

8

PT. Indra Karya (Persero)
Consulting Engineers

Fig. 1.1.4 DRILL LOG

HOLE No. B - 5

DATE	SAMPLING	DEPTH	ELEVATION	COLUMN SECTION	DESCRIPTION	GROUND WATER LEVEL	ROCK GRADE	CORE RECO VERY %	R Q D %	DEPTH		WATER PRESSURE TEST LUGEON VALUE	
										100.00 M	ELEVATION		DRILL RIG
PROJECT SITE		COORDINATE		DATE		INCLINATION		VERTICAL		ELEVATION		LOGGED BY	
CLIENT		DATE		DATE		DRILLED BY		WAKUO		85.585		KOKEN 201	
OCTOBER 17, 1997		1		00% 00%	RIVER DEPOSITE, sand & gravel content, loose, grey			100	0				
		2	1.60	00% 00%	SANDY TUFF, dense, dark bluish grey		CL-L	100	0				
		3	3.30	00% 00%	puritice rich			100	10				
		4	4.10	00% 00%	SANDSTONE, fine grained with many puritice SILTSTONE, laminae observed, 4.45 ~ 4.50 m puritice included		CL (II, 3)	100	0				
		5	4.55	00% 00%	SANDSTONE, fine grained, 4.55 ~ 4.95 m core disturbed			100	20				
		6	5.45	00% 00%	CONGLOMERATE, gravels size Ø 1 - 3 cm rounded, poor cemented		CL	100	0				
		7	6.10	00% 00%				100	0				
		8		00% 00%				100	0				
		9		00% 00%	VOLCANIC BRECCIA, compact, light grey		CM-H	100	0				
		10		00% 00%				100	25				
		11		00% 00%				100	0				
		12	11.60	00% 00%	CONGLOMERATE, poor cemented, brownish grey		D	100	0				
		13	12.10	00% 00%	SAND, poor cemented, medium grained, grey		D	100	0				
		14	13.60	00% 00%	CONGLOMERATE, poor cemented, brownish grey		D	100	0				
		15	14.10	00% 00%	SAND, poor cemented, medium grained, grey		D	100	0				
		16	14.50	00% 00%	CONGLOMERATE, poor cemented, dark grey		D	100	0				
		17	14.90	00% 00%				100	10				
		18		00% 00%				100	0				
		19		00% 00%				100	15				
		20		00% 00%				100	20				
		21		00% 00%				100	15				

Lugeon Value = 105.40
Critical Pressure = kg/cm²

Lugeon Value = 5.50
Critical Pressure = kg/cm²

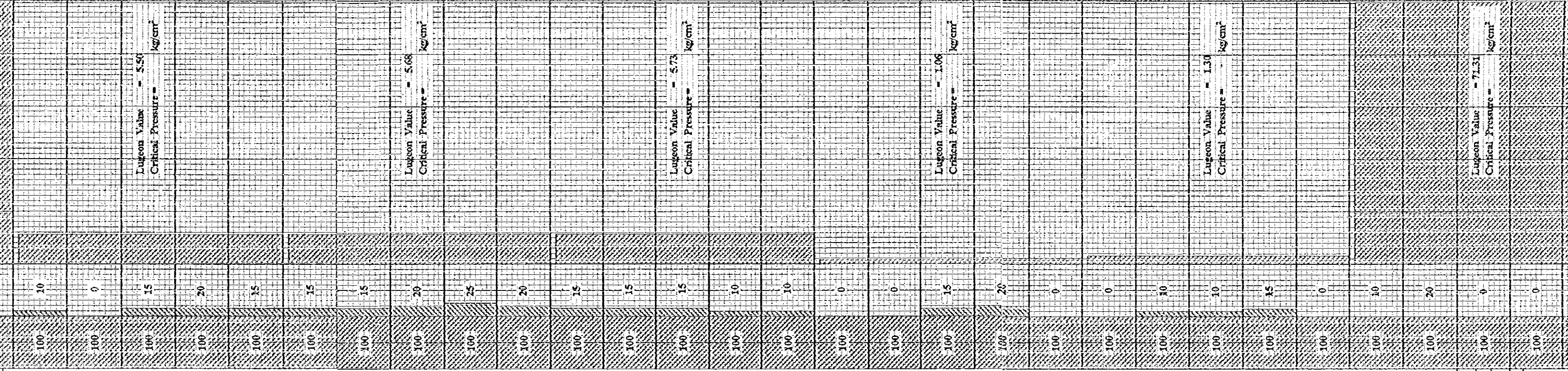
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OCTOBER 26, 1997 OCTOBER 27, 1997 OCTOBER 28, 1997 OCTOBER 29, 1997 OCTOBER 30, 1997 997

