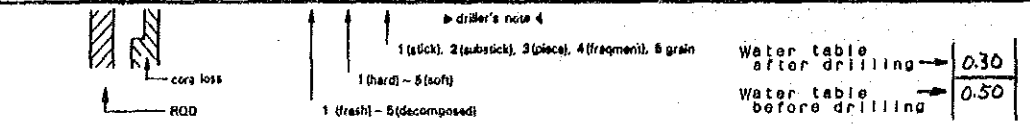


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-1** (SHEET 1 of 5)

LOCATION **DAM** DEPTH OF HOLE **100.00** m COMMENCED **29-8-1987**
 ELEVATION **510** m DEPTH OF OVERBURDEN **23.50** m COMPLETED **29-9-1987**
 COORDINATE **-** LENGTH OF ROCK DRILLING **77.50** m DRILLED BY **DSI**
 ANGLE FROM HORIZONTAL **90** TOTAL LENGTH OF CORE **85.17** m LOGGED BY **JICA**
 BEARING OF ANGLE HOLE **-** CORE RECOVERY **85.17** %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTA-TION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHER-ING	HARD-NESS	CORE CUTTING		WATER TABLE	WATER PRESSURE TEST		
0m			0 → 100%							LUGEON	m	0m	510 m
1									Alluvium.	0.30			
2									Peridotite and limestone gravels.	0.00			
3									No fine material in core box.	0.00			
4									Peridotite gravel is mainly composed.	0.00			
5									Distribution of limestone gravels	0.00			
6									{ 4~6m 6~7.5m 21.0m	0.00			
7											0.00		
8									Distribution of red-shale gravel, 15.0m.	0.30			
9										0.30			
10										0.30			
1										0.30			
2										0.30			
3										0.30			
4										0.50			
5										0.50			
6										0.50			
7										0.50			
8										0.30			
9										0.30			
20										0.30			490

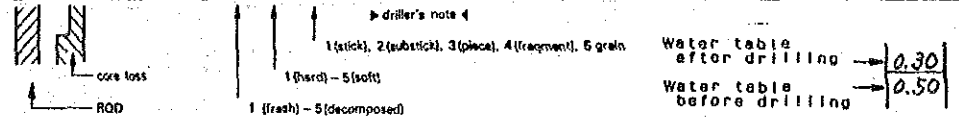


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-1** (SHEET **2** of **5**)

LOCATION **DAM** DEPTH OF HOLE **100.00** m COMMENCED **29-8-1987**
 ELEVATION **510** m DEPTH OF OVERBURDEN **23.50** m COMPLETED **29-9-1987**
 COORDINATE **-** LENGTH OF ROCK DRILLING **77.50** m DRILLED BY **DSI**
 ANGLE FROM HORIZONTAL **90** TOTAL LENGTH OF CORE **85.17** m LOGGED BY **JICA**
 BEARING OF ANGLE HOLE **-** CORE RECOVERY **85.17** %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION			
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER					
0			0-100%							LUGEON	m	0m	490 m			
1	Alluvium	○	○	φ90 mm	Dark gray				ditto.		0.30 0.00	1				
2														23.5	0.00 0.00	2
3																
4	Peridotite	△	△	φ56 mm	Dark gray	N	N	3	Fractured peridotite. Serpentinization and slickenside are seen in some fractures.	Lu = (11) Po max. = 8.0 kg/cm ²	0.00 0.00	4				
5																
6																
7																
8																
9																
0																
1																
2																
3	34.0 38.5	Calsite veins at 33m. An opening, 1-5mm wide.	Lu = 0 Po max. = 8.0	0.00 0.00	6											
4																
5																
6																
7	37.5m: Serpentine 1mm wide along 45° dip crack.	Lu = 1.6 Po max. = 10.0	0.00 0.00	7												
8																
9																
0	38.0	Lu = 0 Po max. = 10.0	0.00 0.00	8												
1																
2	2	Lu = 0 Po max. = 10.0	0.00 0.00	9												
3																
4												470				

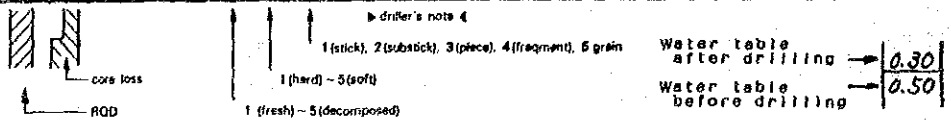


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. SK-1 (SHEET 3 of 5)

LOCATION DAM DEPTH OF HOLE 100.00 m COMMENCED 29-8-1987
 ELEVATION 510 m DEPTH OF OVERBURDEN 23.50 m COMPLETED 29-9-1987
 COORDINATE - LENGTH OF ROCK DRILLING 77.50 m DRILLED BY DSI
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 85.17 m LOGGED BY JICA
 BEARING OF ANGLE HOLE - CORE RECOVERY 85.17 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
4.0m			0 → 100%							LUGEON	m	0m	470
1		^					2		Lu = 0 Po max. = 10.0			1	
2							3	42.5 45° dip cracks main.		0.00		2	
3		^					3	43.0	Lu = 0 Po max. = 10.0			3	
4												4	
5		^							Lu = 0 Po max. = 10.0			5	
6												6	
7		^					2		Lu = 0 Po max. = 10.0			7	
8												8	
9		^							Lu = 0 Po max. = 10.0			9	
5.0	Peridotite			φ56 mm	Dark gray	2	2				0.00	0	
1		^							Lu = 0 Po max. = 10.0			1	
2								52.0				2	
3		^					3		Lu = 0 Po max. = 10.0			3	
4		^					3	53.5 53.5 ~ 55.0 m : Serpentine		0.00		4	
5		^					4	1~2mm wide along 45°		0.00		5	
6		^					4	70° and 90° dip cracks.	Lu = 0 Po max. = 10.0			6	
6		^					1					6	
7		^					1	56.4 m : Serpentine 1mm	Lu = 0 Po max. = 10.0			7	
8							2	wide.				8	
9		^							Lu = 0 Po max. = 10.0			9	
6.0												0	450



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. SK-1 (SHEET 4 of 5)

LOCATION DAM	DEPTH OF HOLE 100.00 m	COMMENCED 29-8-1987
ELEVATION 510 m	DEPTH OF OVERBURDEN 23.50 m	COMPLETED 29-9-1987
COORDINATE -	LENGTH OF ROCK DRILLING 77.50 m	DRILLED BY DSI
ANGLE FROM HORIZONTAL 90	TOTAL LENGTH OF CORE 85.17 m	LOGGED BY JICA
BEARING OF ANGLE HOLE -	CORE RECOVERY 85.17 %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
0			0 → 100%							LUGEON	m	0m	450	
1	Peridotite	✓	✓	φ56 mm	Dark gray	2	2	1	61.0		Lu = 0	Po max. = 10.0 kg/cm ²	0.00	1
2								63.5	63.5 m: Serpentine	Lu = 0	Po max. = 10.0	0.00	2	
3								64.5	0.1 ~ 1mm wide along 40° dip crack.	Lu = 0	Po max. = 10.0		3	
4								67.2	67.2 ~ 67.4 m: Fragment	Lu = 0	Po max. = 10.0		4	
5								67.4	core. Serpentine 1mm				5	
6								68.0	wide along 65° dip crack.	Lu = 0	Po max. = 10.0		6	
7								68.5		Lu = 0	Po max. = 10.0		7	
8								70.1	70.1 ~ 70.3 m: Fragment	Lu = 0	Po max. = 10.0	0.00	8	
9								70.3	core. Serpentinization	Lu = 0	Po max. = 10.0	0.00	9	
10										Lu = 0	Po max. = 10.0		10	
11			Lu = 0	Po max. = 10.0		11								
12			Lu = 0	Po max. = 10.0		12								
13			Lu = 0	Po max. = 10.0		13								
14			Lu = 0	Po max. = 10.0		14								
15			Lu = 0	Po max. = 10.0		15								
16			Lu = 0	Po max. = 10.0		16								
17			Lu = 0	Po max. = 10.0		17								
18			Lu = 0	Po max. = 10.0		18								
19			Lu = 0	Po max. = 10.0		19								
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26			Lu = 0	Po max. = 10.0		26								
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94			Lu = 0	Po max. = 10.0		94								
95			Lu = 0	Po max. = 10.0		95								
96			Lu = 0	Po max. = 10.0		96								
97			Lu = 0	Po max. = 10.0		97								
98			Lu = 0	Po max. = 10.0		98								
99			Lu = 0	Po max. = 10.0		99								
100			Lu = 0	Po max. = 10.0		100								

Driller's note 4

1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain

1 (hard) - 5 (soft)

1 (fresh) - 5 (decomposed)

Water table after drilling → 0.30

Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-1** (SHEET **5** of **5**)

LOCATION **DAM** DEPTH OF HOLE **100.00** m COMMENCED **29-8-1987**
 ELEVATION **510** m DEPTH OF OVERBURDEN **23.50** m COMPLETED **29-9-1987**
 COORDINATE **-** LENGTH OF ROCK DRILLING **77.50** m DRILLED BY **DSI**
 ANGLE FROM HORIZONTAL **90** TOTAL LENGTH OF CORE **85.17** m LOGGED BY **JICA**
 BEARING OF ANGLE HOLE **-** CORE RECOVERY **85.17** %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BITTING CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	LUGEON		
0			0-100%									0	430	
1		✓					2			Lu = 0 Po max. = 10.0 kg/cm ²	0.00	1		
2		✓					1					2		
3		✓								Lu = 0 Po max. = 10.0		3		
4		✓										4		
5		✓								Lu = 0 Po max. = 10.0		5		
6		✓									0.00	6		
7		✓								Lu = 0 Po max. = 10.0	0.00	7		
8		✓										8		
9		✓					2	2	1	89.0 m: 45° dip crack. no serpentine.		9		
10		✓					1	5	2	89.4 m: Partly serpentinization less than 1mm wide.		10		
11		✓										11		
12		✓								Lu = 0 Po max. = 10.0	0.00	12		
13		✓										13		
14		✓								Lu = 0 Po max. = 10.0		14		
15		✓										15		
16		✓								Lu = 0 Po max. = 10.0		16		
17		✓										17		
18		✓								Lu = 0 Po max. = 10.0		18		
19		✓										19		
20		✓								Lu = 0 Po max. = 10.0	0.30	20	410	



driller's note 4
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (electromagnetic)

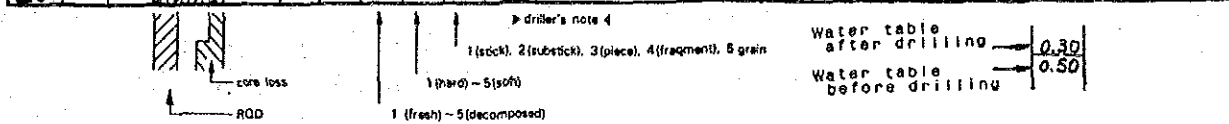
Water table after drilling → 0.30
 Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. SK-2 (SHEET 1 OF 4)

LOCATION DAM DEPTH OF HOLE 70.00 m COMMENCED 2-9-1987
 ELEVATION 510.834 m DEPTH OF OVERBURDEN 17.00 m COMPLETED 17-9-1987
 COORDINATE Δ 452.625.12 LENGTH OF ROCK DRILLING 53.00 m DRILLED BY DSI
 ANGLE FROM HORIZONTAL 90 TOTAL LENGTH OF CORE 58.75 m LOGGED BY JICA
 BEARING OF ANGLE HOLE - CORE RECOVERY 83.9 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	NESS	CORE CUTTING					
0m			0-100%								LUGEON	m	0m	510.834m
1										Alluvium.	1.30		1	
2										They include peridotite			2	
3										and some limestone			3	
4										gravels.			4	
5										No fine material in	1.50		5	
6										core box.	1.50		6	
7										Distribution of lime-			7	
8										stone gravels,	1.30		8	
9										7.5m	1.30		9	
10										14.0m			10	
11										16-17m.	1.30		11	
12													12	
13													13	
14													14	
15													15	
16													16	
17													17	
18										Fractured, but strong	1.30		18	
19										peridotite.	1.30		19	
20													20	



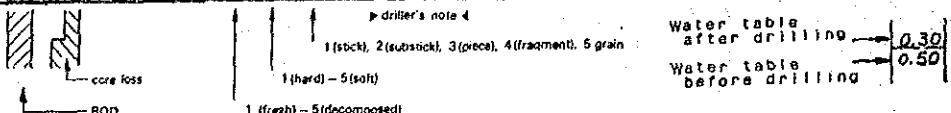
Water table after drilling → 0.30
 Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-2** (SHEET **2** OF **4**)

LOCATION DAM	DEPTH OF HOLE 70.00 m	COMMENCED 2 - 9 - 1987
ELEVATION 510.834 m	DEPTH OF OVERBURDEN 17.00 m	COMPLETED 17 - 9 - 1987
COORDINATE X: 452,695.19 Y: 4,178,859.45	LENGTH OF ROCK DRILLING 53.00 m	DRILLED BY DSI
ANGLE FROM HORIZONTAL 90	TOTAL LENGTH OF CORE 58.75 m	LOGGED BY JICA
BEARING OF ANGLE HOLE -	CORE RECOVERY 83.9 %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT OR CASING	OBSERVATION OF CORE					WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION				
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION						LUGEON			
2			0 → 100%										0m	490.834m				
1	Peridotite	V	100%															
2															2	20.5m: Calcite vein 2mm wide along 25° dip crack.	Lu = (14) Po max. = 8.0	1.30
3															3	21.0 ~ 21.3m: Serpentine 1mm wide along several cracks.	Lu = (34) Po max. = 8.0	1.30
4															2	21.9m: Calcite vein 1mm wide.	Lu = (44) Po max. = 8.0	
5															2	23.0m: Calcite vein 1mm wide.	Lu = (45) Po max. = 8.0	
6															3	26.0 ~ 26.3m: Calcite vein 1mm wide.	Lu = (22) Po max. = 8.0	1.30
7															2	27.6m: 45° dip crack, no serpentine.	Lu = 23 Po max. = 10.0	
8															2	37.5 ~ 37.5m: Serpentine 1mm wide along 45° dip crack.	Lu = 0 Po max. = 10.0	1.30
9															4	38.8 ~ 39.0m: Fragment core, no serpentine.	Lu = 0 Po max. = 10.0	1.30
10																		

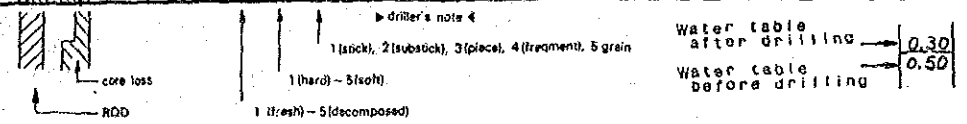


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-2** (SHEET **3** OF **4**)

