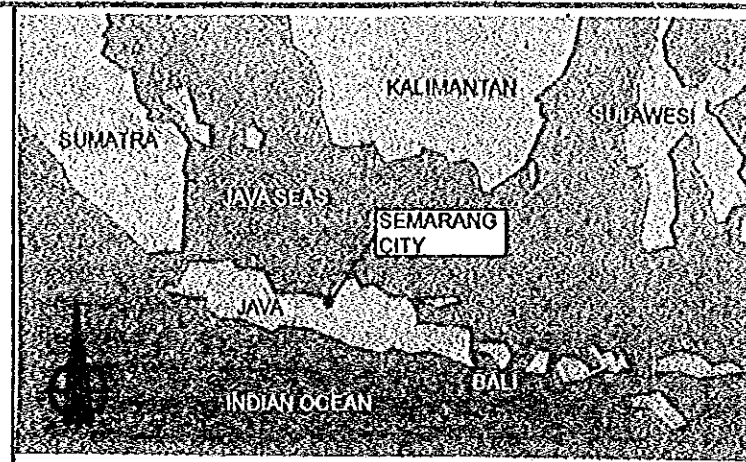
3. COMPONENT B : JATIBARANG MULTIPURPOSE DAM CONSTRUCTION

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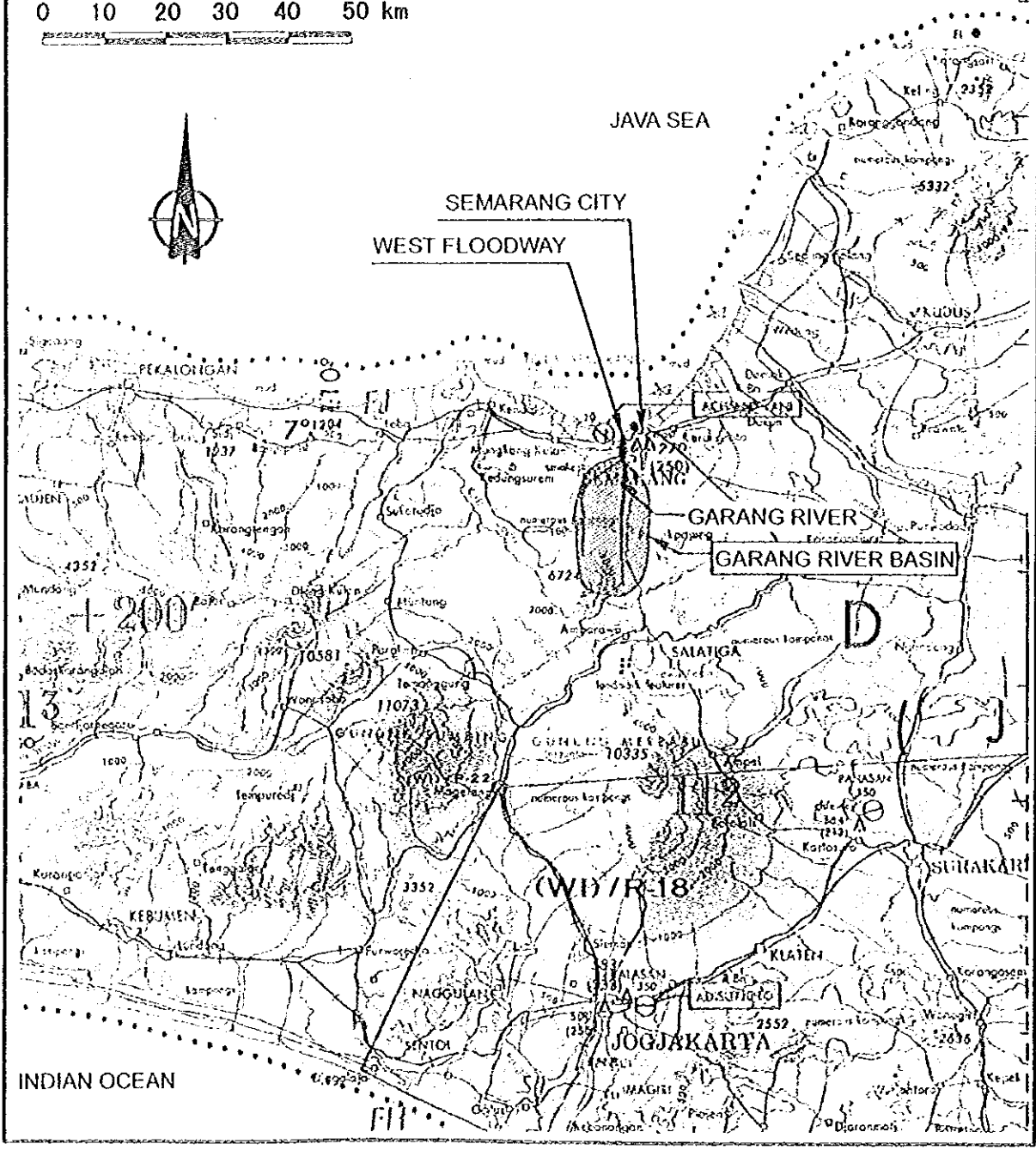
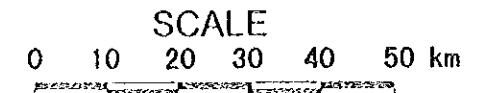
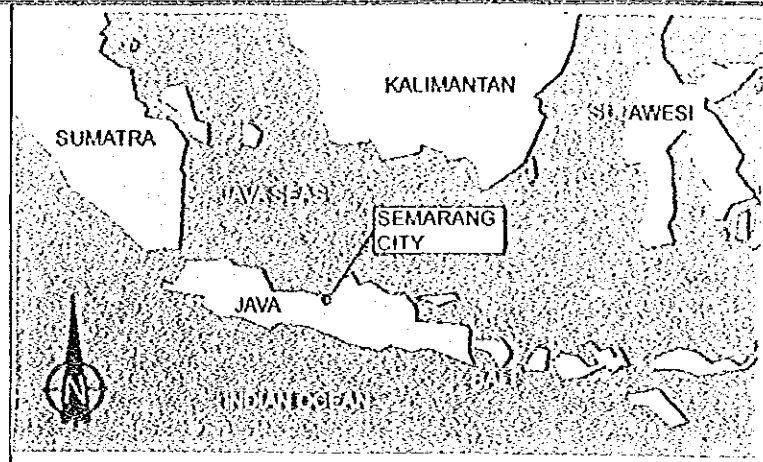
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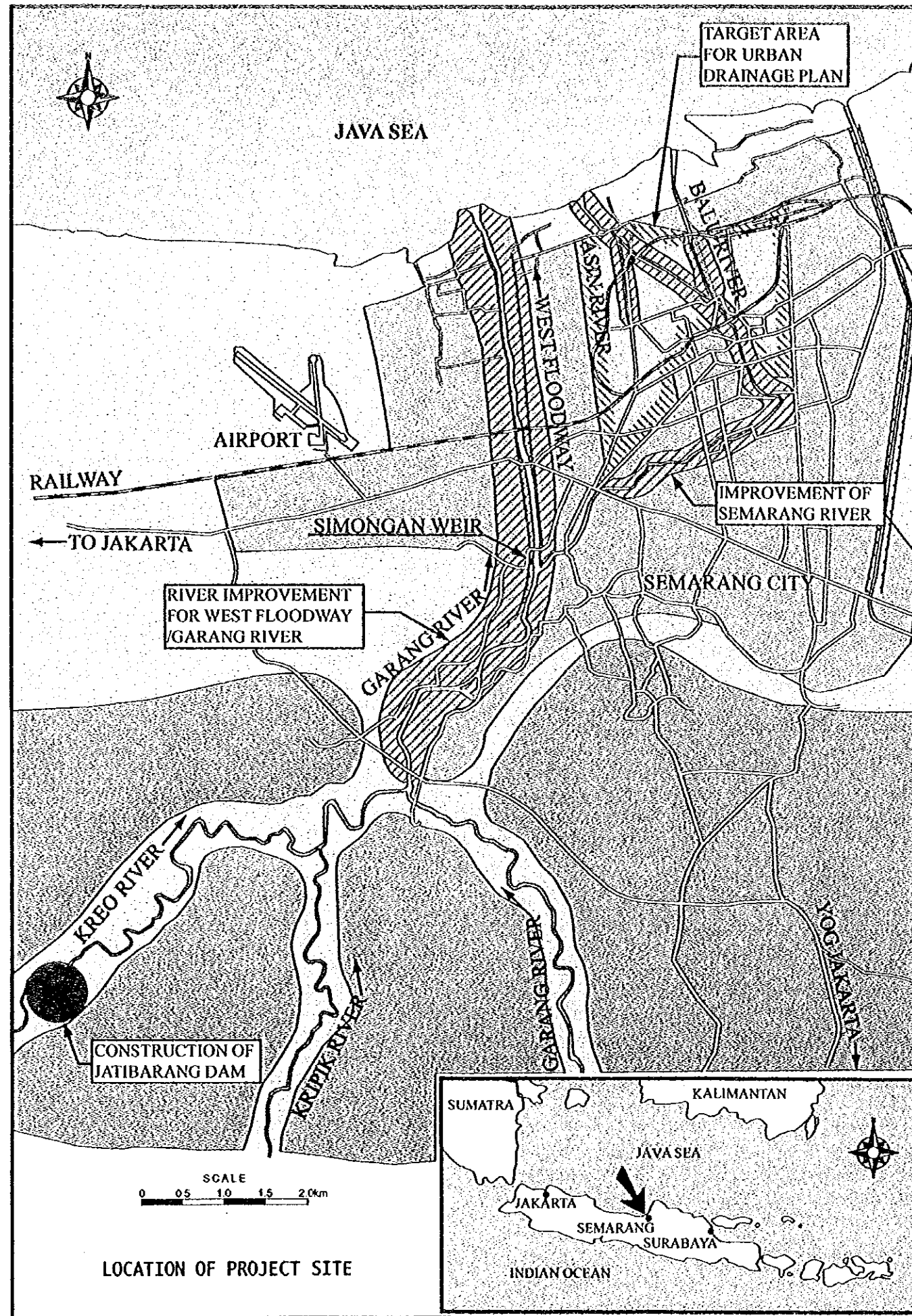
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GENERAL MAP



GENERAL MAP





**VOLUME VIII ANNEX
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CHAPTER 1 DAM SITE

The location map of the Geological Survey for the Damsite and Reservoir Area are shown in Fig. 1.1.1 and the location map for the Damsite are shown in Fig. 1.1.2.