42.00	46.565	△ △ △	E	D	TUFF. SSTONE, fine grained, laminar observed
42.56	46.015	△ △ △	E	D	SANDSTONE, medium grained, gravel included
42.70	45.965	△ △ △	E	D	TUFF, soft, light grey
43.00	45.565	△ △ △	E	D	SANDSTONE, medium - coarse grained, dark grey
		△ △ △			SANDSTONE, dense to compact, fine grained.

VOLCANIC BRECCIA, compact, grey with boulder Ø 95 cm (14.80 - 15.75)

CM - H



DATE	DEPTH (m)	SOIL TYPE / DESCRIPTION	WATER CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	UNSATURATED WATER CONTENT (%)	SHRINKAGE (%)	SHRINKAGE LIMIT (%)	SHRINKAGE INDEX (%)	FLUIDITY	CLASSIFICATION	LABORATORY VALUE	CRITICAL PRESSURE (kg/cm ²)	
OCTOBER 30, 1997	35													
	36													
	37													
	38													
	39													
	40													
	41													
	42	42.00	TUFF. SSTONE, fine grained, lamirac observed	46.565										
	43	42.55	SANDSTONE, medium grained, gravel included	46.015										
	44	42.70	TUFF, soft, light grey	45.865										
OCTOBER 31, 1997	45	43.00	SANDSTONE, medium ~ coarse grained, dark grey	45.565										
	46	45.00	SANDSTONE, dense to compact, fine grained, blackish grey	43.565										
	47	45.45	SANDSTONE, dense to compact, s. grained, grey	42.115										
	48	45.75	CONGLOMERATE, poor cemented with gravel	42.815										
	49	46.00	SANDSTONE, medium grained, dense, grey	41.965										
	50	47.25	TUFF, fine grained, yellowish grey	41.315										
	51	47.50	MUDDY TUFF, organic content, blackish grey	41.065										
	52	48.50	SANDSTONE, fine grained, poor cemented, grey	40.065										
	53	49.00	SILTSTONE, fine grained, compact, light brown	39.565										
	54	49.35	TUFF SANDSTONE, fine grained, dense, brown	39.015										
NOVEMBER 04, 1997	55	50.25	CONGLOMERATE, with gravel Ø 1-5 cm, brown	38.315										
	56	50.90	SAND, coarse grained, loose, grey ~ black	37.665										
	57	51.40	CONGLOMERATE, with gravel Ø 1-5 cm, brown	37.165										
	58	51.80	TUFF SANDSTONE, poor cemented, grey	36.765										
	59	52.20	SANDSTONE, coarse grained, dense, grey	36.365										
	60	52.45	CONGLOMERATE, poor cemented, brownish grey	36.115										
	61	52.85	LAPILLI TUFF, gravel size Ø 0.2 ~ 1 cm, light grey	35.715										
	62	54.00	SANDSTONE, poor cemented, medium-coarse grained, light grey	34.565										
	63	54.35	CONGLOMERATE, poor cemented, grey	34.215										
	64	55.00	SANDSTONE, fine ~ coarse grained, dark grey	33.565										
NOVEMBER 06, 1997	65	55.20	MUDDY TUFF, organic content, blackish grey	33.365										
	66	55.50	CONGLOMERATE, poor cemented, brownish grey	33.065										
	67	55.95	MUDDY TUFF, organic content, blackish grey	32.615										
	68	57.20	VOLCANIC CONGLOMERATE, poor cemented, with gravel Ø 0.5 - 1 cm, brownish grey	31.365										
	69		SANDSTONE, coarse grained, poor cemented, round gravel included (Ø 0.5 - 1 cm), grey											
	70	61.00	CONGLOMERATE, poor cemented, with gravel Ø 0.5 - 5 cm, grey	27.565										
	71													
	72													
	73													
	74													
NOVEMBER 07, 1997	75													
	76													
	77													
	78													
	79													
	80													
	81													
	82													
	83													
	84													