LOCATION **DAM** DEPTH OF HOLE **70.00** m COMMENCED **2 - 9 - 1987**
 ELEVATION **510.834** m DEPTH OF OVERBURDEN **17.00** m COMPLETED **17 - 9 - 1987**
 COORDINATE \times **452,495.19** LENGTH OF ROCK DRILLING **53.00** m DRILLED BY **DSI**
 \uparrow **4,173,286.65** TOTAL LENGTH OF CORE **58.75** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90** CORE RECOVERY **83.9** %
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
4.0			0-100%							LUGEON	m	0m	470.834	
1	Peridotite	V	100%					3	40.5	Lu = 0	P _{o max} = 10.0	1		
2									41.5m and 44.5m: 45° dip cracks, no filling.					2
3										Lu = 0	P _{o max} = 10.0			
4										Lu = 1.2	P _{o max} = 10.0			
5										P _{o max} = 10.0				
6										Lu = 2.2	P _{o max} = 10.0			
7										P _{o max} = 10.0				
8										Lu = 0	P _{o max} = 10.0			
9										P _{o max} = 10.0				
50														
1														
2														
3														
4														
5														
6														
7														
8														
9														
60													450.834	

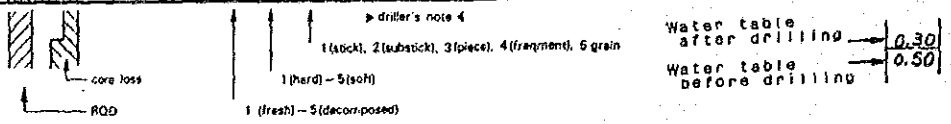


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-2** (SHEET 4 OF 4)

LOCATION **DAM** DEPTH OF HOLE **70.00** m COMMENCED **2-9-1987**
 ELEVATION **510.834** m DEPTH OF OVERBURDEN **17.00** m COMPLETED **17-9-1987**
 COORDINATE **X: 452,695.19** LENGTH OF ROCK DRILLING **53.00** m DRILLED BY **DSI**
Y: 4,178,250.25 TOTAL LENGTH OF CORE **58.75** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90** CORE RECOVERY **83.9** %
 BEARING OF ANGLE HOLE **--**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION					
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	LUGEON			m				
0m			0-100%									0m	450.834m						
1	Peridotite	V	V	φ86 mm	Dark gray	2	2	2	60.8	60.8~63.0m: Serpentine	Lu = 0 Po max. = 10.0	1.30	1	1					
3								61.0	1-2mm wide along many cracks.										
4								2	63.0		Lu = 0 Po max. = 10.0	1.30	2	2					
5								3	64.0										
6								1	66.0	66.0~66.4m: Serpentine	Lu = 0 Po max. = 10.0	1.30	3	3					
7								1	66.4	1mm wide along several cracks.									
8								1			Lu = 0 Po max. = 10.0	1.30	2	2					
9								2		R.Q.D (Av.) = 86%									
0																	1.30	0	440.834

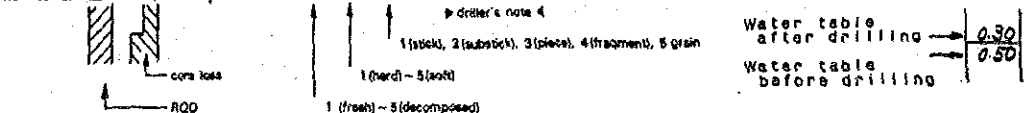


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-3** (SHEET 1 OF 5)

LOCATION **DAM** DEPTH OF HOLE **100.00** m COMMENCED **25 - 8 - 1988**
 ELEVATION **607.609** m DEPTH OF OVERBURDEN **0** m COMPLETED **11 - 9 - 1988**
 COORDINATE **X 452,559.74** LENGTH OF ROCK DRILLING **100.00** m DRILLED BY **DSI**
Y 477,956.03 TOTAL LENGTH OF CORE **100.00** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90** CORE RECOVERY **100.0** %
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	LU				
0m			0-100%									0m	607.609 m
1		✓					3			No surface soil.	Lu = (40)		
2		✓					4	15		0~1.5m: Piece-fragment cores.	Po max. = 3.0 kg/cm ²		
3		✓					2	2		1.9m: Oxidization crack,	Lu = (41)		
4		✓				2	3	3.0		80° dip.	Po max. = 3.0		
5		✓				2	3	3.2		2.1m: Oxidization crack,			
6		✓				2	3	3.5		70° dip.			
7		✓				3	3	3.9		3.5~3.9m: Serpentine	Lu > 100		
8		✓				3	3	4.7		2~3mm wide along several cracks (65° dip).	Po max. = 3.0	5.00	
9		✓				3	3	5.0		4.7m and 5.0m: Serpentine	Lu = (33)	5.50	
10		✓				3	3	6.8		2~3mm wide along 65° dip cracks.	Po max. = 5.0		
11		✓				3	3	7.0		5.3m: Serpentine 2mm wide along 20° dip crack.	Lu = (6)		
12		✓				3	3	7.5		6.1m: Serpentine 2mm wide along 70° dip crack.	Po max. = 5.0	7.00	
13		✓				3	3	7.7		7.5~7.7m: Fragment cores, oxidization.	Lu = 5.1	7.50	
14		✓				3	3	8.8		12.0~14.8m: Serpentine 1~2mm wide along vertical crack.	Po max. = 10.0		
15		✓				3	3	14.0		14.0~14.2m: Piece cores, no serpentine.	Lu = 24.0	9.00	
16		✓				3	3	14.2		15.8m: Serpentine 1~2mm wide along 45° dip crack.	Po max. = 10.0	12.20	
17		✓				3	3	14.2			Lu = 5.5		
18		✓				3	3	14.2			Po max. = 10.0		
19		✓				3	3	14.2			Lu = 6.0		
20		✓				3	3	14.2			Po max. = 10.0	13.55	
21		✓				3	3	14.2			Lu = 5.0	17.00	
22		✓				3	3	14.2			Po max. = 10.0		
23		✓				3	3	14.2				15.00	587.609

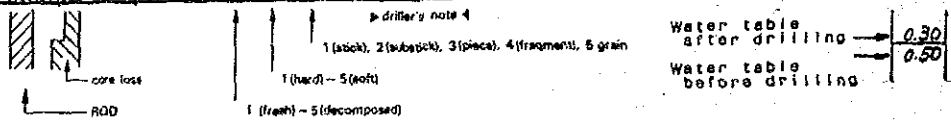


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **SK-3** (SHEET **2** OF **5**)

LOCATION **DAM** DEPTH OF HOLE **100.00** m COMMENCED **25 - 8 - 1988**
 ELEVATION **607.609** m DEPTH OF OVERBURDEN **0** m COMPLETED **11 - 9 - 1988**
 COORDINATE X: **452,559.74** LENGTH OF ROCK DRILLING **100.00** m DRILLED BY **DSI**
 Y: **177,956.03** TOTAL LENGTH OF CORE **100.00** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90** CORE RECOVERY **100.0** %
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	DEPTH		
0			0 → 100%								LUGEON	m	0	607.609
1		✓							1	22.0 ~ 22.7 m: Piece cores.	Lu = 5.5		1	
2		✓							2	Weak serpentinization.	Po max. = 10.0 kg/cm ²		2	
3		✓							3		Lu = 2.9		3	
4		✓							2	25.0 m: Weathered calcite vein less than 1mm wide (60° dip).	Po max. = 10.0	15.20	4	
5		✓									Lu = 0	21.16	5	
6		✓									Po max. = 10.0		6	
7		✓							2		Lu = 0		7	
8		✓									Po max. = 10.0	15.00	8	
9		✓									Lu = 0	15.00	9	
10	Peridotite	✓		φ 86 mm					2	29.8 ~ 30.6 m: Serpentine less than 1mm wide along several cracks.	Po max. = 10.0		10	
11		✓							1		Lu = 3.4		11	
12		✓							1	33.5 m: Calcite vein 5mm wide (30° dip)	Po max. = 10.0	22.45	12	
13		✓							2		Lu = 2.9	16.70	13	
14		✓								← 33.6 ~ 34.0 m core: Laboratory test.	Po max. = 10.0		14	
15		✓									Lu = 5.2		15	
16		✓									Po max. = 10.0	32.65	16	
17		✓									Lu = 6.2	28.95	17	
18		✓									Po max. = 10.0		18	
19		✓							3	39.0 ~ 40.0 m: Piece cores. no serpentine.	Lu = 7.4		19	
20		✓							3		Po max. = 10.0	16.70	20	607.609

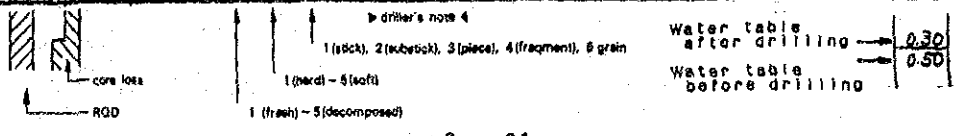


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT **HOLE No. SK-3 (SHEET 3 of 5)**

LOCATION DAM DEPTH OF HOLE 100.00 m COMMENCED 25 - 8 - 1988
 ELEVATION 607.609 m DEPTH OF OVERBURDEN 0 m COMPLETED 11 - 9 - 1988
 COORDINATE X 452,559.74 LENGTH OF ROCK DRILLING 100.00 m DRILLED BY DSI
 Y 117,356.03 TOTAL LENGTH OF CORE 100.00 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90 CORE RECOVERY 100.0 %
 BEARING OF ANGLE HOLE -

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	LUGEON			m
4.0m			0 → 100%									39.60	0m	567.609	
1		✓								40.0m: Serpentine 1mm wide along 45° dip crack.	Lu=0 Po max. = 10.0 kg/cm ²				
2															
3		✓						1			Lu=0 Po max. = 10.0				
4								1				25.98			
5		✓						2			Lu=0 Po max. = 10.0	25.98			
6										Serpentinization is weak. Scattered serpentine less than 1mm wide.					
7		✓									Lu=0 Po max. = 10.0				
8												27.50			
9		✓									Lu=0 Po max. = 10.0	41.36			
50	Peridotite	✓		φ86 mm				2	49.5						
1		✓						2	51.0						
2															
3		✓										31.70			
4												31.70			
5		✓						1							
6															
7		✓						1		Continued stick ~ substick cores.	Lu=0 Po max. = 10.0				
8								2							
9		✓										28.90			
												41.60			
7		✓									Lu=0 Po max. = 10.0	57.15			
8															
9		✓									Lu=0 Po max. = 10.0				
60									60.0				31.55	0	567.609

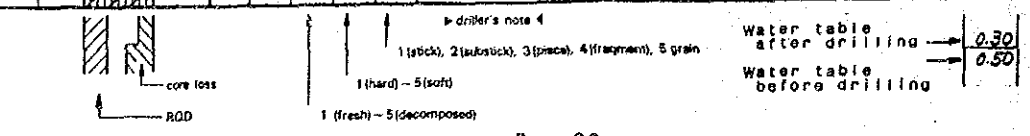


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT **HOLE No. SK-3 (SHEET 4 of 5)**

LOCATION DAM DEPTH OF HOLE 100.00 m COMMENCED 25 - 8 - 1988
 ELEVATION 607.609 m DEPTH OF OVERBURDEN 0 m COMPLETED 11 - 9 - 1988
 COORDINATE X 452,559.74 LENGTH OF ROCK DRILLING 100.00 m DRILLED BY DSI
Y 4177,936.03 TOTAL LENGTH OF CORE 100.00 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90 CORE RECOVERY 100.0 %
 BEARING OF ANGLE HOLE -

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER TABLE	WATER PRESSURE TEST		
0m			0 → 100%							LUGEON	m	0m	527.609
1		✓						60.0		Lu = 0 P _{o max} = 10.0 kg/cm ²	37.55	1	
2							2					2	
3		✓								Lu = 0 P _{o max} = 10.0		3	
4											27.70 38.90	4	
5		✓						65.5	65.5 ~ 65.7 m: Piece ~	Lu = 0 P _{o max} = 10.0		5	
6		✓					2	65.7	fragment cores, weak serpentinization.	Lu = 0 P _{o max} = 10.0		6	
7		✓										7	
8								67.5		Lu = 0 P _{o max} = 10.0	27.10 27.10	8	
9		✓					1			Lu = 0 P _{o max} = 10.0		9	
10		✓					1					0	
11		✓					2			Lu = 0 P _{o max} = 10.0		1	
12								72.0	73.0 m and 73.2 m: Serpentine 1mm wide along 50° dip cracks.	Lu = 0 P _{o max} = 10.0	32.10 46.70	2	
13		✓					2					3	
14												4	
15		✓						75.0	74.5 m: Serpentine 1- 2mm wide along 50° dip crack.	Lu = 0 P _{o max} = 10.0		5	
16											34.90 34.90	6	
17		✓					1			Lu = 0 P _{o max} = 10.0		6	
18							1					7	
19		✓					2					8	
20								79.0		Lu = 0 P _{o max} = 10.0		9	
21							2				34.95	0	527.609



Water table after drilling → 0.30
 Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-3 (SHEET 5 OF 5)

LOCATION	DAM	DEPTH OF HOLE	100.00 m	COMMENCED	25 - 8 - 1988
ELEVATION	607.609 m	DEPTH OF OVERBURDEN	0 m	COMPLETED	11 - 9 - 1988
COORDINATE	X: 452,539.74 Y: 177,956.03	LENGTH OF ROCK DRILLING	100.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	100.00 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	100.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				DESCRIPTION
80m			0 → 100%						LUGEON	m	Om	527.609 ^m
1		✓							Lu = 0 Po max = 10.0	43.05	1	
2		✓							Lu = 0 Po max = 10.0		2	
3		✓							Lu = 0 Po max = 10.0		3	
4		✓							Lu = 0 Po max = 10.0	45.80 45.80	4	
5		✓							Lu = 0 Po max = 10.0		5	
6		✓							Lu = 0 Po max = 10.0		6	
7		✓							Lu = 0 Po max = 10.0		7	
8		✓					2		Lu = 0 Po max = 10.0	30.00 53.00	8	
9		✓							Lu = 0 Po max = 10.0		9	
90	Peridotite	✓							Lu = 0 Po max = 10.0		0	
									Lu = 0 Po max = 10.0		1	
		✓							Lu = 0 Po max = 10.0	44.70 49.70	2	
		✓							Lu = 0 Po max = 10.0		3	
		✓							Lu = 0 Po max = 10.0		4	
		✓							Lu = 0 Po max = 10.0		5	
		✓							Lu = 0 Po max = 10.0	47.80 52.70	6	
		✓							Lu = 0 Po max = 10.0		7	
		✓							Lu = 0 Po max = 10.0		8	
		✓							Lu = 0 Po max = 10.0		9	
100		✓							Lu = 0 Po max = 10.0	55.60	0	507.609

1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)
 1 (rock), 2 (subrock), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-4 (SHEET 1 OF 4)