1.1 Core Drilling

The Drill Log from Damsite including the Lugeon value for the corresponding Depth are Shown in Fig. 1.1.3 to Fig. 1.1.34 Drill Log Hole No. B - 4 to No. B - 35. The corresponding Drilling Core Photographs of the Drill Logs are shown in Photo 1.1.1 to Photo 1.1.32.

1.2 Trench Excavation

The Trench Rock Type Photographs of the trench excavation (See Fig. 1.1.1) are shown in Photo 1.2.1 Trench Rock Type Photograph.

1.3 Adit Excavation

The Adit Rock Type Photograph of the Adit excavation (See Fig. 1.1.2) are shown in Photo 1.3.1 Adit Rock Type Photograph.

1.4 In-situ Shearing Test

The shearing Blocks Areas photographs of In-situ shearing test on Adit T - 1 and T - 3, before and after Test are shown in Photo 1.4.1 to Photo 1.4.6, Shearing Block Area.

1.5 Laboratory Test of Core Sample

The photographs of the results of Unconfined Sample Test are shown in Photo 1.5.1 Result of Unconfined Sample Test Photograph.

1.6 In-situ Plate Loading Test

The Tested Rock Surface from In-situ Plate Loading Test in Adit T - 1, T - 3 and T - 4, are shown in Photo 1.6.1 to Fig. 1.6.6 Tested Rock Surface Photograph from In-situ Plate Loading Test.

CHAPTER 2 CORE DRILLING IN RESERVOIR AREA

2.1 Drill Log Hole

The location of bore holes are shown in Fig. 1.1.1 Location Map of the Geological Survey (Reservoir Area). The Drill Log from Reservoir Area including the Lugeon Value and the Standard Penetration Test Value are shown in Fig. 2.1.1 to Fig. 2.1.16 Drill Log Hole.

2.2 Drilling Core Photograph

The corresponding Drilling Core Photographs of the above Drill Log Holes are shown in Photo 2.2.1 to Photo 2.2.16 Drilling Core Photograph of Bore Hole.

CHAPTER 3 CONSTRUCTION MATERIAL

3.1 Aggregate

3.1.1 Core Drilling

The Location Map of Core Drilling in Quarry Site is shown in Figure 3.1.1 Bore Holes Locations and Line Seismic for Quarry Site. The result of core drilling is presented in Fig. 3.1.2 to Fig. 3.1.14 Subsurface Exploration Log No. A – 1 to No. A – 13, and the photo of Core samples are shown in Photo 3.1.1 to Photo 3.1.13 Drilling Core Photograph of Bore Hole No. A – 1 to No. A – 13.

3.1.2 Laboratory Test of Core Sample and Aggregate

The photo of the result of Unconfined Sample Test are shown in Fig. 3.1.14 Result of Unconfined Sample Test Photographs (20 samples).

3.2 Impervious Material

3.2.1 Core Drilling

The Location Map of Borrow Areas are shown in Fig. 3.2.1.

The Location Map of Core Drilling in Borrow Area A and B, are shown in Fig. 3.2.2 and Fig. 3.2.3, Location Map and Geological Profile at Borrow Area A and B, respectively.

The result of core drilling is presented in Fig. 3.2.5 to Fig. 3.2.10 for Borrow Area A and in Fig. 3.2.11 to Fig. 3.2.24 for Borrow Area B.

The photos of Core Samples arranged into core boxes are shown in Photo 3.2.1 to Photo 3.2.6 for Borrow Area A and Photo 3.2.7 to Photo 3.2.20 for Borrow Area B.

3.2.2 Test Pit Excavation

The location map of Test Pit Excavations in Borrow Area A and B are shown in Fig. 3.2.2 and Fig. 3.2.3 respectively.

The result of the test pit of the Borrow Area A, B and D, in the form of log of test pit are shown Fig. 3.2.25 to Fig. 3.2.36 Log of Test Pit, and the photograph of the test pits are shown in Photo 3.2.21 to Photo 3.2.32 Test Pit No. TPA – 1 Photograph to Test Pit No. TPD – 2 Photograph.

The Depth of Sampling Photographs, are shown in Photo 3.2.33 to Photo 3.2.44 Depth of Sampling TPA – 1U Photograph to Depth of Sampling TPD – 2L Photograph.

3.2.3 Laboratory Testing

The Photographs of the Selected Fine Materials for laboratory testing are shown in Photo 3.2.45 to Photo 3.2.68 Photograph of Selected Fine Materials for Laboratory Testing taken from TPA – 1, depth 2.50 m to Photograph of Selected Fine Materials for Laboratory Testing taken from TPD – 2, depth 3.50.

The photograph of Fine Aggregate Sample for Laboratory Testing is shown in Photo 3.2.69 Photograph of Fine Aggregate Sample for Laboratory Testing taken from Quarry Mts. Mergy, Ungaran.

3.3 Semi Pervious Material

3.3.1 Core Drilling

The Location Map of Core Drillings in Borrow Area C are shown in Fig. 3.2.4 Location Map and Geological Profile at Borrow Area C. The results of core drillings are presented in Fig. 3.3.1 to Fig. 3.3.7 Subsurface Exploration Log. No. BC – 1 to No. BC – 7.