OCTOBER 30, 1997

OCTOBER 31, 1997

NOVEMBER 04, 1997

NOVEMBER 06, 1997

NOVEMBER 07, 1997

997

Lugeon Value = 1.30
Critical Pressure = kg/cm²

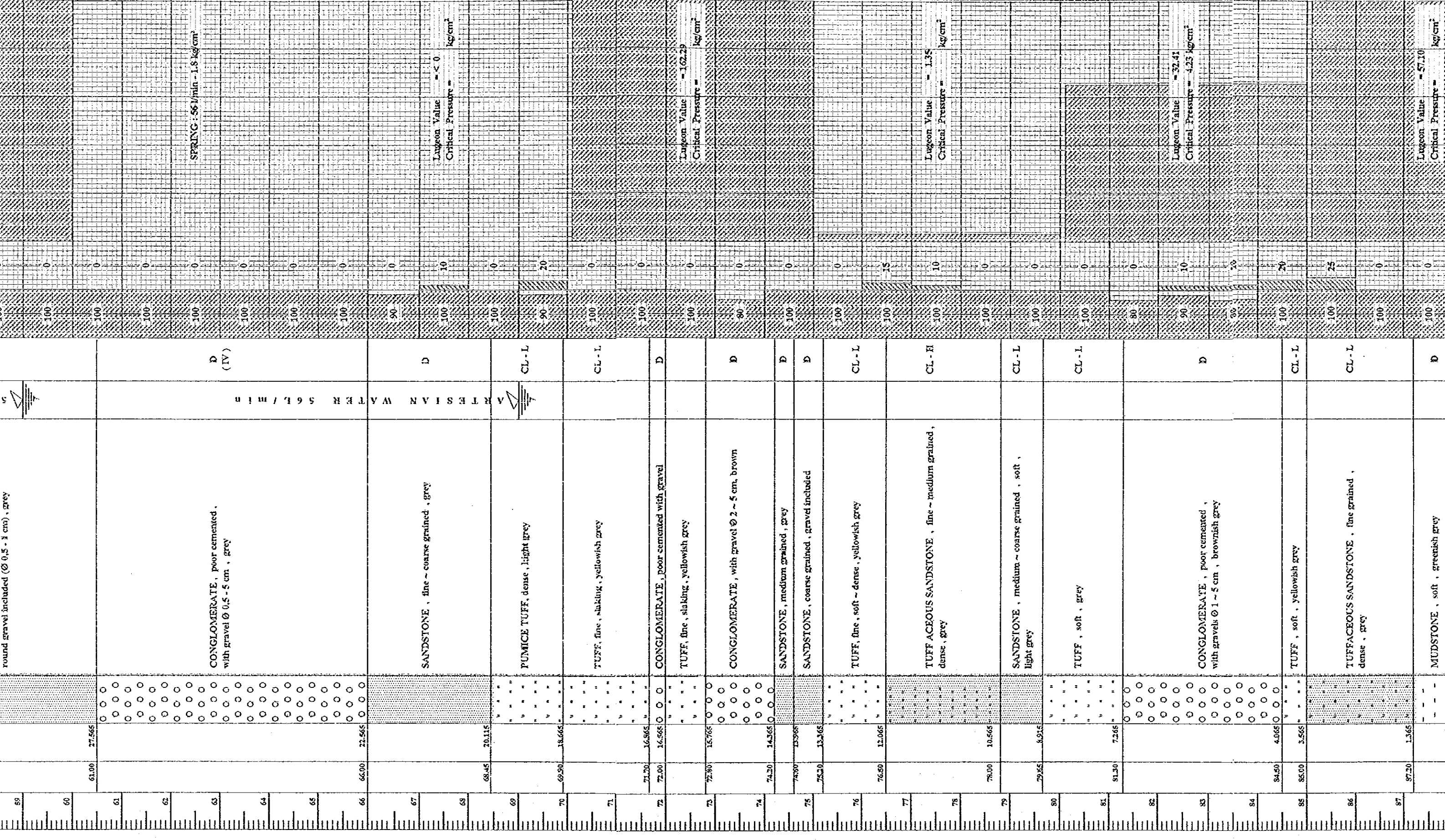
Lugeon Value = 7.31
Critical Pressure = kg/cm²