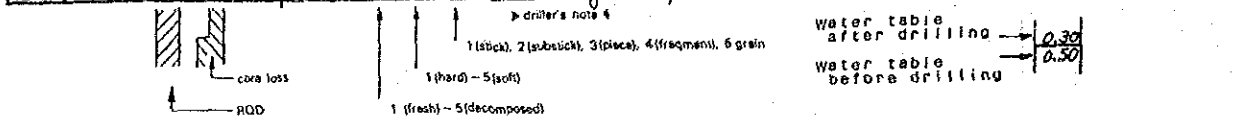
LOCATION	DAM	DEPTH OF HOLE	80.00 m	COMMENCED	10-8-1988
ELEVATION	607.222 m	DEPTH OF OVERBURDEN	0 m	COMPLETED	24-8-1988
COORDINATE	X: 452,560.15 Y: 4177,955.30	LENGTH OF ROCK DRILLING	80.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	45°	TOTAL LENGTH OF CORE	80.00 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S25°E	CORE RECOVERY	100.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0 → 100%							LUGEON	m	0m	607.222 m
1		✓					2		No surface soil.	Lu = (98)			
1.5							3	1.5	Oxidization crack is few	Po max. = 3.0 kg/cm ²	1.50		
2							2	2.0			1.50		
2.6							3	2.6	2.6m: Serpentine 1mm wide along 30° dip crack.	Lu > 100			
3		✓								Po max. = 3.0			
4		✓					2		(to drilling direction)				
5		✓								Lu = (28)			
5.8							3-4	5.8	5.8~6.1m: Piece-fragment cores, weak serpentinization.	Po max. = 5.0	6.00		
6							4	6.1			6.00		
7		✓					1			Lu = 0			
8		✓					2		8.2m: Serpentine 1~5mm wide along 30° dip crack.	Po max. = 5.0	2.05		
9		✓					1		9.3m: Serpentine 1mm wide along 30° dip crack.		2.05		
10		✓					2			Lu = 0			
11		✓					2			Po max. = 10.0			
12		✓									2.00		
13		✓								Po max. = 10.0	1.30		
14							3	14.0	14.0~15.0m: Piece cores, weak serpentinization.	Lu = 0			
15		✓					3	15.0		Po max. = 10.0			
16		✓					1		16.0~16.3m core: Laboratory test.	Lu = 6.2	2.70		
17		✓					5			Po max. = 10.0	16.00		
18		✓					2		16.5m: Serpentine 2mm wide along 45° dip crack.				
19		✓					2	18.0	17.1m: Serpentine and calcite vein 2mm wide along 60° dip crack.	Lu = 3.9			
20		✓					2	20.0		Po max. = 10.0	3.00		593.080

peridotite

φ86 mm

dark gray



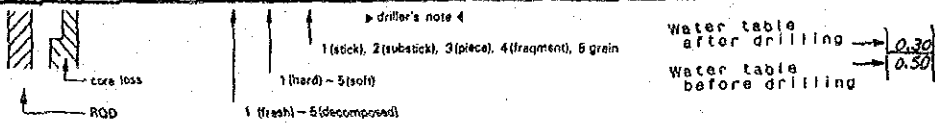
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-4 (SHEET 2 of 4)

LOCATION DAM	DEPTH OF HOLE 80.00 m	COMMENCED 10-8-1988
ELEVATION 607.222 m	DEPTH OF OVERBURDEN 0 m	COMPLETED 24-8-1988
COORDINATE X 492560.15 Y 4177355.30	LENGTH OF ROCK DRILLING 80.00 m	DRILLED BY DSI
ANGLE FROM HORIZONTAL 45°	TOTAL LENGTH OF CORE 80.00 m	LOGGED BY JICA
BEARING OF ANGLE HOLE S25°E	CORE RECOVERY 100.0 %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				DESCRIPTION
2.0m			0-100%						LUGEON	m	593.080	
1	Ferri-dobite	<	<	φ86 mm	Dark gray	2	2	1	19.8m: Serpentine 1-5 mm wide along 30° dip crack.	Lu=2.9	3.00	1
2								22.0-22.5m: Weak serpentinization.	P _{o max} = 10.0 kg/cm ²			
3								2	22.5	Lu=3.8	10.60	2
4								1	5	P _{o max} = 10.0		
5								2	Lu=0.4	13.00	3	
6								3	25.5-26.0m: Piece cores, 80° dip crack with thin serpentine.			P _{o max} = 10.0
7								1	Lu=3.0	17.00	4	
8								2	26.8m: Serpentine 1mm wide			P _{o max} = 10.0
9								2	Lu=0	17.00	5	
0								1	30.6m: Serpentine 1-5 mm wide along 20° dip crack			P _{o max} = 10.0
1	1	Lu=1.3	13.76	6								
2	2	37.3m, 37.4m and 37.7m: Serpentine 1mm wide along 55° dip cracks.			P _{o max} = 10.0							
3	2	Lu=0.4	29.10	7								
4	1	Lu=3.0			P _{o max} = 10.0							
5	2	Lu=3.0	18.70	8								
6	1	37.3m, 37.4m and 37.7m: Serpentine 1mm wide along 55° dip cracks.			P _{o max} = 10.0							
7	2	Lu=4.8	18.70	9								
8	1	Lu=1.2			P _{o max} = 10.0							
9	2	Lu=1.2	17.15	0								
0	1	37.3m, 37.4m and 37.7m: Serpentine 1mm wide along 55° dip cracks.			P _{o max} = 10.0							



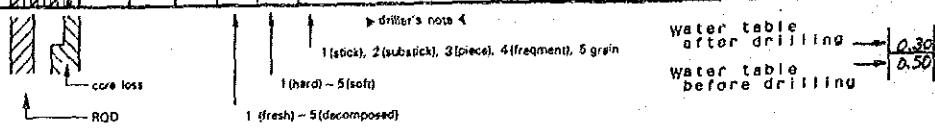
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. **SK-4** (SHEET **3** OF **4**)

LOCATION	DAM	DEPTH OF HOLE	80.00 m	COMMENCED	10-8-1988
ELEVATION	607.222 m	DEPTH OF OVERBURDEN	0 m	COMPLETED	24-8-1988
COORDINATE	X 452.560.15 Y 4.177.959.30	LENGTH OF ROCK DRILLING	80.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	45°	TOTAL LENGTH OF CORE	80.00 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S25°E	CORE RECOVERY	100.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				
4.0m			0 → 100%							LUGEON	m	578.738 ^m
1		✓					1	42.1m : Serpentine 1mm wide along 30° dip crack.	Lu = 1.6 P _{o max.} = 10.0 kg/cm ²	28.50	1	
2		✓					1				2	
3		✓					2		Lu = 15.0 P _{o max.} = 10.0		3	
4		✓								18.20	4	
5		✓						44.5°	Lu = 4.0 P _{o max.} = 10.0	18.20	5	
6		✓									6	
7		✓						47.5m : Calcite vein 1mm wide, 60° dip.	Lu = 6.3 P _{o max.} = 10.0	21.70	7	
8		✓					2			44.30	8	
9		✓						48.8m : Serpentine 1mm wide along 30° dip and 45° dip cracks.	Lu = 0.4 P _{o max.} = 10.0	49.80	9	
50	Peridotite	✓					2				0	
1		✓						50.4m : Serpentine 1mm wide.	Lu = 0 P _{o max.} = 10.0		1	
2		✓						51.7~52.0m core : Laboratory test.	Lu = 0 P _{o max.} = 10.0	22.10	2	
3		✓									3	
4		✓					3	53.5 53.5~54.3m : Piece cores thin meshy serpentine.	P _{o max.} = 10.0		4	
5		✓					2		Lu = 0 P _{o max.} = 10.0		5	
6		✓					3			16.90	6	
7		✓					2	56.0m : Calcite vein 2 cm wide and Serpentine 5mm wide along 35° dip crack.	Lu = 0 P _{o max.} = 10.0	48.40	7	
8		✓					1				8	
9		✓					3	57.2m : Serpentine 1mm wide along 20° dip crack.	Lu = 0 P _{o max.} = 10.0		9	
60		✓					2			17.15	0	564.796



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. **SK-4** (SHEET 4 OF 4)

LOCATION DAM	DEPTH OF HOLE 80.00 m	COMMENCED 10-8-1988
ELEVATION 607.222 m	DEPTH OF OVERBURDEN 0 m	COMPLETED 24-8-1988
COORDINATE X 452560.15 Y 4177355.30	LENGTH OF ROCK DRILLING 80.00 m	DRILLED BY DSI
ANGLE FROM HORIZONTAL 45	TOTAL LENGTH OF CORE 80.00 m	LOGGED BY JICA
BEARING OF ANGLE HOLE S25°E	CORE RECOVERY 100.0 %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION
				CEMENTATION KIND OF BIT CASING	COLOR WEATHERING HARDNESS CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	LUGEON	m		
0m			0-100%								0m	566.786
1	Peridotite	V	100%	φ86 mm	Dark gray	2	2	62.0 62.3	Lu = 0 Pomax = 10.0	17.15	1	
2												
3												
4												
5												
6												
7												
8												
9												
70												
71												
72												
73												
74												
75												
76												
77												
78												
79												
80												

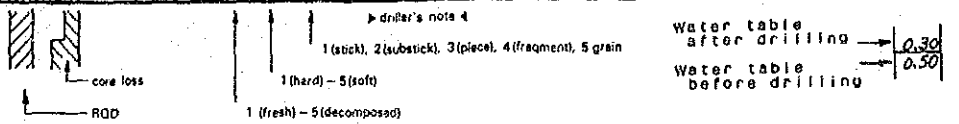
67.2~67.5 m: Thin meshy serpentine.

75.5~76.0 m core: Laboratory test.

77.3~77.8 m: 90° dip crack.

R.Q.D (Av.) = 86%

End of drill hole



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT		HOLE No. SK-5 (SHEET 1 of 5)	
LOCATION	DAM	DEPTH OF HOLE	100.00 m
ELEVATION	517.561 m	DEPTH OF OVERBURDEN	39.00 m
COORDINATE	N. 452,534.29 E. 4,178,057.82	LENGTH OF ROCK DRILLING	61.00 m
ANGLE FROM HORIZONTAL	55°	TOTAL LENGTH OF CORE	69.97 m
BEARING OF ANGLE HOLE	S40° E	CORE RECOVERY	69.97 %
		COMMENCED	14 - 7 - 1988
		COMPLETED	6 - 9 - 1988
		DRILLED BY	DSI
		LOGGED BY	JICA

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				
0m			0 → 100%							LUGEON	0m	517.561 m
1											1	
2											2	
3											3	
4											4	
5											5	
6											6	
7											7	
8											8	
9											9	
10											10	
11											11	
12											12	
13											13	
14											14	
15											15	
16											16	
17											17	
18											18	
19											19	
20											20	

Alluvium

φ 90 mm

Dark gray ~ firebrick gray

φ 86 mm

Alluvium.
They include peridotite
and some limestone
gravels.

No fine material in
core box.

0 ~ 26 m : All peridotite
gravels.

8.10M

3.00
3.00

6.00
6.00

7.50
7.50

7.60
7.60

7.60
7.60

7.40
7.80

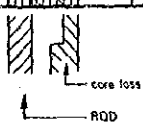
7.20
6.70
6.70

6.70
6.70
6.70

6.70
6.70

6.70
6.70

7.30
7.30



driller's note 4
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) - 5 (soft)
1 (fresh) - 5 (decomposed)

Water table after drilling → 0.30
Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-5 (SHEET 2 OF 5)

LOCATION DAM	DEPTH OF HOLE 100.00 m	COMMENCED 14 - 7 - 1988
ELEVATION 517.561 m	DEPTH OF OVERBURDEN 39.00 m	COMPLETED 6 - 9 - 1988
COORDINATE X 452,534.29 Y 4,178,057.82	LENGTH OF ROCK DRILLING 61.00 m	DRILLED BY DSI
ANGLE FROM HORIZONTAL 55°	TOTAL LENGTH OF CORE 69.97 m	LOGGED BY JICA
BEARING OF ANGLE HOLE S 40° E	CORE RECOVERY 69.97 %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
2.0m			0 → 100%									0m	517.561
1		○										7.30	
2		○										7.30	
3		○										7.30	
4		○										7.30	
5		○										7.30	
6		○										7.30	
7		○										7.30	
8		○										7.30	
9		○										7.30	
10		○										7.30	
11		○										7.30	
12		○										7.30	
13		○										7.30	
14		○										7.30	
15		○										7.30	
16		○										7.30	
17		○										7.30	
18		○										7.30	
19		○										7.30	
20		○										7.30	
21		○										7.30	
22		○										7.30	
23		○										7.30	
24		○										7.30	
25		○										7.30	
26		○										7.30	
27		○										7.30	
28		○										7.30	
29		○										7.30	
30		○										7.30	
31		○										7.30	
32		○										7.30	
33		○										7.30	
34		○										7.30	
35		○										7.30	
36		○										7.30	
37		○										7.30	
38		○										7.30	
39		○										7.30	
40	Peridotite	▽			Dark gray	2	2	3	4	Peridotite.	Lu = 22.0 P _{max} = 10.0 kg/cm ²	9	485.614

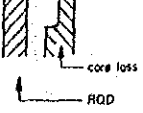
Alluvium

Dark gray ~ greenish gray

26.0-27.5m: Included red shale gravels.

29.0-30.5m: Included limestone gravels.

38-39m: Included limestone gravels.



driller's note 4
1 (rock), 2 (subrock), 3 (piece), 4 (fragment), 5 grain
1 (hard) - 5 (soft)
1 (fresh) - 5 (decomposed)

Water table after drilling → 0.30
Water table before drilling → 0.50

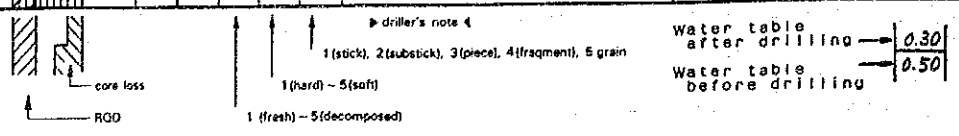
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-5 (SHEET 3 OF 5)

LOCATION	DAM	DEPTH OF HOLE	100.00 m	COMMENCED	14 - 7 - 1988
ELEVATION	517.561 m	DEPTH OF OVERBURDEN	39.00 m	COMPLETED	6 - 9 - 1988
COORDINATE	X: 452,534.29 Y: 4,178,057.82	LENGTH OF ROCK DRILLING	61.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	55	TOTAL LENGTH OF CORE	69.97 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S 40° E	CORE RECOVERY	69.97 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
4.0m			0 → 100%							LUGEON	m	0m	484.795 ^m
1		✓					3		39.0~42.0m: Piece ~ fragment cores.	Lu = 0 Pomax. = 10.0 kg/cm ²		1	
2		✓					4	420	41.5m, 42.0m and 42.2m calcite vein 1mm wide.		7.30 7.30	2	
3		✓					3		42.1m: Serpentine 1mm wide.	Lu = 0 Pomax. = 10.0		3	
4		✓					2	440				4	
5		✓					2	455		Lu = 0 Pomax. = 10.0		5	
6		✓					3				7.30 8.15	6	
7		✓					3			Lu = 0 Pomax. = 10.0		7	
8		✓					2					8	
9		✓					2	485	48.8m: Serpentine 3mm wide.	Lu = 0 Pomax. = 10.0		9	
50	Peridotite	✓		457 mm		2	2		50.5m: Serpentine lens, diameter 1cm.	Lu = 0 Pomax. = 10.0		0	
1		✓					2					1	
2		✓					2	515		Lu = 0 Pomax. = 10.0		2	
3		✓					3				8.15 8.15	3	
4		✓					3			Lu = 0 Pomax. = 10.0		4	
5		✓					4	543	54.3~54.5m and 54.8~54.8			5	
6		✓					3	545	55.2m: Fragment cores.	Lu = 19.0 Pomax. = 10.0		6	
7		✓					4	548	weak serpentinization.			7	
8		✓					2	55.2			8.15 8.00	8	
9		✓					1			Lu = 16.1 Pomax. = 10.0		9	
60		✓					3			Lu = 4.8 Pomax. = 10.0	8.00 8.15	0	468.412