3.3.2 Test Pit Excavation

The Location Map of Test Pit Excavation in Borrow Area C are shown in Fig. 3.2.4 Location Map and Geological Profile at Borrow Area C. The result of test pit of the Borrow Area C in the form of log of test pit are shown in Fig. 3.3.8 to Fig. 3.3.15 Log of Test Pit TPC – 1 to TPC – 8 and the photographs of the test pits are shown in Photo 3.3.8 to Photo 3.3.15 Test Pit No. TPC – 1 photograph to Test Pit No. TPC – 8 photograph.

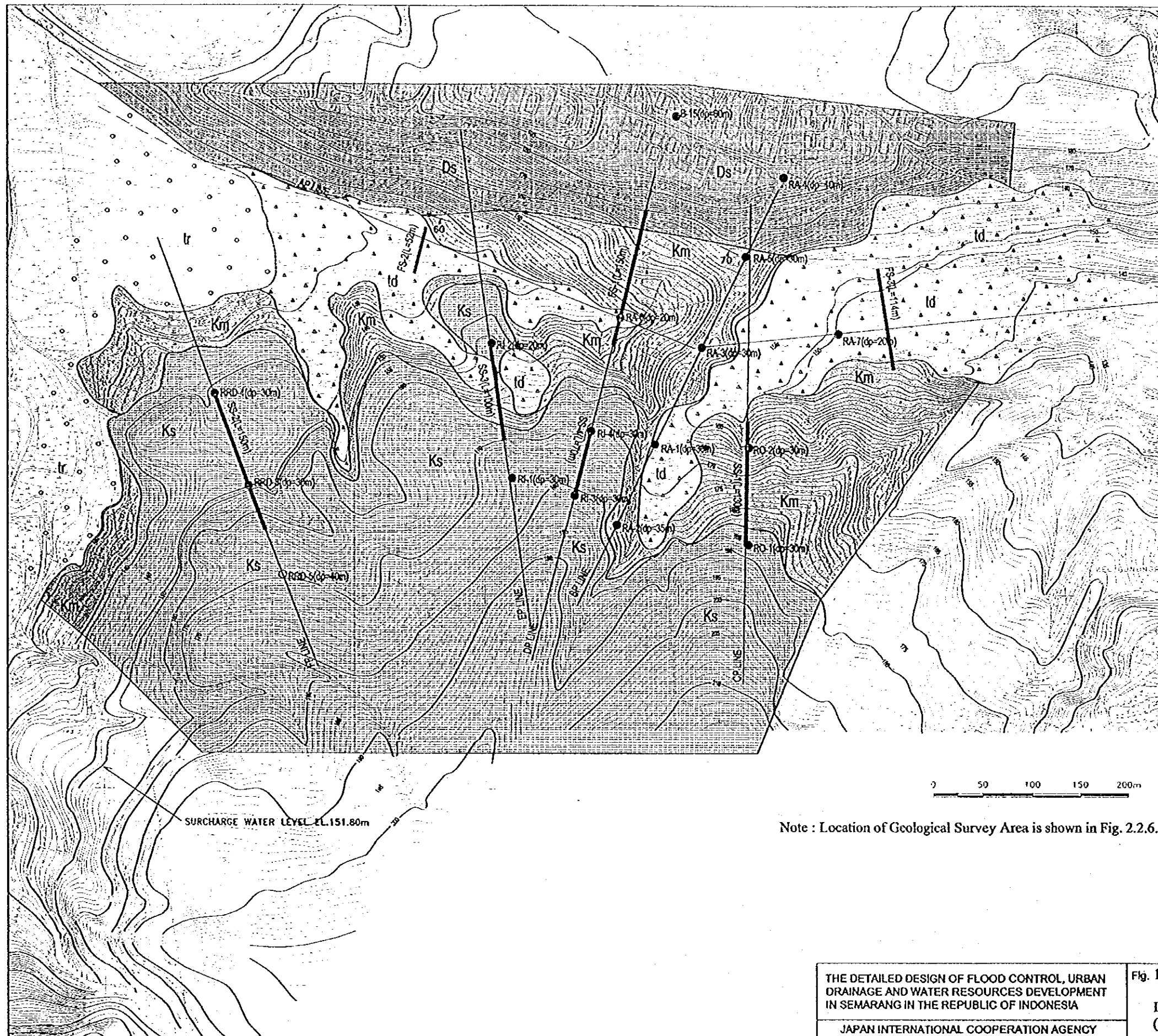
3.3.3 Laboratory Testing

The photographs of the Selected Coarse Material Samples for laboratory testing are shown in Photo 3.3.16 to Photo 3.3.19 Photograph of Selected Coarse Material Samples for Laboratory Testing taken from TPC – 1, depth 1.00 ~ 2.00 m to TPC – 6. The photograph of coarse aggregate sample is shown in Photo 3.3.20 photograph of coarse aggregate samples for laboratory testing taken from Quarry Mts. Mergy, Ungaran, and

the photograph of sand sample is shown in Photo 3.3.21 Photograph of Natural Sand Samples for Laboratory Testing taken From Krasak River (Yogya sand).

The photograph of Mixed Material between fine and coarse aggregate are shown in Photo 3.3.22 and Photo 3.3.23.