Lugeon Value = 105.24
Critical Pressure = kg/cm²

Lugeon Value = > 100
Critical Pressure = kg/cm²

Lugeon Value = > 100
Critical Pressure = kg/cm²

SPRING: \$6 l/min - 1.8 kg/cm²



ARTESIAN WATER 56 L/min

DATE	DEPTH (m)	ROCK QUALITY DESIGNATION	DESCRIPTION	LOGEON VALUE	CRITICAL PRESSURE (kg/cm ²)	UNIT WEIGHT (kg/cm ³)
DECEMBER 03, 1997	75.20	CL-L	TUFF, fine, soft ~ dense, yellowish grey	13.265	1.35	100
	76.60	CL-H	TUFFACEOUS SANDSTONE, fine ~ medium grained, dense, grey	12.065	1.35	100
DECEMBER 01, 1997	78.00	CL-L	SANDSTONE, medium ~ coarse grained, soft, light grey	10.565	1.35	100
	79.65	CL-L	TUFF, soft, grey	8.915	1.35	100
NOVEMBER 24, 1997	81.20	D	CONGLOMERATE, poor cemented, with gravels Ø 1 ~ 5 cm, brownish grey	7.265	52.41	80
	84.50	CL-L	TUFF, soft, yellowish grey	4.065	42.25	100
NOVEMBER 25, 1997	85.00	CL-L	TUFF, soft, yellowish grey	3.565	42.25	100
	87.20	CL-L	TUFFACEOUS SANDSTONE, fine grained, dense, grey	1.565	42.25	100
NOV. 26, 1997	88.10	D	MUDSTONE, soft, greenish grey	0.465	42.25	100
	89.20	D	MUDSTONE, soft, dark grey	-0.635	42.25	100
NOV. 26, 1997	89.85	D	SANDSTONE, fine grained, soft, grey	-1.285	42.25	100
	90.00	D	MUDSTONE, soft, dark grey	-1.335	42.25	100
NOV. 26, 1997	90.20	D	TUFF, soft, grey	-1.635	42.25	100
	90.75	D	SANDSTONE, fine grained, soft, grey	-2.185	42.25	100
NOV. 26, 1997	91.20	D	MUDSTONE, soft, grey	-2.735	42.25	100
	92.40	CL-L	SANDSTONE, coarse grained, soft, grey	-3.835	42.25	100
DECEMBER 01, 1997	94.75	D	MUDSTONE, soft, with gravels Ø 0.5 ~ 2 cm, black	-6.185	42.25	100
	96.25	D	CONGLOMERATE, poor cemented, dark grey	-7.685	42.25	80
DECEMBER 03, 1997	96.70	CL-L	SANDY TUFF, soft, grey	-8.135	42.25	100
	100.00	D	CONGLOMERATE, poor cemented, dark grey with gravels Ø 1 ~ 2 cm	-11.635	19.03	100

END OF DRILLING

* R. Q. D. = Rock Quality Designation = (Total Length of Cylindric Cores longer than 10 cm) / (Total Core Length) x 100 %

* LOGEON VALUE is ltr/min/mtr under injection water pressure by 10 kgf/cm²

* G. W. L. = Ground Water Level = Height of Spring Water



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Consulting Engineers

Fig. 1.1.5 DRILL LOG

HOLE No. B - 6

PROJECT		JABERANG DAM		DEPTH		ELEVATION		M		
SITE		DAMSITE		INCLINATION		VERTICAL		DRILL RIG		
CLIENT		DATE		DRILLED BY		SUMPENQ		LOGGED BY		
DATE	SAMPLING	DEPTH	ELEVATION	COLUMN SECTION	DESCRIPTION	GROUND WATER LEVEL	ROCK GRADE	CORE RECO VERY %	R Q D %	WATER PRESSURE TEST LUZEON VALUE
		0.30	147.797		TOP SOIL		D	100	0	
					TUFF. SANDSTONE (nearly Lapilli Tuff), soft, light brown		CL-L	100	0	
		7.80	140.297		CONGLTIC S'STONE, soft, light brown		CL-L	100	25	
		8.60	139.497		CONGLOMERATE, poor cemented, brown		D	100	0	
		10.40	137.697		CONGLTIC S'STONE, dense, light brown		CL-H	100	25	
		12.05	136.047		TUFF. SANDSTONE, fine grained, compact, brown		CL-H	80	30	
		12.80	135.297		CONGLOMERATE, poor cemented, laminae, intercalation with coarse s'stone (15.50-15.65), light brown		D	100	0	
		17.25	130.847		CONGLTIC SANDSTONE, dense, light brown		CL-L	80	20	
		17.70	130.397		SAND, loose, poor cemented, grey		D	100	0	
		18.40	129.697		TUFFACEOUS CONGLTIC SANDSTONE, dense, brownish grey		CL-L	100	17	
		20.80	127.297		SANDSTONE, coarse grained, soft-dense, grey		CL-H	80	19	
		22.60	125.497		CONGLTIC SANDSTONE, mixed with gravels, soft-dense, brownish grey		CL-L	70	0	
24, 1997		23.70	124.397				CL-L	90	20	
24, 1997										