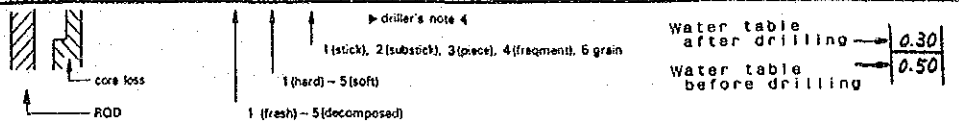
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-5 (SHEET 4 OF 5)

LOCATION	DAM	DEPTH OF HOLE	100.00 m	COMMENCED	14 - 7 - 1988
ELEVATION	517561 m	DEPTH OF OVERBURDEN	39.00 m	COMPLETED	6 - 9 - 1988
COORDINATE	$\begin{matrix} N. 452,534.27 \\ E. 4178,057.82 \end{matrix}$	LENGTH OF ROCK DRILLING	61.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	55°	TOTAL LENGTH OF CORE	69.97 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S 40° E	CORE RECOVERY	69.97 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION OF KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
6.0m			0 → 100%									0m	468.412m
1		✓						2	← 61.2~61.4 m core : Laboratory test.	Lu = 0 P _{o max.} = 10.0 kg/cm ²		1	
2		✓						3			9.00 8.00	2	
3		✓						3		Lu = 0 P _{o max.} = 10.0		3	
4		✓						3	64.2 64.2~66.0m : Poor core recovery.	Lu = 0 P _{o max.} = 10.0		4	
5		✓						4	Piece cores.			5	
6		✓						3	66.0 66.4m : Serpentine 1mm wide.	Lu = 0 P _{o max.} = 10.0	8.15 8.15	6	
7		✓						4	66.8m : Weak serpen- tization 2~3cm wide.			7	
8		✓						2		Lu = 0 P _{o max.} = 10.0	8.00 8.20	8	
9		✓						1		Lu = 0 P _{o max.} = 10.0		9	
10	Peridotite	✓						2		Lu = 0 P _{o max.} = 10.0		0	
11		✓						3		Lu = 0 P _{o max.} = 10.0		1	
12		✓						3		Lu = 0 P _{o max.} = 10.0		2	
13		✓						3		Lu = 0 P _{o max.} = 10.0	8.00 8.15	3	
14		✓						1	76.0 76.0~76.4 m core : Laboratory test.	Lu = 0 P _{o max.} = 10.0		4	
15		✓						1				5	
16		✓						2				6	
17		✓						2		Lu = 0 P _{o max.} = 10.0		7	
18		✓						3			7.90 8.10	8	
19		✓						3		Lu = 0 P _{o max.} = 10.0		9	
80												0	452.029

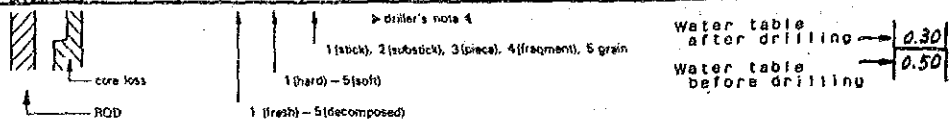


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT **HOLE No. SK-5 (SHEET 5 OF 5)**

LOCATION	DAM	DEPTH OF HOLE	100.00 m	COMMENCED	14 - 7 - 1988
ELEVATION	517.561 m	DEPTH OF OVERBURDEN	39.00 m	COMPLETED	6 - 9 - 1988
COORDINATE	452,534.29 1,4178,057.82	LENGTH OF ROCK DRILLING	61.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	55°	TOTAL LENGTH OF CORE	69.97 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S 40° E	CORE RECOVERY	69.97 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	OBSERVATION OF CORE DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
										WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0 → 100%							LUGEON	m	0m	452.029
1		✓					2			Lu = 0 P _{o max.} = 10.0 kg/cm ²		1	
2		✓					3				8.00	2	
3		✓					3		84.0m: Slickenside 60° dip.	Lu = 0 P _{o max.} = 10.0	8.05	3	
4		✓					3-4		84.4-84.7m: Piece- fragment cores, thin serpentine.	Lu = 0 P _{o max.} = 10.0		4	
5		✓					1					5	
6		✓					1				8.00	6	
7		✓					2			Lu = 0 P _{o max.} = 10.0	8.00	7	
8		✓					3		89.0-89.5m: Piece cores no serpentine.	Lu = 0 P _{o max.} = 10.0		8	
9		✓					3				8.15	9	
10		✓					2				8.15	10	
11	Peridotite	✓					1			Lu = 0 P _{o max.} = 10.0		11	
12		✓					1					12	
13		✓					1			Lu = 0 P _{o max.} = 10.0		13	
14		✓					2				8.10	14	
15		✓					2			Lu = 0 P _{o max.} = 10.0	8.10	15	
16		✓					1		95.6-96.0m core: Laboratory test.	Lu = 0 P _{o max.} = 10.0		16	
17		✓					1					17	
18		✓					2		98.0-100.0m: Weak ser- pentinization.	Lu = 0 P _{o max.} = 10.0	8.00	18	
19		✓					5				8.15	19	
20		✓					3		R & D (Av.) = 53%	Lu = 0 P _{o max.} = 10.0		20	
100									100.0 End of drill hole		8.10	100	435.646



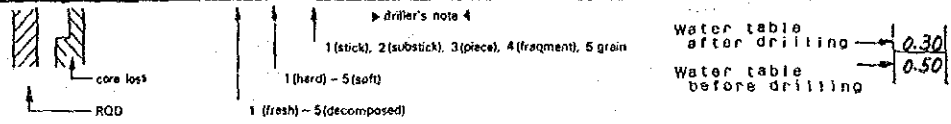
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. **SK-6** (SHEET 1 of 5)

LOCATION DAM	DEPTH OF HOLE 90.00m	COMMENCED 11-8-1988	
ELEVATION 542.365 m	DEPTH OF OVERBURDEN 2.00m	COMPLETED 1-9-1988	
COORDINATE X 452.510.97 Y 4178.997.07	LENGTH OF ROCK DRILLING 88.00m	DRILLED BY DSI	
ANGLE FROM HORIZONTAL 90°	TOTAL LENGTH OF CORE 89.23m	LOGGED BY JICA	
BEARING OF ANGLE HOLE -	CORE RECOVERY 99.1%		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0 → 100%							LUGEON	m	0m	542.365m
0-1.5	Alluvium	○				Brown			0-1.5m: Sand and gravels			1	
1.5-2.0						Dark gray			1.5-2.0m: Peridotite gravels.			2	540.365
2.0-9.5	Peridotite	∇							Peridotite. 2.0-9.5m: Many oxidation cracks.	Lu = (70) P _{max} = 3.0 1kg/cm ²	2.00 2.00	3	
9.5-10.2									5.2m: Weathered serpentine 1mm wide.	Lu > 100 P _{max} = 3.0	2.00 2.00	5	
10.2-11.8	Peridotite	∇				Dark gray			10.2m: Serpentine 1-5 mm wide along horizontal crack.	Lu = (40) P _{max} = 5.0	5.85 6.50	7	
11.8-12.0									11.8m: Weathered serpentine 1mm wide along 60° dip crack.	Lu = (63) P _{max} = 5.0	8.10 8.20	10	
12.0-14.0										Lu = 4.6 P _{max} = 10.0		1	
14.0-16.9										Lu = 13.7 P _{max} = 10.0	10.80 12.00	3	
16.9-18.5										14.50m Lu = 5.1 P _{max} = 10.0		5	
18.5-20.0										Lu = 8.6 P _{max} = 10.0	13.70 13.90	7	
20.0										Lu = 0 P _{max} = 10.0		9	522.365



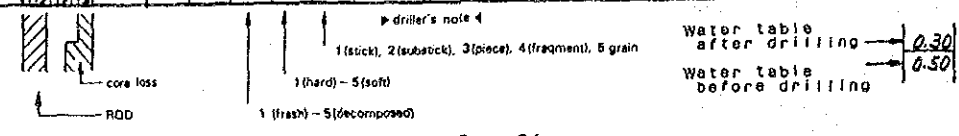
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-6 (SHEET 2 of 5)

LOCATION	DAM	DEPTH OF HOLE	90.00m	COMMENCED	11 - 8 - 1988
ELEVATION	542.365 m	DEPTH OF OVERBURDEN	2.00m	COMPLETED	1 - 9 - 1988
COORDINATE	X: 452,510.97 Y: 4,178,922.07	LENGTH OF ROCK DRILLING	88.00m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	89.23m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	99.1 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION			
2.0m			0 → 100%							LUGEON	m	542.365m
1	Peridotite	V	100%		Dark gray	2	2	1	29.9~30.3m: Fragment cores, meshy serpentine 1~5mm wide (60° dip).	Lu = 0	15.50	542.365m
2										Pomax. = 10.0	18.50	
3										Lu = 0		
4										Pomax. = 10.0		
5										Lu = 0		
6										Pomax. = 10.0	18.00	
7										Lu = 0	18.00	
8										Pomax. = 10.0		
9										Lu = 0		
10										Pomax. = 10.0	13.40	
1	Peridotite	V	100%		Dark gray	2	3	30.3~31.8m: Piece fragment cores, meshy serpentine 1mm wide (70°~90° dip).	Lu = 0	21.30	542.365m	
2									Pomax. = 10.0			
3									Lu = 0			
4									Pomax. = 10.0			
5									Lu = 0			
6									Pomax. = 10.0	13.45		
7									Lu = 0	16.00		
8									Pomax. = 10.0			
9									Lu = 0			
10									Pomax. = 10.0			
1	Peridotite	V	100%		Dark gray	2	1	35.8~36.5m core: Laboratory test.	Lu = 0		542.365m	
2									Pomax. = 10.0			
3									Lu = 0			
4									Pomax. = 10.0			
5									Lu = 0			
6									Pomax. = 10.0			
7									Lu = 0			
8									Pomax. = 10.0	14.70		
9									Lu = 0	17.30		
10									Pomax. = 10.0			



Water table after drilling → 0.30
 Water table before drilling → 0.50

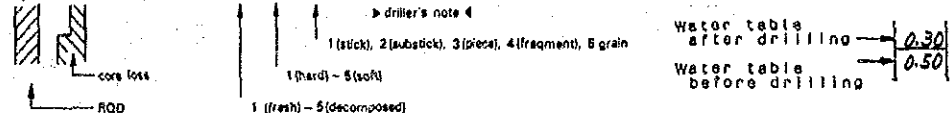
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-6 (SHEET 3 OF 5)

LOCATION DAM	DEPTH OF HOLE 90.00m	COMMENCED 11 - 8 - 1988
ELEVATION 542.365 m	DEPTH OF OVERBURDEN 2.00m	COMPLETED 1 - 9 - 1988
COORDINATE X: 452.510.97 Y: 4178.697.07	LENGTH OF ROCK DRILLING 88.00m	DRILLED BY DSI
ANGLE FROM HORIZONTAL 90°	TOTAL LENGTH OF CORE 89.23 m	LOGGED BY JICA
BEARING OF ANGLE HOLE -	CORE RECOVERY 99.1 %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION						
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER								
4.0m			0 → 100%																
1	Peridotite	<	<	<	<	<	<	<	<	<	<	<	<	<					
2															40.7m: Serpentine 1mm wide along 70° dip crack.	Lu = 0 P _{max.} = 10.0 kg/cm ²	14.50 16.70	1	542.365
3																Lu = 0 P _{max.} = 10.0		2	
4																Lu = 0 P _{max.} = 10.0		3	
5																Lu = 0 P _{max.} = 10.0		4	
6																Lu = 0 P _{max.} = 10.0		5	
7																Lu = 0 P _{max.} = 10.0		6	
8																Lu = 0 P _{max.} = 10.0		7	
9																Lu = 0 P _{max.} = 10.0		8	
50																		9	
1	Dark gray	<	<	<	<	<	<	<	<	<	<	<	<	<					
2															47.9m: Calcite vein less than 1mm wide.	Lu = 0 P _{max.} = 10.0	14.50 14.50	0	
3																Lu = 0 P _{max.} = 10.0	14.50 21.30	1	
4																Lu = 0 P _{max.} = 10.0	14.50 21.30	2	
5																Lu = 0 P _{max.} = 10.0		3	
6																Lu = 0 P _{max.} = 10.0		4	
7																Lu = 0 P _{max.} = 10.0		5	
8																Lu = 0 P _{max.} = 10.0		6	
9																Lu = 0 P _{max.} = 10.0		7	
60																		8	
1				9															
2				0	482.365														



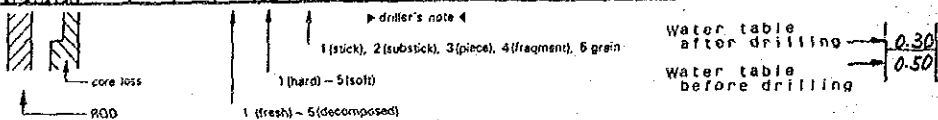
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-6 (SHEET 4 OF 5)

LOCATION	DAM	DEPTH OF HOLE	90.00m	COMMENCED	11 - 8 - 1988
ELEVATION	542.365 m	DEPTH OF OVERBURDEN	2.00m	COMPLETED	1 - 9 - 1988
COORDINATE	X. 452,510.97 Y. 4,178,077.07	LENGTH OF ROCK DRILLING	88.00m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	89.23m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	99.1%		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
6.0m			0 → 100%									0m	442.365m
1		✓								Lu = 0 P _{max.} = 10.0 kg/cm ²	27.00	1	
2		✓								Lu = 0 P _{max.} = 10.0		2	
3		✓								Lu = 0 P _{max.} = 10.0		3	
4		✓								Lu = 0 P _{max.} = 10.0		4	
5		✓								Lu = 0 P _{max.} = 10.0		5	
6		✓								Lu = 0 P _{max.} = 10.0	14.00	6	
7		✓								Lu = 0 P _{max.} = 10.0	14.00	7	
8		✓								Lu = 0 P _{max.} = 10.0		8	
9		✓								Lu = 0 P _{max.} = 10.0		9	
70	Peridotite	✓		φ 76 mm	Dark gray				67.1m : Calcite vein and serpentine less than 1mm wide (50° dip).	Lu = 0 P _{max.} = 10.0		0	
1		✓								Lu = 0 P _{max.} = 10.0		1	
2		✓								Lu = 0 P _{max.} = 10.0	14.20	2	
3		✓								Lu = 0 P _{max.} = 10.0	20.00	3	
4		✓								Lu = 0 P _{max.} = 10.0		4	
5		✓								Lu = 0 P _{max.} = 10.0		5	
6		✓								Lu = 0 P _{max.} = 10.0		6	
7		✓								Lu = 0 P _{max.} = 10.0		7	
8		✓								Lu = 0 P _{max.} = 10.0	14.00	8	
9		✓								Lu = 0 P _{max.} = 10.0	14.50	9	
80												0	442.365



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

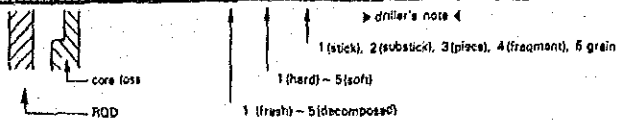
HOLE No. SK-6 (SHEET 5 OF 5)