Figures



LEGEND

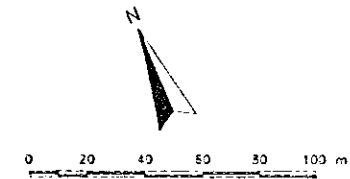
(Geological Strata)			
Age	Formation and Strata Name	Symbol	Description
Quaternary Holocene	Embankment	B	The embankment is distributed at the peak. It consists of gravel and soil.
	Talus deposit	△	The deposit is distributed at the slope of the mountainside slope. It consists of talus soil and sand, debris and fallen rocks.
	Terrace deposit	○	The deposit forms the terrace plain along the riverbed, and the relative height of the plain is less than 2m from the elevated. Terrace deposit can be divided into two layers, the upper layer mainly consists of silt, and the lower layer mainly consists of sand and gravel.
Tertiary-Quaternary Pliocene-Pleistocene	Sedimentary Rock Unit Kalgijasa	□	Kalgijasa formation is distributed at the south side of a fault, which located 400m southwest of the damsite. This fault has direction from east to northwest and forms a boundary of Demer formation and Karak and Kalgijasa formations. Sedimentary rock unit is formed by complicated alteration which mainly consists of conglomerate, conglomeratic sandstone, siliceous sandstone and sandstone. Cracks hardly develop in the bedrock, and the degree of cementation and the hardness of rock are comparatively low.
	Sedimentary Rock Unit Demer	□	Demer formation is distributed at the north side of the above mentioned fault. Sedimentary rock unit is formed by complicated alteration which mainly consists of siliceous sandstone, conglomeratic sandstone and volcanic conglomerate. Cracks hardly develop in the bedrock, and the degree of cementation and the hardness of rock are comparatively low.
Tertiary Miocene-Pliocene	Sedimentary Rock Unit Karak	□	Karak formation is distributed at the south side of the above-mentioned fault. Sedimentary rock unit mainly consists of siltstone whose color is greenish dark gray, and partly contains coral limestone. The hardness of siltstone is comparatively low, and slickensite develops around the fault.

- BOUNDARY OF GEOLOGICAL UNIT AND STRATUM
- FAULT AND DIPSTRIKE
- (LOCATION OF BORING HOLES AND TRENCHES)
- HOLE NUMBER(TOTAL DEPTH)
- TRENCH NUMBER(TOTAL LENGTH)

Note : Location of Geological Survey Area is shown in Fig. 2.2.6.

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA
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Fig. 1.1.1
LOCATION MAP OF THE GEOLOGICAL SURVEY (RESERVOIR AREA)



LEGEND

(Geological Strata)			
Age	Formation and Strata Name	Symbol	Description
Quaternary	Riverbed deposit	rd	Riverbed deposit consists of Gravel, sand and clay. And it contains the huge banded rock in the gorge area, which was made by Koro river.
	Talus deposit	Id	Talus deposit consists of collapse soil and sand, debris, banded rocks. And it is accumulated on the foot of mountain slope and cliff.
Tertiary-Quaternary	Pliocene-Pleistocene	Upper Saurinary Rock Unit	The unit mainly consists of alternation of conglomerate, conglomeratic sandstone, lufaceous sandstone and sandstone, and partly contains mafic tuff and volcanic conglomerate. The change of grain size of sandstone is big, and lamina is formed partly. The matrix of conglomerate consists of same material of sandstone, and gravel consists of andesite and porphyry, and diameter of gravel is smaller than 50cm. Cracks hardly develop in the bedrock, and the degree of cementation of conglomerate, lufaceous sandstone, sandstone and tuff is comparatively low, and lower cementation layer is formed partly in sandstone, conglomerate.
		Upper Pyroclastic Rock Unit	The unit mainly consists of volcanic breccia, and partly contains mafic tuff and andesite lava. The volcanic breccia contains fragments of andesite and porphyry, and matrix consists of mafic tuff. Cracks hardly develop in the bedrock, and the hardness of rock is comparatively high.
	Middle Saurinary Rock Unit	The unit mainly consists of alternation of conglomerate, conglomeratic sandstone, sandstone and lufaceous sandstone, and partly contains mafic tuff. The texture of each rock and conditions of bedrock are almost same as the upper saurinary rock unit.	

- BOUNDARY OF GEOLOGICAL UNIT AND STRATUM
- (LOCATION OF BORE HOLES AND ADITS AT THE PHASE 1 INVESTIGATION)
- : BORE HOLE (NUMBER, TOTAL DEPTH)
- : ADIT (NUMBER, TOTAL LENGTH)
- (LOCATION OF BORING HOLES AND TEST PITS AT THE PHASE 2 INVESTIGATION)
- : BORE HOLE (NUMBER, TOTAL DEPTH)
- : TEST PIT (NUMBER)

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Fig. 1.1.2
 LOCATION MAP OF THE GEOLOGICAL SURVEY (DAM SITE)