24, 1997
OCT. 11, 1997
OCT. 12
OCT. 13
OCT. 15
OCT. 16
OCT. 17
OCT. 17
OCT. 22, 97
OCT. 22, 1997
OCT. 23, 1997
OCT. 23, 1997

15		CONGLOMERATE, poor cemented, laminae, intercalation with coarse s'stone (15.50 ~ 15.65), light brown	D	100		
16				100		
17	17.25 130.847		CL-L	80	Lugeon Value = 12.93 Critical Pressure = 6.49 kg/cm ²	
18	17.70 130.897	CONGLTIC SANDSTONE, dense, light brown	D	100		
19	18.40 129.607	SAND, loose, poor cemented, grey		80		
20		TUFFACEOUS CONGLTIC SANDSTONE, dense, brownish grey	CL-L	100		
21	20.80 127.297			100		
22		SANDSTONE, coarse grained, soft ~ dense, grey	CL-H	80	Lugeon Value = 12.50 Critical Pressure = 6.48 kg/cm ²	
23	22.60 125.497		CL-L	90		
24	23.70 124.297	CONGLTIC SANDSTONE, mixed with gravels, soft ~ dense, brownish grey	CL-L	100		
24	24.00 124.097	TUFF, dense, brown	CL-L	70		
24	24.70 125.397	CONGLTIC SANDSTONE (nearly volcanic breccia)	CL-L	100		
25	24.75 123.247	CONGLOMERATE, poor cemented, grey	D	100		
25	25.10 122.997	CONGLTIC SANDSTONE (nearly volcanic breccia)	CL-L	100		
26		SANDSTONE, fine ~ coarse grained, soft, brown	CL-L	100		
26	26.20 121.897			100		
27		TUFFACEOUS SANDSTONE, coarse grained, grey, soft ~ dense	CL-L	100		
27	27.20 126.897		CL-H	100	Lugeon Value = 8.44 Critical Pressure = 7.20 kg/cm ²	
27	27.60 120.697	TUFF, fine, dense, light grey		100		
28				100		
29				100		
30				100		
31				90		
32				90		
33				100	Lugeon Value = 3.42 Critical Pressure = kg/cm ²	
34		VOLCANIC BRECCIA, compact, grey	CM-E	100		
35				100		
36				100		
37				100		
38				100	Lugeon Value = 3.10 Critical Pressure = kg/cm ²	
39				90		
40	40.00 108.097			100		
41	40.90 107.107	SANDSTONE, c. grained with punice, dense ~ compact, grey	CL-H	100		
41	41.15 106.947	TUFF, fine, dense, light grey	CL-H	90		
42		SANDSTONE, medium grained, dense, dark grey	CL-H	40		
42	42.20 105.897		CL-H	100	Lugeon Value = 3.80 Critical Pressure = 4.33 kg/cm ²	
42	42.60 105.497	TUFF, fine, dense, light grey	CL-H	100		
43		SANDSTONE, fine grained, grey	CL-L	100		
44	43.45 104.647		CL-L	100		
44	44.25 103.847	SANDSTONE, coarse grained, laminae, dense, grey	CL-L	100		
44		TUFF, fine, dense, blackish brown	CL-L	100		