LOCATION <u>DAM</u>	DEPTH OF HOLE <u>90.00m</u>	COMMENCED <u>11-8-1988</u>	
ELEVATION <u>542.365</u> m	DEPTH OF OVERBURDEN <u>2.00m</u>	COMPLETED <u>1-9-1988</u>	
COORDINATE <u>X. 452.510.97</u> <u>Y. 4178.977.07</u>	LENGTH OF ROCK DRILLING <u>88.00m</u>	DRILLED BY <u>DSI</u>	
ANGLE FROM HORIZONTAL <u>90°</u>	TOTAL LENGTH OF CORE <u>89.23m</u>	LOGGED BY <u>JICA</u>	
BEARING OF ANGLE HOLE <u>-</u>	CORE RECOVERY <u>99.1%</u>		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION		
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER				
0m			0 → 100%								LUGEON	m	0m	462.365	
1	Peridotite	✓	φ 76 mm	Dark gray	2	2	1	5	2	86.5m: Meshy serpentine 10cm wide, weak serpentinization.	Lu = 0	P _{max} = 10.0	14.50 21.30	1	2
2		Lu = 0									P _{max} = 10.0	14.30 19.50			
3		Lu = 0									P _{max} = 10.0		14.30 19.50	5	6
4		Lu = 0									P _{max} = 10.0	14.30 19.50			
5		Lu = 0									P _{max} = 10.0		14.30 19.50	9	0
6		Lu = 0									P _{max} = 10.0	14.30 19.50			
7		Lu = 0									P _{max} = 10.0		14.30 19.50	3	4
8		Lu = 0									P _{max} = 10.0	14.30 19.50			
9		Lu = 0									P _{max} = 10.0		14.30 19.50	7	8
0		Lu = 0									P _{max} = 10.0	14.30 19.50			
0															

89.4~89.8m core :
Laboratory test.
R.Q.D (Av.) = 91%

90.0 End of drill hole



Water table after drilling → 0.30
Water table before drilling → 0.50

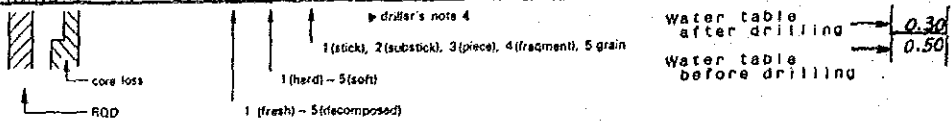
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-7 (SHEET 1 of 4)

LOCATION DAM DEPTH OF HOLE 80.00 m COMMENCED 23-9-1988
 ELEVATION 603.687 m DEPTH OF OVERBURDEN 0 m COMPLETED 6-10-1988
 COORDINATE X: 452439.47 LENGTH OF ROCK DRILLING 80.00 m DRILLED BY DSI
Y: 178108.32 TOTAL LENGTH OF CORE 80.00 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 60° CORE RECOVERY 100.0 %
 BEARING OF ANGLE HOLE N25°W

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0→100%							LUGEON	m	0m	603.687m
0							3	No surface soil.		0.00	overflow 0.5 l/min		
1		✓					4	1.3 Peridotite.		Lu = (17)		1	
2										P _{max} = 3.0 kg/cm ²	1.00	2	
3		✓						4.1m: Oxidization crack		Lu = (22)	1.00	3	
4								45° dip.		P _{max} = 3.0		4	
5		✓						4.3m and 4.5m: Serpentine 1mm wide along 0°		Lu = (9)		5	
6		✓						15° dip cracks.		P _{max} = 5.0	3.00	6	
7		✓					1	(to drilling direction)		Lu = (5)	3.00	7	
8		✓						6.1m: Serpentine 1mm wide along 15° dip crack.		P _{max} = 5.0		8	
9		✓					2			Lu = 0		9	
10	Peridotite	✓		φ86 mm			2			P _{max} = 5.0	3.60	10	
11		✓			Dark gray					P _{max} = 10.0	6.30	11	
12		✓								Lu = 0		12	
13		✓								P _{max} = 10.0		13	
14		✓								Lu = 0		14	
15		✓								P _{max} = 10.0	6.95	15	
16		✓								Lu = 1.4	6.85	16	
17		✓								P _{max} = 10.0		17	
18		✓								Lu = 2.6		18	
19		✓								P _{max} = 10.0		19	
20		✓					3	18.0-19.5m: Oxidization cracks, weak serpentinization.		Lu = 13.0		20	
21							2			P _{max} = 10.0	16.34	21	
22							2				17.00	22	
23							2					23	586.386



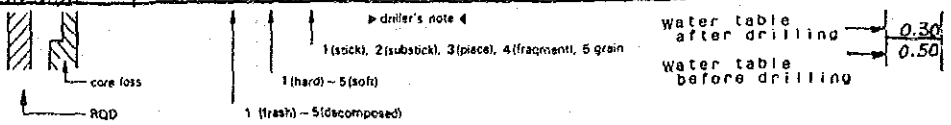
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-7 (SHEET 2 OF 4)

LOCATION	DAM	DEPTH OF HOLE	80.00 m	COMMENCED	23-9-1988
ELEVATION	603.687 m	DEPTH OF OVERBURDEN	0 m	COMPLETED	6-10-1988
COORDINATE	X: 452439.67 Y: 4172108.32	LENGTH OF ROCK DRILLING	80.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	60°	TOTAL LENGTH OF CORE	80.00 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	N 25° W	CORE RECOVERY	100.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	LUGEON		
0			0 → 100%										0	586.366
1	Peridotite	✓	100%								Lu = 0	P _{max} = 10.0	15.00	15.00
2											Lu = 0	P _{max} = 10.0		
3											Lu = 0	P _{max} = 10.0		
4											Lu = 0	P _{max} = 10.0		
5											Lu = 0	P _{max} = 10.0		
6											Lu = 0	P _{max} = 10.0		
7											Lu = 0	P _{max} = 10.0		
8											Lu = 0	P _{max} = 10.0		
9											Lu = 0	P _{max} = 10.0		
10											Lu = 0	P _{max} = 10.0		
11	Dark gray	✓	100%								Lu = 0	P _{max} = 10.0	10.00	10.00
12											Lu = 0	P _{max} = 10.0		
13											Lu = 0	P _{max} = 10.0		
14											Lu = 0	P _{max} = 10.0		
15											Lu = 0	P _{max} = 10.0		
16											Lu = 0	P _{max} = 10.0		
17											Lu = 0	P _{max} = 10.0		
18											Lu = 0	P _{max} = 10.0		
19											Lu = 0	P _{max} = 10.0		
20											Lu = 0	P _{max} = 10.0		
21	Peridotite	✓	100%								Lu = 0	P _{max} = 10.0	3.00	3.00
22											Lu = 0	P _{max} = 10.0		
23											Lu = 0	P _{max} = 10.0		
24											Lu = 0	P _{max} = 10.0		
25											Lu = 0	P _{max} = 10.0		
26											Lu = 0	P _{max} = 10.0		
27											Lu = 0	P _{max} = 10.0		
28											Lu = 0	P _{max} = 10.0		
29											Lu = 0	P _{max} = 10.0		
30											Lu = 0	P _{max} = 10.0		
31	Peridotite	✓	100%								Lu = 0	P _{max} = 10.0	0.00	0.00
32											Lu = 0	P _{max} = 10.0		
33											Lu = 0	P _{max} = 10.0		
34											Lu = 0	P _{max} = 10.0		
35											Lu = 0	P _{max} = 10.0		
36											Lu = 0	P _{max} = 10.0		
37											Lu = 0	P _{max} = 10.0		
38											Lu = 0	P _{max} = 10.0		
39											Lu = 0	P _{max} = 10.0		
40											Lu = 0	P _{max} = 10.0		



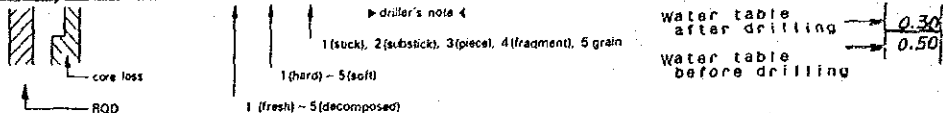
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-7 (SHEET 3 OF 4)

LOCATION DAM DEPTH OF HOLE 80.00 m COMMENCED 23-9-1988
 ELEVATION 603.687 m DEPTH OF OVERBURDEN 0 m COMPLETED 6-10-1988
 COORDINATE X 452439.67 LENGTH OF ROCK DRILLING 80.00 m DRILLED BY DSI
Y 4178108.32 TOTAL LENGTH OF CORE 80.00 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 60 CORE RECOVERY 100.0 %
 BEARING OF ANGLE HOLE N25°W

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
4.0			0 → 100%									0m	562.046 m
1		✓					2		42.5~44.5m: Thin ser-	Lu = 0 P _{max} = 10.0	kg/cm ²	0.00	1
2									pentine along 70°~80°	Lu = 0 P _{max} = 10.0	kg/cm ²	0.00	2
3		✓					2	3	dip crack.				3
4									44.5~45.6m: Serpentine	Lu = 0 P _{max} = 10.0			4
5		✓					2	3	1mm wide along 40° dip				5
6		✓							crack.			0.00	6
7		✓					2		47.1~47.4m: Calcite	Lu = 0 P _{max} = 10.0			7
8		✓					3	3-4	vein 2-3mm wide, ser-				8
9		✓							pentine 1mm wide and	Lu = 0 P _{max} = 10.0			9
50	Peridotite	✓		φ76mm			2		talc less than 1mm wide.	Lu = 0 P _{max} = 10.0		0.00	0
1		✓							Meshy.			0.00	1
2		✓							47.9~51.5m: Serpentine	Lu = 0 P _{max} = 10.0			2
3		✓					2	2	1mm wide along many				3
4		✓							cracks.	Lu = 0 P _{max} = 10.0		0.00	4
5		✓							54.8m: Serpentine 1mm	Lu = 0 P _{max} = 10.0		0.00	5
6		✓							wide along 40° dip crack.				6
7		✓							57.2m: Meshy serpen-	Lu = 0 P _{max} = 10.0			7
8		✓							tine 1mm wide.			0.00	8
9		✓							58.1m: Serpentine 1mm	Lu = 0 P _{max} = 10.0		0.00	9
60									wide along 30° dip crack.				0



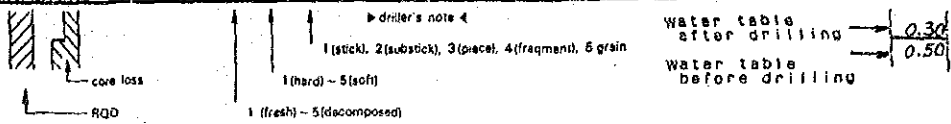
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SK-7 (SHEET 4 OF 4)

LOCATION	DAM	DEPTH OF HOLE	80.00 m	COMMENCED	23-9-1988
ELEVATION	603.687 m	DEPTH OF OVERBURDEN	0 m	COMPLETED	6-10-1988
COORDINATE	X: 452439.67 Y: 4178168.32	LENGTH OF ROCK DRILLING	80.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	60°	TOTAL LENGTH OF CORE	80.00 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	N25°W	CORE RECOVERY	100.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION								
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER											
0			0 → 100%								LUGEON	m	0	551.725								
1	Peridotite	V	100%	φ76 mm	Dark gray	2	2	2	2	60.3m: Serpentine 1mm wide along 30° dip crack.	Lu = 0 P _{max} = 10.0 kg/cm ²	0.00	1									
2										62.7m: Serpentine 1mm wide along 10° dip crack.	Lu = 0 P _{max} = 10.0	0.00	2									
3																					3	
4																					4	
5																					5	
6																					6	
7																					7	
8																					8	
9																					9	
70																		67.5	Lu = 0 P _{max} = 10.0	0.00	0	
1										Lu = 0 P _{max} = 10.0	0.00	1										
2									72.0	Lu = 0 P _{max} = 10.0	0.00	2										
3										Lu = 0 P _{max} = 10.0	0.00	3										
4									73.1m and 73.7m: Serpentine 1mm wide along 70° dip crack.	Lu = 0 P _{max} = 10.0	0.00	4										
5										Lu = 0 P _{max} = 10.0	0.00	5										
6										Lu = 0 P _{max} = 10.0	0.00	6										
7										Lu = 0 P _{max} = 10.0	0.00	7										
8										Lu = 0 P _{max} = 10.0	0.00	8										
9										Lu = 0 P _{max} = 10.0	0.00	9										
80									80.0 End of drill hole	Lu = 0 P _{max} = 10.0	0.00	0	334.405									

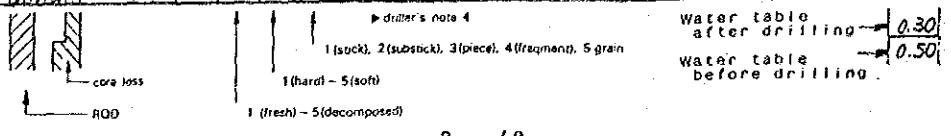


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **TB-1** (SHEET **1** OF **5**)

LOCATION HEADRACE TUNNEL	DEPTH OF HOLE 90.00 m	COMMENCED 4 - 5 - 1988
ELEVATION 631.357 m	DEPTH OF OVERBURDEN 3.00 m	COMPLETED 8 - 6 - 1988
COORDINATE X: 455,751.98 Y: 4,172,232.91	LENGTH OF ROCK DRILLING 87.00 m	DRILLED BY DSI
ANGLE FROM HORIZONTAL 90°	TOTAL LENGTH OF CORE 89.50 m	LOGGED BY JICA
BEARING OF ANGLE HOLE -	CORE RECOVERY 99.4 %	

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE		DEPTH	ELEVATION					
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER							
0m			0-100%								LUGEON	m	0m	631.357				
1	Alluvium	○		φ90 mm	Dark brown	Brown												
1.0															1.00	1.00	1	
2															2			
3	Limestone			φ86 mm	Gray	ω												
3.0															3.0	3.0	3	628.357
3.4																		
3.9																		
5.0																		
6.0																		
7.0																		
8.5																		
9.5																		
11.5																		
13.0																		
14.5																		
15.5																		
16.0																		
16.6																		
18.8																		
20															611.357			

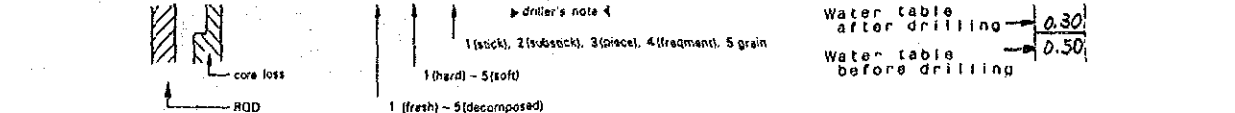


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. TB-1 (SHEET 2 OF 5)