PT. Indra Karya (Persero)
Consulting Engineers

Fig. 1.1.3 DRILL LOG

HOLE No. B - 4

DATE	SAMPLING	DEPTH	ELEVATION	COLUMN SECTION	DESCRIPTION	GROUND WATER LEVEL	ROCK GRADE	CORE RECO VERY %	R Q D %	DEPTH		ELEVATION	
										INCLINATION	VERTICAL	DRILL RIG	LOGGED BY
PROJECT: JABBARANG DAM SITE: DAMSITE COORDINATE X: 9222.232940 Y: 428.237753 CLIENT: P.J.C.A. DATE: Dec-21-1997 till Jan-31-1998													
		0.60	137.166	X	TOP SOIL, soft, brown			100	0				
		1		"	SILTY TUFF, soft, brown		D	100	0				
		2	135.766	"				100	0				
		3		"				100	0				
		4		"				100	0				
		5		"				100	0				
		6		"				100	0				
		7		"				100	0				
		8		"				100	0				
		9	128.866	"				100	0				
		10	127.766	"				100	0				
26, 1997		10.00	127.766	"	HIGHLY WEATHERED TUFF, CONGLTIC SSTONE, (nearly Lapilli - Tuff), soft, brown - light brown		D	100	0				
DECEMBER 21, 1997		10.05	127.416	"				100	0				
		10.65	127.116	"				100	0				
		11		"				100	0				
		11.85	125.916	"				100	10				
		12		"				100	10				
		12.55	125.216	"				100	40				
		13		"				100	40				
		13.20	124.566	"				100	40				
		13.30	124.466	"				100	20				
		13.60	123.966	"				100	20				
		14.20	123.566	"				100	20				
		14.35	123.416	"				100	20				
		14.70	123.066	"				100	20				
		15.00	122.766	"				100	20				
		15.25	122.516	"				100	40				
		15.35	122.416	"				100	40				
		16	120.866	"				100	25				
		17		"				100	25				
		17.60	120.866	"				100	25				
		18		"				100	25				
		18.10	119.666	"				100	25				
		19		"				100	25				
		20		"				100	30				
		21		"				100	20				
		22		"				100	15				

Lugeon Value = 2.80
Critical Pressure = 3.85 kg/cm²

Lugeon Value = 4.29
Critical Pressure = 3.85 kg/cm²

Depth (m)	Soil Description	Soil Type	Moisture (%)	Temperature (°C)	Water Content (%)	Shrinkage (%)	Organic Matter (%)	Void Ratio	Specific Gravity	Unit Weight (kg/cm³)	Penetration (mm)	Compression Index	Swelling Potential (%)	Other Parameters
15.25	SANDSTONE, med. grained, compact, brown	CL-H	100	20	15	10	0	0.65	2.65	1.85	40	0.05	Liquor Value = 4.29 Critical Pressure = 3.88 kg/cm²	
15.35	SANDY TUFF, fine grained, soft, grey	D	100	20	15	10	0	0.65	2.65	1.85	40	0.05		
16.30	TUFF, S' STONE, fine grained, included gravels, grey	CL-H	90	25	15	10	0	0.65	2.65	1.85	25	0.05		
16.30	PUMICE TUFF, dense, yellowish grey	CL-L	90	25	15	10	0	0.65	2.65	1.85	25	0.05		
18.10	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
18.10	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
19	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
20	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
21	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
22	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
23	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
24	" " " " " "	D	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
25	VOLCANIC BRECCIA, compact, brownish grey	CM-H	100	25	15	10	0	0.65	2.65	1.85	25	0.05	Liquor Value = 1.86 Critical Pressure = 10.01 kg/cm²	
26	" " " " " "	CM-H	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
27	" " " " " "	CM-H	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
28	" " " " " "	CM-H	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
29	" " " " " "	CM-H	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
30	" " " " " "	CM-H	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
31	" " " " " "	CM-H	100	25	15	10	0	0.65	2.65	1.85	25	0.05		
31.30	SANDSTONE, coarse grained, laminae observed, locally conglitic stone, compact, blackish grey	CM-H	100	30	15	10	0	0.65	2.65	1.85	30	0.05	Liquor Value = 0.75 Critical Pressure = 10.07 kg/cm²	
32.80	TUFF, fine grained, soft, light brown	D	100	35	15	10	0	0.65	2.65	1.85	35	0.05		
33.10	TUFF, S' STONE, f. grained, dense ~ compact, brown	CL-L	100	40	15	10	0	0.65	2.65	1.85	40	0.05	Liquor Value = 1.70 Critical Pressure = 4.95 kg/cm²	
33.85	SANDSTONE, fine grained, dense ~ compact, brown	CL-L	100	40	15	10	0	0.65	2.65	1.85	40	0.05		
35.00	SANDSTONE, fine ~ coarse grained, dense, laminae observed, pumice tuff (37.20 ~ 37.30 & 37.40 ~ 37.55)	D	100	40	15	10	0	0.65	2.65	1.85	40	0.05	Liquor Value = 3.95 Critical Pressure = 8.57 kg/cm²	
37.95	PUMICE TUFF, dense, yellowish light brown, with organic black (38.20 ~ 38.40)	D	100	40	15	10	0	0.65	2.65	1.85	40	0.05		
39.70	CONGLOMERATIC SANDSTONE, laminae observed locally coarse sandstone, compact, brown	CM-L	100	50	15	10	0	0.65	2.65	1.85	50	0.05	Liquor Value = 3.08 Critical Pressure = 7.95 kg/cm²	
40	" " " " " "	CM-L	100	50	15	10	0	0.65	2.65	1.85	50	0.05		
41	" " " " " "	CM-L	100	50	15	10	0	0.65	2.65	1.85	50	0.05		
42	" " " " " "	CM-L	100	50	15	10	0	0.65	2.65	1.85	50	0.05		
43	" " " " " "	CM-L	100	50	15	10	0	0.65	2.65	1.85	50	0.05		
44	" " " " " "	CM-L	100	50	15	10	0	0.65	2.65	1.85	50	0.05		