Core No.	Depth (m)	Interval (m)	Grain Size	Color	Texture	Notes	Classification	Moisture (%)	Grain Density (kg/cm³)	Porosity (%)	Void Ratio	Compressibility	Strength	Other
38	40.00	108.097	Δ Δ Δ			SANDSTONE, c. grained with pumice, dense - compact, grey	CL-H	100	3.10	26				
39	41.15	106.947	" " "			TUFF, fine, dense, light grey	CL-H	100						
40	42.60	105.497	" " "			SANDSTONE, medium grained, dense, dark grey	CL-H	100						
41	43.45	104.647	" " "			TUFF, fine, dense, light grey	CL-H	100						
42	44.25	103.847	" " "			SANDSTONE, fine grained, grey	CL-L	100						
43	45.30	102.797	" " "			SANDSTONE, coarse grained, laminae, dense, grey	CL-L	100						
44	45.90	102.197	" " "			TUFF, fine, dense, blackish brown	CL-L	100						
45	47.20	100.897	" " "			TUFF, dense, brownish white	CL-L	100						
46	48.20	99.897	" " "			SANDSTONE, fine grained, dense - compact, grey	CL-L	100						
47	49.05	99.047	" " "			TUFF, compact, brownish white	CL-H	100						
48	50.20	97.897	" " "			SANDSTONE, coarse grained, compact, grey	CL-H	100						
49	51.25	96.847	" " "			SANDSTONE, medium grained, laminae observed, grey	CL-L	100						
50	51.80	96.297	" " "			CONGLUTIC S' STONE, coarse grained, compact, grey	CM-L	100						
51	52.10	95.997	" " "			TUFFACEOUS SANDSTONE, fine grained, compact, grey	CL-H	100						
52	54.15	93.947	" " "			TUFF, fine, dense	CL-L	100						
53	55.00	93.097	" " "			TUFFACEOUS SANDSTONE, compact, fine grained, grey	CL-H	100						
54	55.90	92.107	" " "			TUFF, fine, dense	CL-L	100						
55	56.60	91.497	" " "			SANDSTONE, fine grained, dense, grey	CL-L	80						
56	56.60	91.497	" " "			CONGLUTIC S' STONE, c. grained, compact, greyish brown	CL-L	100						
57	58.20	89.897	" " "			SANDSTONE, fine ~ coarse grained, compact, grey	CL-L	100						
58	59.45	88.647	" " "			CONGLOMERATIC SANDSTONE, compact, light grey	CL-H	100						
59	60.35	87.747	" " "			SANDSTONE, fine ~ coarse grained, laminae observed, grey	CL-L	100						
60	61.40	86.697	" " "			SAND, medium grained, loose, grey	D	100						
61	63.50	84.897	" " "			CONGLOMERATIC SANDSTONE, compact, grey	CM-L	100						
62														
63														
64														
65														
66														
67						SAND, loose, medium grained, grey intercalation with gravels (66.80 - 67.40)	D	100						