LOCATION HEADRACE TUNNEL DEPTH OF HOLE 90.00 m COMMENCED 4 - 5 -1988
 ELEVATION 631.357 m DEPTH OF OVERBURDEN 3.00 m COMPLETED 8 - 6 -1988
 COORDINATE X: 455,757.98 Y: 172,232.91 LENGTH OF ROCK DRILLING 87.00 m DRILLED BY DSI
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 89.50 m LOGGED BY JICA
 BEARING OF ANGLE HOLE - CORE RECOVERY 99.4 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTA- TION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING				
0m			0 → 100%								616.357m	
1							1		$P_{0 \max} = 10.0$ $198/cm^2$	20.55		
2							2		$L_u = 60.0$ $P_{0 \max} = 10.0$	21.00		
3					2		3	23.0 ~ 24.5 m: Piece cores				
4					3		3	7cm interval cracks, 70° dip.	$L_u = 45.0$ $P_{0 \max} = 10.0$			
5							2	25 ~ 90m (End of drill hole): More meshy calcite veins.	$L_u = 39.0$ $P_{0 \max} = 10.0$	22.60		
6							2	26.5m and 30~32m: Calcite vein rich.	$L_u = 24.0$ $P_{0 \max} = 10.0$	22.60		
7							2	28.0m: Brownish weath- ered zone 4cm wide, 15° dip.	$L_u = 13.0$ $P_{0 \max} = 10.0$	28.70		
8							2			29.00		
9							2					
10							2					
11							2	31.0m: Oxidization crack 1mm wide, 70° dip.	$L_u = 6.5$ $P_{0 \max} = 10.0$			
12							2					
13							2			29.55		
14							2			29.80		
15							2					
16							2					
17							2			30.75		
18							2			30.75		
19							2	39.0m: Oxidization crack along calcite vein.	$L_u = 8.9$ $P_{0 \max} = 10.0$			
20							2		$L_u = 25.0$			
40							2				591.357	



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. TB-1 (SHEET 3 of 5)

LOCATION HEADRACE TUNNEL DEPTH OF HOLE 90.00 m COMMENCED 4 - 5 - 1988
 ELEVATION 631.357 m DEPTH OF OVERBURDEN 3.00 m COMPLETED 8 - 6 - 1988
 COORDINATE X 455.75198 Y 4172.232.91 LENGTH OF ROCK DRILLING 87.00 m DRILLED BY DSI
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 89.50 m LOGGED BY JICA
 BEARING OF ANGLE HOLE - CORE RECOVERY 99.4 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	LUGEON					m
4.0m			0 → 100%									0m	591.357m	
1	Limestone (bituminous)				Dark grey	2	1	3	2	40.0	40.0~57.0m	$P_{0max} = 10.0$ $18/cm^2$	33.45	39.25
2										Limestone (bituminous)	$Lu = 0$ $P_{0max} = 10.0$			
3										40.0m: Solution crack with clay material.				
4											$Lu = 0$ $P_{0max} = 10.0$			
5												35.45	35.45	
6											$Lu = 0$ $P_{0max} = 10.0$			
7										46.85~47.0m core: Microscopic observation.				
8			35.60	37.30										
9														
5.0	Limestone				Dark grey	2	1	3	2			$Lu = 0$ $P_{0max} = 10.0$		
1												39.40	39.20	
2											$Lu = 0$ $P_{0max} = 10.0$			
3											$Lu = 0$ $P_{0max} = 10.0$			
4												33.40	33.40	
5														
6			$Lu = 0$ $P_{0max} = 10.0$											
7														
57.0														
8	Limestone				Gray	2	1	3	2		Gray, hard limestone.	$Lu = 0$ $P_{0max} = 10.0$		
8														
9										57.5m: Solution crack 70° dip.		33.00	39.25	
6.0														
													574.357	
														531.357

driller's note
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 (gran)
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

Water table after drilling → 0.30
 Water table before drilling → 0.50

core loss
 ADD

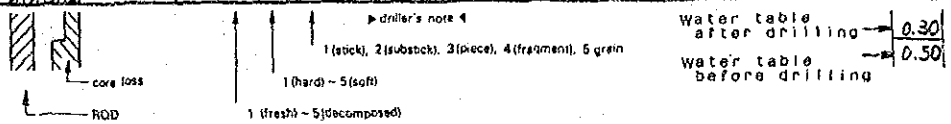
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. TB-1 (SHEET 4 OF 5)

LOCATION	HEADRACE TUNNEL	DEPTH OF HOLE	90.00 m	COMMENCED	4 - 5 - 1988
ELEVATION	631.357 m	DEPTH OF OVERBURDEN	3.00 m	COMPLETED	8 - 6 - 1988
COORDINATE	493,751.98 7,417,232.91	LENGTH OF ROCK DRILLING	87.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	89.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	99.4 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0 → 100%							LUGEON	m	0m	531.357 ^m
1	Limestone	φ 86 mm			Gray				60m: Small cavities rich.	P _{max} = 10.0 18/cm ²		1	
2									62.0m: Calcite vein 1cm wide filled solution crack.	Lu = 29.0 P _{max} = 10.0		2	
3									63.5	63.50M	57.20	3	
4									62.0~69.0m: More oxidization zone. Many solution cracks with clay material.	Lu = 38.0 P _{max} = 10.0	57.20	4	
5									65.2	Lu = 28.0 P _{max} = 10.0		5	
6									63.5~65.2m: Fragment cores caused by two direction solution cracks.	Lu = 30.0 P _{max} = 10.0	58.06 59.25	6	
7									69.0	Lu = 7.9 P _{max} = 10.0		7	
8										Lu = 0 P _{max} = 10.0	58.10 58.10	8	
9										Lu = 0 P _{max} = 10.0		9	
70												0	
1	Limestone (bituminous)	Dark gray							75.0~90.0m (End of drill hole): Limestone (bituminous).	Lu = 1.1 P _{max} = 10.0		1	
2									77.0	Lu = 0 P _{max} = 10.0		2	
3										Lu = 0 P _{max} = 10.0		3	
4										Lu = 0 P _{max} = 10.0		4	
5									75.0	Lu = 0 P _{max} = 10.0	58.20 59.80	5	536.357
6										Lu = 0 P _{max} = 10.0		6	
7										Lu = 0 P _{max} = 10.0		7	
8										Lu = 0 P _{max} = 10.0		8	
9										Lu = 0 P _{max} = 10.0	58.40 58.40	9	
80												0	511.357

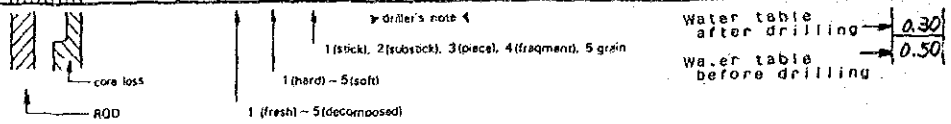


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **TB-1** (SHEET **5** OF **5**)

LOCATION **HEADRACE TUNNEL** DEPTH OF HOLE **90.00** m COMMENCED **4 - 5 - 1988**
 ELEVATION **631.357** m DEPTH OF OVERBURDEN **3.00** m COMPLETED **8 - 6 - 1988**
 COORDINATE **X: 455,781.98** LENGTH OF ROCK DRILLING **87.00** m DRILLED BY **DSI**
Y: 4172,232.91 TOTAL LENGTH OF CORE **89.50** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90°** CORE RECOVERY **99.4 %**
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION																																							
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER	LUGEON			m																																						
0			0 → 100%									0	511.357 ^B																																								
1	Limestone (bituminous)	φ86 mm				Dark gray			1	83.9~84.4m core: Laboratory test.	P _{0 max} = 10.0																																										
2														1	84.7~84.9m core: Microscopic observation.	Lu = 0	P _{0 max} = 10.0	57.76																																			
3																			2	85.2~86.0m: Calcite vein rich	Lu = 0	P _{0 max} = 10.0	59.70																														
4																								2	85.4~85.6m: Oxidization calcite vein, fragment cores.	Lu = 0	P _{0 max} = 10.0	58.30																									
5																													5	R.O.D (Av.) = 86%	Lu = 0	P _{0 max} = 10.0	58.30																				
6																																		3	90.0 End of drill hole	Lu = 0	P _{0 max} = 10.0	63.50															
7																																							1														
8																																																					
9																																																					
0																																																					

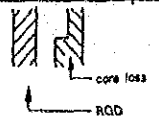


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **TB-2** (SHEET 1 of 10)

LOCATION **HEADRACE TUNNEL** DEPTH OF HOLE **190.00** m COMMENCED **10 - 5 - 1988**
 ELEVATION **740.076** m DEPTH OF OVERBURDEN **0** m COMPLETED **19 - 7 - 1988**
 COORDINATE X **460.825.80** Y **4168.253.59** LENGTH OF ROCK DRILLING **190.00** m DRILLED BY **DSI**
 ANGLE FROM HORIZONTAL **90** TOTAL LENGTH OF CORE **81.20** m LOGGED BY **JICA**
 BEARING OF ANGLE HOLE **-** CORE RECOVERY $\frac{81.2}{190} = 89.2$ %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0-100%							LUGEON	m	0m	740.076 ^m
1									Non-coring			1	
2												2	
3											2.50	3	
4											2.50	4	
5	LS				Gray			4.5	5.0 Massive limestone		4.00	5	
6									Non-coring			6	
7												7	
8												8	
9								9.5			8.20	9	
10	LS				Gray			10.0	Limestone with shale layer 1cm thick at 9.75m.		9.00	10	
11									Non-coring			11	
12												12	
13												13	
14												14	
15	LS				Dark gray			14.5			9.50	15	
16								15.0			10.00	16	
17									Non-coring			17	
18												18	
19												19	
20	LS				Gray			19.5	20.0 Massive limestone		8.50	20	720.076
											14.50		
											9.50		
											4.50		



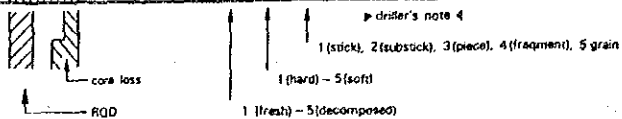
driller's note 4
 1 (back), 2 (subbed), 3 (prec), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

Water table after drilling **0.30**
 Water table before drilling **0.50**

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT		HOLE No. TB-2 (SHEET 2 of 10)	
LOCATION	HEADRACE TUNNEL	DEPTH OF HOLE	190.00 m
ELEVATION	740.076 m	DEPTH OF OVERBURDEN	0 m
COORDINATE	X: 460.825.80 Y: 4168.653.59	LENGTH OF ROCK DRILLING	190.00 m
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	81.20 m
BEARING OF ANGLE HOLE	-	CORE RECOVERY	81.2/190 = 89.2 %
		COMMENCED	10 - 5 - 1988
		COMPLETED	19 - 7 - 1988
		DRILLED BY	DSI
		LOGGED BY	JICA

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		LEAKAGE OF DRILLING WATER	LUGEON		
20m			0-100%									0m	740.076m
1									Non-coring		5.00	1	
2											12.50	2	
3												3	
4												4	
5		LS			Gray			24.5	25.0 Massive limestone		5.65	5	
6									Non-coring		6.50	6	
7												7	
8												8	
9												9	
30		LS			Gray			29.5	30.0 Massive limestone		8.00	0	
1									Non-coring		28.00	1	
2												2	
3												3	
4												4	
5		LS			Gray			34.5	35.0 Massive limestone		6.00	5	
6									Non-coring		6.50	6	
7												7	
8												8	
9												9	
40		LS			Gray			39.5	40.5 Massive limestone		7.00	0	740.076



Water table after drilling → 0.30
 Water table before drilling → 0.50

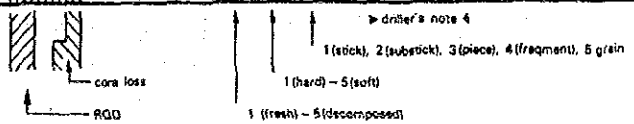
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. TB-2 (SHEET 3 of 10)

LOCATION	HEADRACE TUNNEL	DEPTH OF HOLE	190.00 m	COMMENCED	10 - 5 - 1988
ELEVATION	740.076 m	DEPTH OF OVERBURDEN	0 m	COMPLETED	19 - 7 - 1988
COORDINATE	X: 460.225.80 Y: 4168.653.59	LENGTH OF ROCK DRILLING	190.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	81.20 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	$\frac{81.2}{91} = 89.2\%$		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
4.0m			0 → 100%							LUGEON	33.00	0m	740.076 m
1									Non-coring				
2													
3													
4								44.5					
5		LS			Gray			50.0	Massive limestone				
6									Non-coring				
7										7.15			
8										7.30			
9													
5.0		LS			Gray			49.5	50.0 Massive limestone				
1									Non-coring				
2													
3										10.50			
4										36.70			
5		LS			Gray			54.5	55.0 Massive limestone				
6									Non-coring				
7													
8													
9													
6.0		LS			Gray			59.5	60.0 Massive limestone				
										32.00			
										38.50			



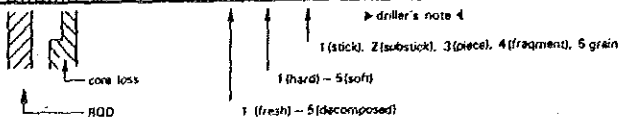
Water table after drilling → 0.30
 Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **TB-2** (SHEET 4 OF 10)

LOCATION **HEADRACE TUNNEL** DEPTH OF HOLE **190.00** m COMMENCED **10-5-1988**
 ELEVATION **740.076** m DEPTH OF OVERBURDEN **0** m COMPLETED **19-7-1988**
 COORDINATE X: **460.825.80** Y: **4168.653.59** LENGTH OF ROCK DRILLING **190.00** m DRILLED BY **DSI**
 ANGLE FROM HORIZONTAL **90** TOTAL LENGTH OF CORE **81.20** m LOGGED BY **JICA**
 BEARING OF ANGLE HOLE **-** CORE RECOVERY $\frac{81.20}{190} = 89.2$ %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				
0			0-100%							LUGEON	m	660.076
1									Non-coring			
2									Non-coring			
3									Non-coring			
4									Non-coring			
5		LS			Gray			64.5	65.0 Massive limestone			
6									Non-coring	32.00		
7									Non-coring	56.50		
8									Non-coring			
9									Non-coring			
10		LS			Gray			67.5	70.0 Massive limestone			
11									Non-coring	26.40		
12									Non-coring	28.00		
13									Non-coring			
14									Non-coring			
15		LS			Gray			74.5	75.0 Massive limestone			
16									Non-coring	27.00		
17									Non-coring	59.50		
18									Non-coring			
19									Non-coring			
20		LS			Gray			79.5	80.0 Massive limestone			660.076



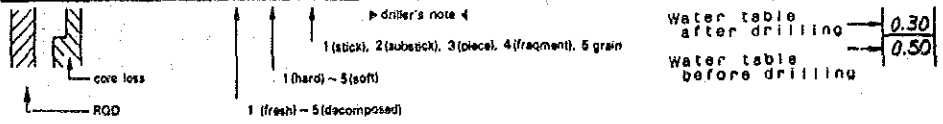
Water table after drilling → 0.30
 Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **TB-2** (SHEET **5** OF **10**)

LOCATION **HEADRAGE TUNNEL** DEPTH OF HOLE **190.00** m COMMENCED **10 - 5 -1988**
 ELEVATION **740.076** m DEPTH OF OVERBURDEN **0** m COMPLETED **19 - 7 -1988**
 COORDINATE X: **460,425.89** LENGTH OF ROCK DRILLING **190.00** m DRILLED BY **DSI**
 Y: **4168,653.59** TOTAL LENGTH OF CORE **81.20** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90** CORE RECOVERY $\frac{81.20}{190} = 89.2$ %
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT OF CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING				
0			0 → 100%							LUGEON	0m	660.076 m
0											27.00	
1									Non-coring			
2												
3												
4											28.00	
5	LS				Gray			84.5	85.0 Massive limestone		68.00	
6									Non-coring			
7												
8											60.55	
9											68.00	
0	LS			486 mm	Gray			89.5	90.0 Massive limestone			
1									Non-coring			
2											68.50	
3											68.50	
4												
5	LS				Gray			94.5	95.0 Massive limestone			
6									Non-coring			
7												
8											45.00	
9											46.00	
10	LS				Gray			99.5	100.0 Massive limestone		71.00	640.076