Core No.	Interval (m)	Depth (m)	Stratigraphic Unit	Lithology	Grain Size (mm)	Moisture (%)	Wet Density (kg/cm³)	Dry Density (kg/cm³)	Porosity (%)	Notes
37										
38		37.95 - 39.70	D	PUMICE TUFF, dense, yellowish light brown, with organic black (38.20 ~ 38.40)			99.816			
39										
40		39.70 - 44.30	CM-L	CONGLOMERATIC SANDSTONE, laminae observed locally coarse sandstone, compact, brown			98.066			
41										
42										
43										
44										
45		44.30 - 45.00	D	TUFF, yellowish grey			92.866			
46		45.00 - 46.60	CL-L	SANDSTONE, med. grained, compact, brown			92.766			
47		46.60 - 47.35	CL-L	TUFF. SSTONE, fine grained, compact, brown			91.166			
48		47.35 - 47.50	CL-L	SANDSTONE, medium grained, compact, brown			90.816			
48		47.50 - 47.55	D	TUFF, fine grained, yellowish grey			90.416			
48		47.55 - 48.00	D	SANDSTONE, fine grained, dense, blackish grey			90.266			
48		48.00 - 49.60	CL-L	TUFF. SSTONE, nearly isipally tuff, c. grained, grey			90.216			
49		49.60 - 49.75	CL-L	SANDSTONE, fine ~ medium grained, laminae observed, compact, light grey			89.766			
49		49.75 - 49.85	D	CONGLTIC SSTONE, pumice Ø0.3 ~ 0.5 cm, included basalt, dark grey			88.916			
50		49.85 - 49.90	D	included basalt, dark grey			88.166			
50		49.90 - 51.50	D	SILTSTONE, dense, blackish grey			88.016			
51		51.50 - 52.35	D	MUDDY TUFF, included pumice, dense, blackish grey			86.266			
52		52.35 - 53.50	CL-L	SANDSTONE, fine grained, laminae observed included pumice, grey			85.816			
53		53.50 - 55.50	CL-L	TUFF, pumice rich, yellowish grey			84.266			
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										

Lugeon Value = 5.95
Critical Pressure = 8.57 kg/cm²

Lugeon Value = 3.08
Critical Pressure = 7.89 kg/cm²

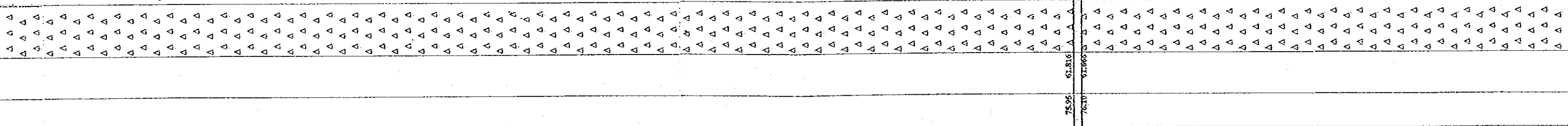
Lugeon Value = 3.45
Critical Pressure = 7.58 kg/cm²