OCTOBER 27, 1997

OCTOBER 28, 1997

OCTOBER 29, 1997

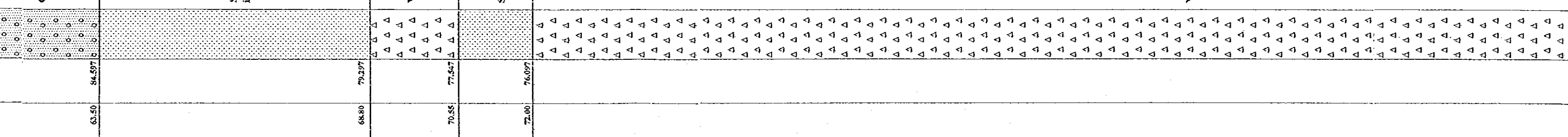
OCTOBER 30, 1997

NOV. 11, 1997

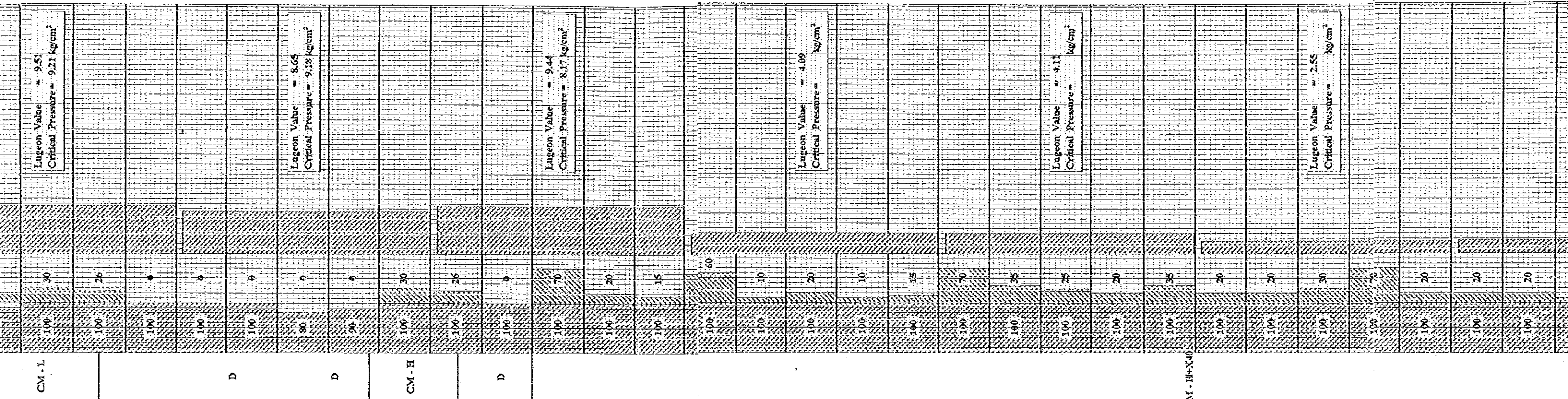
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4, 1997 NOV. 23, 1997 NOVEMBER 20, 1997 NOVEMBER 19, 1997 NOVEMBER 12, 1997 NOV. 11, 1997 OCTOBER 3

62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92



CM-L	CONGLOMERATIC SANDSTONE, compact, grey	63.50	84.597	100	30	Lugeon Value = 9.51 Critical Pressure = 9.21 kg/cm ²
D	SAND, loose, medium grained, grey intercalation with gravels (66.80-67.40)	68.80	79.297	100	26	Lugeon Value = 8.65 Critical Pressure = 9.18 kg/cm ²
CM-H	VOLCANIC BRECCIA, compact, grey	70.55	77.527	100	30	Lugeon Value = 9.44 Critical Pressure = 8.17 kg/cm ²
D	SAND, medium grained, poor cemented, grey	72.00	76.097	100	20	Lugeon Value = 4.09 Critical Pressure = kg/cm ²
CM-H+X10	VOLCANIC BRECCIA, compact, grey	76.00	84.597	100	35	Lugeon Value = 4.11 Critical Pressure = kg/cm ²



Depth (m)	Core Quality Designation	Description	Remarks	Grain Size	Lugeon Value (kg/cm ²)	Critical Pressure (kg/cm ²)
104	CM-L	CONGLOMERATIC SANDSTONE, compact, grey		100		
105	CL-H	SILTSTONE, dense, grey		100		
106	CL-H	CONGLOMERATIC SANDSTONE, compact, grey		100		
106.45			41.647			
106.95			41.247			
107.16			40.947			
108	CL-L	SANDSTONE, med. ~ coarse grained, poor cemented, grey		100		
108.90			39.197			
109	CL-L	TUFFACEOUS SANDSTONE, medium ~ coarse grained, with pumice, poor cemented, brownish grey		100		
109.50			38.597			
110	D	SANDSTONE, medium ~ coarse grained, poor cemented, grey		100		
111	D	CONGLOMERATE Ø 1.5 ~ 3 cm, grey		100		
111.60			36.497			
112	D	SAND, loose, coarse grained, blackish grey		100		
112.00			36.097			
113	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
114	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
115	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
116	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
117	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
118	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
119	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
120	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
121	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
122	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
123	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
124	D	SANDSTONE, with pumice, locally laminae observed, poor cemented, blackish grey		100		
124.60			23.497			
125	CL-H	MUDSTONE, compact, brownish grey		100		
126	CL-H	MUDSTONE, compact, brownish grey		100		
127	CL-L	SANDSTONE, poor cemented, brownish grey, intercalation with cong'lite (127.70 ~ 128) & (129.60 ~ 130)		100		
126.65			21.447			
130	CL-L	SANDSTONE, poor cemented, brownish grey, intercalation with cong'lite (127.70 ~ 128) & (129.60 ~ 130)		100		
130.00			18.097			

* 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

NOV. 29 1997
 NOV. 30 1997
 NOV. 30 1997
 DEC. 10 1997
 DEC. 13 1997
 DEC. 13 1997
 DEC. 14 1997
 DEC. 14 1997
 DEC. 14 1997