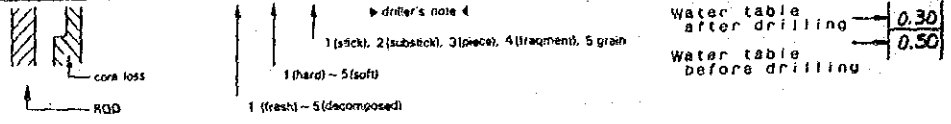


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **TB-2** (SHEET 6 OF 10)

LOCATION **HEADRACE TUNNEL** DEPTH OF HOLE **190.00** m COMMENCED **10 - 5 - 1988**
 ELEVATION **740.076** m DEPTH OF OVERBURDEN **0** m COMPLETED **19 - 7 - 1988**
 COORDINATE **X: 460,825.89** LENGTH OF ROCK DRILLING **190.00** m DRILLED BY **DSI**
Y: 4,168,653.59 TOTAL LENGTH OF CORE **81.20** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90** ° CORE RECOVERY $\frac{81.20}{190} = 89.2$ %
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0			0 → 100%							LUGEON	m	0m	640.076 m
1								Non-coring			74.50	1	
2												2	
3												3	
4								104.5 ~ 105.0 m core : Microscopic observation.				4	
5								104.5 105.0 Massive limestone			71.50 97.90	5	
6								Non-coring				6	
7												7	
8												8	
9								109.5				9	630.576
10								Gray, hard limestone.			76.30 79.30	10	
1									$L_u = 0.5$			1	
2								112.5m : Oxidization crack.	$P_{o \max} = 10.0$ kg/cm ²			2	
3									$L_u = 0$			3	
4								112.6 ~ 113.1 m core : Laboratory test.	$P_{o \max} = 10.0$			4	
5								113.85 ~ 114.0 m core : Microscopic observation.	$L_u = 0$			5	
6								115.8	$P_{o \max} = 10.0$			6	624.276
7								115.8 ~ 136.0 m : Limestone (bituminous)	$L_u = 0$			7	
8								117.0 117.2	$P_{o \max} = 10.0$			8	
9								117.0 ~ 117.2 m : Fragment cores.	$L_u = 0$			9	
10									$P_{o \max} = 10.0$			10	620.076



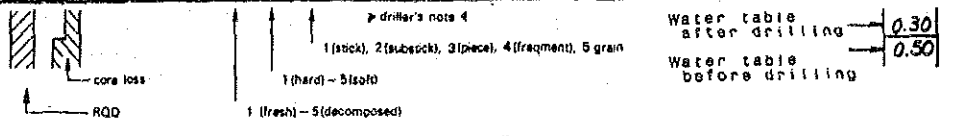
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. TB-2 (SHEET 7 of 10)

LOCATION	HEADRACE TUNNEL	DEPTH OF HOLE	190.00 m	COMMENCED	10 - 5 - 1988
ELEVATION	740.076 m	DEPTH OF OVERBURDEN	0 m	COMPLETED	19 - 7 - 1988
COORDINATE	X: 460.825.80 Y: 4168.653.59	LENGTH OF ROCK DRILLING	190.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	81.20 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	81.2/190 = 89.2 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION			
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER					
12.0m			0-100%							LUGEON	m	0m	620.076			
1	Limestone (bituminous)				Dark gray	2	3	2	1215	No oxidization crack.	Lu=0	73.40				
2											P _{max} = 10.0 kg/cm ²			86.00		
3											Lu=0			P _{max} = 10.0		
4											Lu=0			P _{max} = 10.0		
5											← 124.6-124.78m core: Microscopic observation.			Lu=0	P _{max} = 10.0	
6											125.0			Lu=0	P _{max} = 10.0	
7											127.6			Lu=0	P _{max} = 10.0	
8											128.0			127.6-128.0m: Re-consolidated fracture zone, 15° dip.	Lu=0	P _{max} = 10.0
9											129.5			Lu=0	P _{max} = 10.0	
10											136.0			Lu=0	P _{max} = 10.0	
11	Quartz sandstone				Light gray	2	3	2	136.0-149.0m Quartz sandstone.	No solution crack.	Lu=0	86.00				
12											P _{max} = 10.0					
13											Lu=0			P _{max} = 10.0		
14											Lu=0			P _{max} = 10.0		
15											Lu=0			P _{max} = 10.0		
16	138.0	Lu=0	P _{max} = 10.0													
17	Quartz sandstone				Light gray	2	3	2	139.5-140.3m: Prece- fragment cores.		Lu=0	65.10				
18											P _{max} = 10.0					
19											Lu=0			P _{max} = 10.0		
20	139.5	Lu=0	P _{max} = 10.0													
21	140.0	Lu=0	P _{max} = 10.0													
22	140.0	Lu=0	P _{max} = 10.0													
23	140.0	Lu=0	P _{max} = 10.0													
24	140.0	Lu=0	P _{max} = 10.0													
25	140.0	Lu=0	P _{max} = 10.0													
26	140.0	Lu=0	P _{max} = 10.0													
27	140.0	Lu=0	P _{max} = 10.0													
28	140.0	Lu=0	P _{max} = 10.0													
29	140.0	Lu=0	P _{max} = 10.0													
30	140.0	Lu=0	P _{max} = 10.0													
31	140.0	Lu=0	P _{max} = 10.0													
32	140.0	Lu=0	P _{max} = 10.0													
33	140.0	Lu=0	P _{max} = 10.0													
34	140.0	Lu=0	P _{max} = 10.0													
35	140.0	Lu=0	P _{max} = 10.0													
36	140.0	Lu=0	P _{max} = 10.0													
37	140.0	Lu=0	P _{max} = 10.0													
38	140.0	Lu=0	P _{max} = 10.0													
39	140.0	Lu=0	P _{max} = 10.0													
40	140.0	Lu=0	P _{max} = 10.0													
41	140.0	Lu=0	P _{max} = 10.0													
42	140.0	Lu=0	P _{max} = 10.0													
43	140.0	Lu=0	P _{max} = 10.0													
44	140.0	Lu=0	P _{max} = 10.0													
45	140.0	Lu=0	P _{max} = 10.0													
46	140.0	Lu=0	P _{max} = 10.0													
47	140.0	Lu=0	P _{max} = 10.0													
48	140.0	Lu=0	P _{max} = 10.0													
49	140.0	Lu=0	P _{max} = 10.0													
50	140.0	Lu=0	P _{max} = 10.0													
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70	140.0	Lu=0	P _{max} = 10.0													
71	140.0	Lu=0	P _{max} = 10.0													
72	140.0	Lu=0	P _{max} = 10.0													
73	140.0	Lu=0	P _{max} = 10.0													
74	140.0	Lu=0	P _{max} = 10.0													
75	140.0	Lu=0	P _{max} = 10.0													
76	140.0	Lu=0	P _{max} = 10.0													
77	140.0	Lu=0	P _{max} = 10.0													
78	140.0	Lu=0	P _{max} = 10.0													
79	140.0	Lu=0	P _{max} = 10.0													
80	140.0	Lu=0	P _{max} = 10.0													
81	140.0	Lu=0	P _{max} = 10.0													
82	140.0	Lu=0	P _{max} = 10.0													
83	140.0	Lu=0	P _{max} = 10.0													
84	140.0	Lu=0	P _{max} = 10.0													
85	140.0	Lu=0	P _{max} = 10.0													
86	140.0	Lu=0	P _{max} = 10.0													
87	140.0	Lu=0	P _{max} = 10.0													
88	140.0	Lu=0	P _{max} = 10.0													
89	140.0	Lu=0	P _{max} = 10.0													
90	140.0	Lu=0	P _{max} = 10.0													
91	140.0	Lu=0	P _{max} = 10.0													
92	140.0	Lu=0	P _{max} = 10.0													
93	140.0	Lu=0	P _{max} = 10.0													
94	140.0	Lu=0	P _{max} = 10.0													
95	140.0	Lu=0	P _{max} = 10.0													
96	140.0	Lu=0	P _{max} = 10.0													
97	140.0	Lu=0	P _{max} = 10.0													
98	140.0	Lu=0	P _{max} = 10.0													
99	140.0	Lu=0	P _{max} = 10.0													
100	140.0	Lu=0	P _{max} = 10.0													



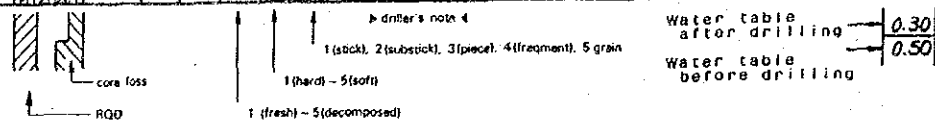
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. TB-2 (SHEET 8 of 10)

LOCATION HEADRACE TUNNEL DEPTH OF HOLE 190.00 m COMMENCED 10 - 5 - 1988
 ELEVATION 740.076 m DEPTH OF OVERBURDEN 0 m COMPLETED 19 - 7 - 1988
 COORDINATE X 460.825.89 Y 4168.653.59 LENGTH OF ROCK DRILLING 190.00 m DRILLED BY DSI
 ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 81.20 m LOGGED BY JICA
 BEARING OF ANGLE HOLE -- CORE RECOVERY $\frac{81.20}{190} = 89.2\%$

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
14.0m	Quartz sandstone	[Hatched pattern]	0 → 100%							LUGEON	m	0m	600.076 m	
1									140.3	Lu = 0		63.00		
2									142.4 142.7	P _{max} = 10.0 kg/cm ²				
3									144.4~144.6m and 145.1~145.5m : Fragment cores.	Lu = 0				
4									oxidization cracks.	P _{max} = 10.0		65.40		
5									144.4 144.6	Lu = 0		87.50		
6									144.6~145.1m core :	P _{max} = 10.0				
7									145.1 145.5 Laboratory test.	Lu = 0				
8									146.5~146.7m core :	P _{max} = 10.0				
9	Sandy limestone	[Hatched pattern]						Microscopic observation.	Lu = 0		75.30		591.076	
10								149.0 149.2	P _{max} = 10.0		76.00			
11									149.0~180.0m : Sandy limestone.	Lu = 0		77.00		
12									152.0 ← 152.0m core : Microscopic observation.	P _{max} = 10.0		67.00		
13									152.0 152.3	Lu = 0				
14									154.5~155.0m core :	P _{max} = 10.0		78.00		
15									155.0 Laboratory test.	Lu = 0		76.20		
16									No oxidization crack.	P _{max} = 10.0		77.00		
17										Lu = 0		156.00		
18								P _{max} = 10.0						
19								Lu = 0						
20								P _{max} = 10.0		88.00		580.076		



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **TB-2** (SHEET 9 OF 10)

LOCATION **HEADRACE TUNNEL** DEPTH OF HOLE **190.00** m COMMENCED **10 - 5 - 1988**
 ELEVATION **740.076** m DEPTH OF OVERBURDEN **0** m COMPLETED **19 - 7 - 1988**
 COORDINATE $X: 460,825.89$ LENGTH OF ROCK DRILLING **190.00** m DRILLED BY **DSI**
 $Y: 4168,653.59$ TOTAL LENGTH OF CORE **81.20** m LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90** ° CORE RECOVERY $\frac{81.20}{190} = 89.2$ %
 BEARING OF ANGLE HOLE **-**

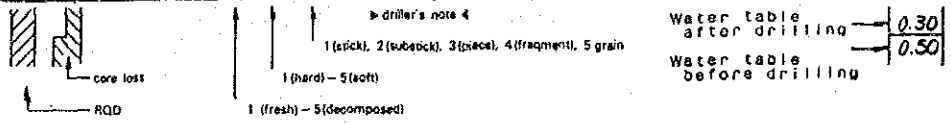
DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION				
16.0			0 → 100%							LUGEON	m	0m	560.076
16.0								160.0		Lu = 0 P _{o max} = 10.0 kg/cm ²	88.00 88.00 88.00	1	
16.0 - 168.0										Poor core recovery, 50~75%.		2	
163.6 - 163.75										← 163.6-163.75m core: Microscopic observation.		3	
										Lu = 0 P _{o max} = 10.0	88.00 88.00	4	
										Lu = 0 P _{o max} = 10.0	88.00 92.15	5	
										Lu = 0 P _{o max} = 10.0	88.00 88.00	6	
										Lu = 0 P _{o max} = 10.0		7	
										Lu = 0 P _{o max} = 10.0		8	
170.0								170.0 ~ 172.0		Poor core recovery, 50%.		9	
										Lu = 0 P _{o max} = 10.0	88.00 88.00	0	
										Lu = 0 P _{o max} = 10.0		1	
										Lu = 0 P _{o max} = 10.0		2	
										Lu = 0 P _{o max} = 10.0		3	
										Lu = 0 P _{o max} = 10.0	89.12 89.10	4	
										Lu = 0 P _{o max} = 10.0		5	
										Lu = 0 P _{o max} = 10.0	176.00 29.50	6	
										Lu = 0 P _{o max} = 10.0		7	
										Lu = 17.5 P _{o max} = 10.0	90.00 100.00	8	
										Lu = 17.5 P _{o max} = 10.0	179.00	9	
180.0								178.0		178.0 ~ 180.0: Core recovery 75%.		0	560.076

Sandy limestone

Dark gray

456 mm

φ 73 mm



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. TB-2 (SHEET 10 OF 10)

LOCATION HEADRACE TUNNEL DEPTH OF HOLE 190.00 m COMMENCED 10 - 5 - 1988

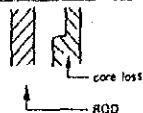
ELEVATION 740.076 m DEPTH OF OVERBURDEN 0 m COMPLETED 19 - 7 - 1988

COORDINATE X: 460.825.88 Y: 4168.653.59 LENGTH OF ROCK DRILLING 190.00 m DRILLED BY DSI

ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 81.20 m LOGGED BY JICA

BEARING OF ANGLE HOLE - CORE RECOVERY $\frac{81.20}{190} = 89.2\%$

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	LUGEON				
180.0			0 → 100%								179.00	560.076	
1	Dolomitic limestone				Gray	2	2	3	180.0 ~ 190.0 m (End of drill hole): Dolomitic limestone.	Lu = 0 Po max. = 10.0 kg/cm ²			
2													
3													
4													
5													
6													
7													
8													
188.0											179.00		
1													
2													
3													
4													
5													
6													
7													
8													
9												557.076	
189.0													
1													
2													
3													
4													
5													
6													
7													
8													
9													
190.0												550.076	
1													
2													
3													
4													
5													
6													
7													
8													
9													
0													



driller's note

1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain

1 (hard) - 5 (soft)

1 (fresh) - 5 (decomposed)

Water table after drilling → 0.30

Water table before drilling → 0.50

GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. PB-1 (SHEET 1 OF 4)