Lugeon Value = 0.08
Critical Pressure = 11.51 kg/cm²

Lugeon Value = 0.43
Critical Pressure = 15.51 kg/cm²

8 JANUARY 08, 1998 | JANUARY 07, 1998 | JANUARY 06, 1998 | JAN. 05 | JANUARY 04, 1998 | JANUARY 03, 1998

66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85



VOLCANIC BRECCIA, compact,
with some boulders Ø 15 - 40 cm, light grey

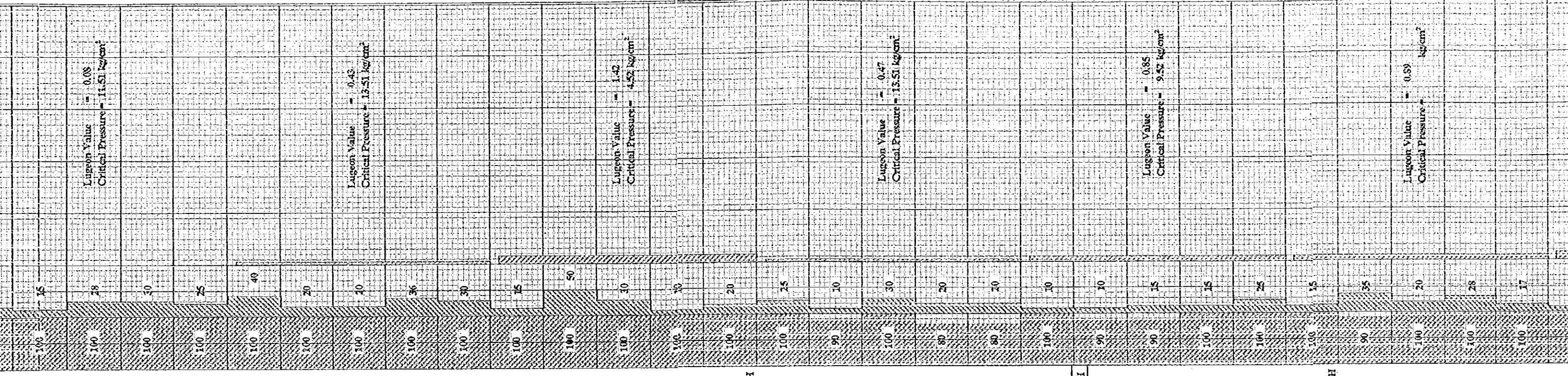
CM - H

TUFF, dense, grey

CL - H

VOLCANIC BRECCIA, compact, light grey

CM - H



Lugeon Value = 0.08
Critical Pressure = 11.51 kg/cm²

Lugeon Value = 0.43
Critical Pressure = 13.51 kg/cm²

Lugeon Value = 1.42
Critical Pressure = 4.52 kg/cm²

Lugeon Value = 0.47
Critical Pressure = 13.51 kg/cm²

Lugeon Value = 0.85
Critical Pressure = 9.52 kg/cm²

Lugeon Value = 0.89
Critical Pressure = 9.52 kg/cm²

JANUARY 06, 1998

JANUARY 07, 1998

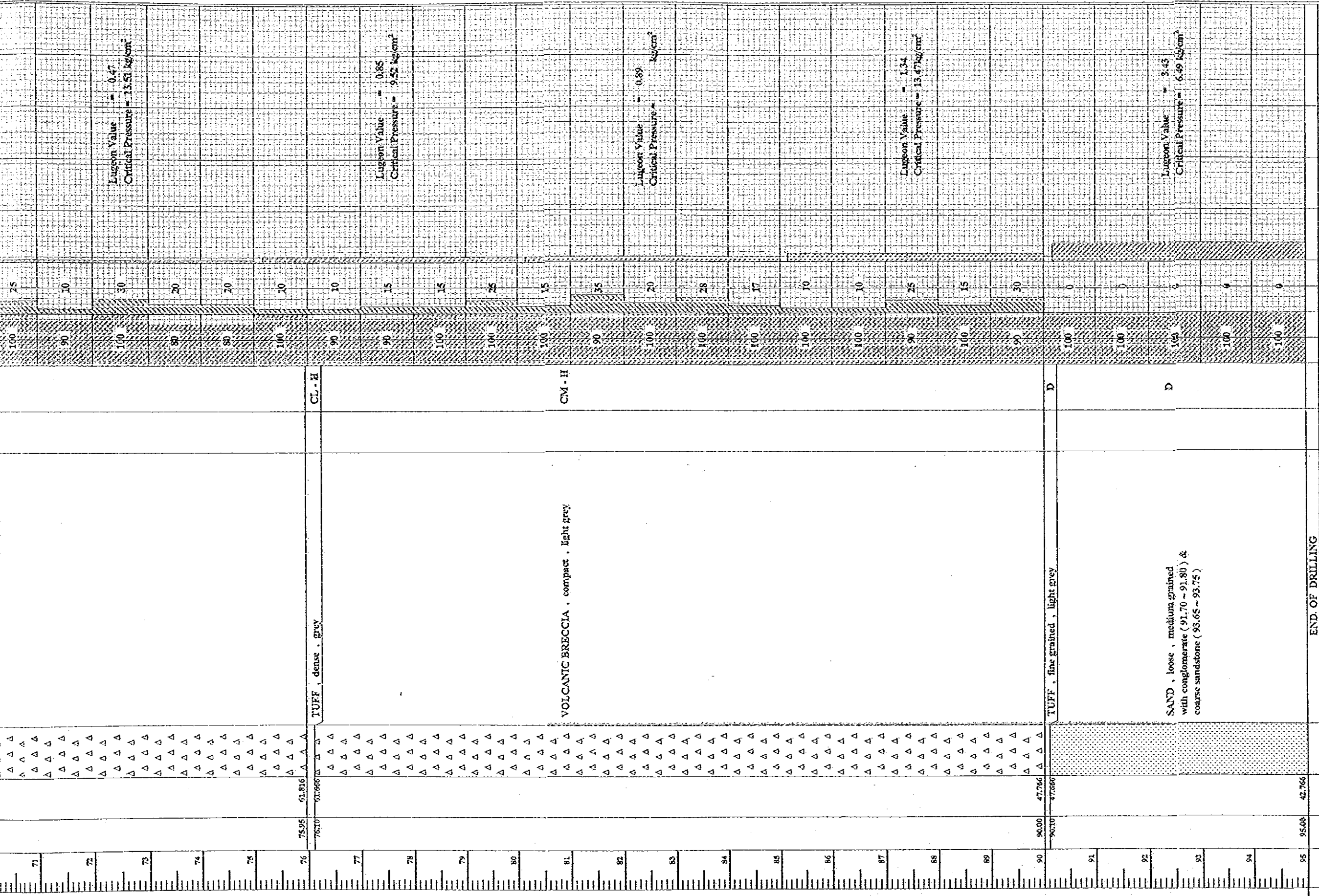
JANUARY 08, 1998

JAN. 09, 1998

JANUARY 10, 1998

JAN. 11

F-1-3



* R. Q. D. = Rock Quality Designation = (Total Length of Cylindric Cores longer than 10 cm) / (Total Core Length) x 100 %
 * LUGEON VALUE is ltr/min/mtr under injection water pressure by 10 kgf/cm2
 * G. W. L. = Ground Water Level = Height of Spring Water

END OF DRILLING