LOCATION	POWER PLANT	DEPTH OF HOLE	71.00 m	COMMENCED	25 - 5 - 1988
ELEVATION	391.912 m	DEPTH OF OVERBURDEN	4.00 m	COMPLETED	16 - 6 - 1988
COORDINATE	X 482.758 Y 4.166.135.83	LENGTH OF ROCK DRILLING	67.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90	TOTAL LENGTH OF CORE	70.37 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	99.1 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0 → 100%							LUGEON	m	0m	391.912
0.5	Talus deposit	△				Brown							
3.3						Dark gray							
4.0						Brown				Lu = (10)			387.912
4.0 ~ 25.5 m						Brownish dark green				Po max. = 3.0 kg/cm ²	2.40		
4.0 ~ 25.5 m	Sandstone (graywacke)					W					3.07		
4.0 ~ 7.5 m						W				Lu = (22)			
4.0 ~ 7.5 m	Many oxidation cracks.					W				Po max. = 5.0			
8.45 ~ 8.60 m	Microscopic observation.					W				Lu = (12)			
8.45 ~ 8.60 m	Microscopic observation.					W				Po max. = 5.0	4.75		
9.9 m	Calcite vein 1mm wide (45° dip)					W				Lu = 9.8	4.75		
9.9 m	Calcite vein 1mm wide (45° dip)					W				Po max. = 10.0			
11.3						W				Lu = 10.5			
12.0						W				Po max. = 10.0			
14.1	Horizontal oxidation crack.					W				Lu = 4.9	5.32		
14.1	Horizontal oxidation crack.					W				Po max. = 10.0	11.00		
16.0						W				Lu = 6.8			
16.0						W				Po max. = 10.0			
17.0						W				Lu = 5.4	11.25		
17.0						W				Po max. = 10.0	11.00		
17.5						W				Lu = 5.8			
17.5						W							
18.0						W							
19.5						W							
19.5						W							
20						W							371.912

driller's note

1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 (grain)

1 (hard) - 5 (soft)

1 (fresh) - 5 (decomposed)

Water table after drilling → 0.30

Water table before drilling → 0.50

core loss

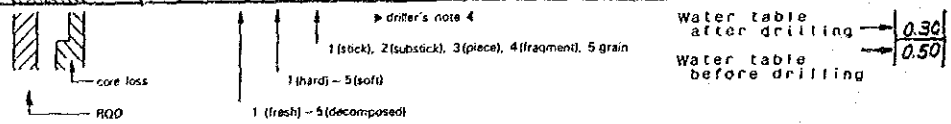
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GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **PB-1** (SHEET **2** of **4**)

LOCATION **POWER PLANT** DEPTH OF HOLE **71.00 m** COMMENCED **25-5-1988**
 ELEVATION **391.912 m** DEPTH OF OVERBURDEN **4.00 m** COMPLETED **16-6-1988**
 COORDINATE **X: 462 758.59** LENGTH OF ROCK DRILLING **67.00 m** DRILLED BY **DSI**
Y: 4 166 135.85 TOTAL LENGTH OF CORE **70.37 m** LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90°** CORE RECOVERY **99.1 %**
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
2.0m			0 → 100%							LUGEON	m	0m	371.912 ^m
1	Sandstone			ø86 mm	Greenish gray	2	3	20.5	20.5~21.0m, 21.6~22.5m and 23.0~23.5m: Fragment cores, cracky zones.	P _{max} = 10.0 kg/cm ²	Lu = 4.1	11.12	366.412
2								21.0				11.03	
3								21.6				11.03	
4								22.5					
5								23.0					
6								23.5					
7								24.0					
8								24.6					
9								25.0					
10								25.5					
11	Shale			ø76 mm	Dark gray	3	3	25.7	25.5~49.2m: Greenish gray ~ purple shale. Boundary dip is 35° at 25.5m.	P _{max} = 10.0	Lu = 0	18.30	
12								26.5				20.40	
13								27.0				19.84	
14								27.7				27.21	
15								28.4					
16								28.7					
17								29.4					
18								30.0					
19								30.5					
20								31.3					
21	Shale			ø76 mm	Greenish gray	3	3	31.3	25.7~26.5m: Dark gray shale, lamina 40° dip.	P _{max} = 10.0	Lu = 0	22.76	
22								32.0				22.76	
23								32.0m and 33.0m: oxidization cracks.					
24								33.9~34.0m: Fragment cores.					
25								34.0					
26								35.5					
27								36.0					
28								37.0					
29								38.4					
30								39.0					
31	Shale			ø76 mm	Greenish gray Purple	3	4	38.4	34.96	P _{max} = 10.0	Lu = 0	20.25	
32								39.0				23.85	
33								39.5				20.25	
34	Shale			ø76 mm	Greenish gray Purple	3	4	39.0	34.96	P _{max} = 10.0	Lu = 0	20.02	
35								39.5				20.02	
36								40.0				20.02	
40													351.912

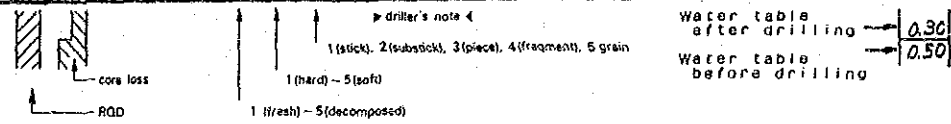


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. **PB-1** (SHEET 3 of 4)

LOCATION **POWER PLANT** DEPTH OF HOLE **71.00** m COMMENCED **25-5-1988**
 ELEVATION **391.912** m DEPTH OF OVERBURDEN **4.00** m COMPLETED **16-6-1988**
 COORDINATE **X: 452.758, Y: 4.166.135.83** LENGTH OF ROCK DRILLING **67.00** m DRILLED BY **DSI**
 ANGLE FROM HORIZONTAL **90** ° TOTAL LENGTH OF CORE **70.37** m LOGGED BY **JICA**
 BEARING OF ANGLE HOLE **-** CORE RECOVERY **99.1** %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
4.0m			0-100%							LUGEON	m	0m	351.912 ^m
1	Shale				Greenish gray	2	2	3	40.1	40.5m: Lamina 35° dip.	P _{o max.} = 10.0 KJ/cm ²	8.70	
2					Greenish gray	2	2	3	41.9	42.0-42.5m core: Laboratory test.	P _{o max.} = 10.0	24.00	
3					Purple	2	2	3	43.5		P _{o max.} = 10.0	18.84	
4					Purple	2	2	3	44.6	43.5-44.6m: Fragment cores.	P _{o max.} = 10.0	18.84	
5					Greenish gray	2	2	3	45.6		P _{o max.} = 10.0		
6					Greenish gray	2	2	3	46.0		P _{o max.} = 10.0		
7					Greenish gray	2	2	3	46.4		P _{o max.} = 10.0	8.57	
8					Greenish gray	2	2	3	47.5		P _{o max.} = 10.0	22.80	
9					Greenish gray	2	2	3	47.7		P _{o max.} = 10.0		
50		Sandstone				Greenish gray	2	2	3	49.2	Boundary dip is 45° at 49.2m.	P _{o max.} = 10.0	22.80
1					Greenish gray	2	2	3	50.1	49.2-60.5m: Greenish gray sandstone.	P _{o max.} = 10.0		
2					Greenish gray	2	2	3	50.7		P _{o max.} = 10.0		
3					Greenish gray	2	2	3	52.8	52.8-54.5m: Many oxidization cracks.	P _{o max.} = 10.0	9.24	
4					Greenish gray	2	2	3	54.5		P _{o max.} = 10.0	22.80	
5					Greenish gray	2	2	3	55.3	55.3-55.9m core: Laboratory test.	P _{o max.} = 10.0		
6					Greenish gray	2	2	3	58.2	58.2-58.35m core: Microscopic observation.	P _{o max.} = 10.0		
7					Greenish gray	2	2	3	59.3		P _{o max.} = 10.0	10.00	
8					Greenish gray	2	2	3			P _{o max.} = 10.0	10.00	
60											P _{o max.} = 10.0		331.912



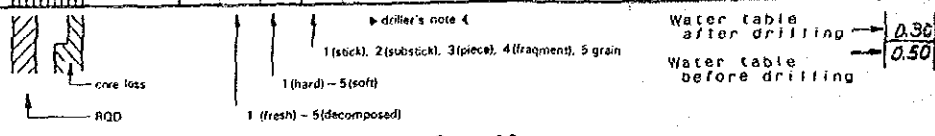
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. PB-1 (SHEET 4 OF 4)

LOCATION	POWER PLANT	DEPTH OF HOLE	71.00 m	COMMENCED	25 - 5 - 1988
ELEVATION	391.912 m	DEPTH OF OVERBURDEN	4.00 m	COMPLETED	16 - 6 - 1988
COORDINATE	X: 462 758 859 Y: 4186 135 85	LENGTH OF ROCK DRILLING	67.00 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	70.37 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	99.1 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0 → 100%							LUGEON	m	0m	391.912m
0.5	SS				Greenish gray	2-3	2	3	60.5	$P_{max} = 10.0$ kg/cm ²	9.33	1	321.412
1					"	2	2	3	60.5 ~ 64.0m: Shale.	$L_u = 0$	22.69		
2	Shale				Purple	2	2	3		$P_{max} = 10.0$			
3					"	3	3	4					
4	Sandstone				Greenish gray	2	2	3	64.0	$L_u = 0$			327.912
5					"	2	2	3	64.0 ~ 65.5m: Sandstone.	$P_{max} = 10.0$	9.30		
6					"	2	2	3	65.5	$L_u = 0$	9.30		326.412
7	Shale				Purple	2	3	3	66.0 ~ 66.15m core: Microscopic observation.	$P_{max} = 10.0$	9.30		
8					"	2	3	4	65.5 ~ 70.0m: Shale.	$L_u = 0$	29.50		
9					"	2	3	4	67.0	$P_{max} = 10.0$	9.08		
10					"	2	3	4	70.0	$L_u = 0$	28.50		321.912
11	SS				Greenish gray	2	2	3	70.0 ~ 71.0m: Sandstone.	$P_{max} = 10.0$			
12					"	2	2	3	71.0 End of drill hole		34.96		320.912
13									R.Q.D (A _w) = 48%				



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. **PB-2** (SHEET 1 OF 4)

LOCATION	PENSTOCK	DEPTH OF HOLE	70.00 m	COMMENCED	7 - 4 - 1988
ELEVATION	521.353 m	DEPTH OF OVERBURDEN	2.25 m	COMPLETED	24 - 5 - 1988
COORDINATE	X: 477,565.39 Y: 4166,145.90	LENGTH OF ROCK DRILLING	67.75 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	68.85 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	98.4 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	COMMENTARY KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION			
0m			0 → 100%								0m	521.353 m
0-2.25	Talus deposit	△			Gray				0-2.25 m: Talus deposit. Limestone gravels φ20cm.	Lu = (0) P _{max} = 3.0 kg/cm ²		
2.25					Light gray				2.25 ~ 56.0 m: Massive limestone.	Lu = (7) P _{max} = 3.0	1.00	519.103
3.1						2	3				1.00	
4.5							3			Lu = (19) P _{max} = 5.0		
5.4									5.4 ~ 8.5 m: Many solution cracks, 70°-80° dip		1.90	
8.5							2			Lu > 100 P _{max} = 0	6.00	
8.5										Lu > 100 P _{max} = 0		
10.00	Limestone				Gray		3				10.00	
10.00										Lu = (80) P _{max} = 5.0		
14.00							2		14 ~ 16 m: Meshy calcite vein.	Lu = (67) P _{max} = 5.0	14.00	
14.00												
15.0							2		15.8 ~ 16.0 m and 17.2 ~ 17.5 m: Fragment cons.	Lu > 100 P _{max} = 1.0		
15.8							4					
16.0												
17.2							2			Lu = 36.5 P _{max} = 10.0		
17.2							4					
17.5												
18.5							1		18.5 m: Solution crack 70°-80° d.p.	Lu = 21.0 P _{max} = 10.0	16.50	
18.5							3				16.50	
19.5												
20.0							2					501.353

driller's note

1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain

1 (hard) - 5 (soft)

1 (fresh) - 5 (decomposed)

Water table after drilling → 0.30

Water table before drilling → 0.50

core loss

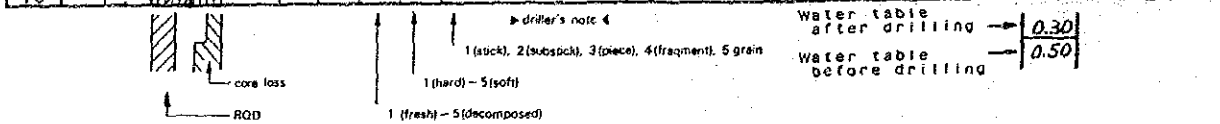
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GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. PB-2 (SHEET 2 of 4)

LOCATION PENSTOCK DEPTH OF HOLE 70.00 m COMMENCED 7 - 4 - 1988
 ELEVATION 521.353 m DEPTH OF OVERBURDEN 2.25 m COMPLETED 24 - 5 - 1988
 COORDINATE X 462,565.39 LENGTH OF ROCK DRILLING 67.75 m DRILLED BY DSI
Y 4166,145.90 TOTAL LENGTH OF CORE 68.85 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90 CORE RECOVERY 98.4 %
 BEARING OF ANGLE HOLE -

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER			
2.0m			0 → 100%								LUGEON	m	0m	501.353m
1											Lu > 100			
2											P _{max} = 1.0 kg/cm ²	22.00	22.00	
3											Lu > 100			
4											P _{max} = 1.0			
5											Lu > 100	25.00	25.00	
6											P _{max} = 1.0			
7											Lu > 100			
8											P _{max} = 1.0			
9											Lu = 16.0			
10											P _{max} = 10.0	30.00	30.00	
11											Lu = 25.0			
12											P _{max} = 10.0	32.00	32.00	
13											Lu > 100			
14											P _{max} = 1.0	34.00	34.00	
15											Lu = 25.0			
16											P _{max} = 10.0	36.00	36.00	
17											Lu = (96)			
18											P _{max} = 1.0			
19											Lu = (87)	39.00	39.00	
20											P _{max} = 1.0			



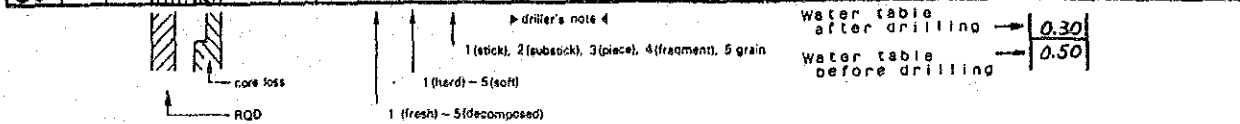
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. PB-2 (SHEET 3 OF 4)

LOCATION	PENSTOCK	DEPTH OF HOLE	70.00 m	COMMENCED	7 - 4 - 1988
ELEVATION	521.353 m	DEPTH OF OVERBURDEN	2.25 m	COMPLETED	24 - 5 - 1988
COORDINATE	X 462,565.39 Y 4,166,145.90	LENGTH OF ROCK DRILLING	67.75 m	DRILLED BY	DSI
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	68.85 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	-	CORE RECOVERY	98.4 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION						
					COLOR	WEATHERING	HARDNESS	CORE CUTTING										
4.0m			0 → 100%							LUGEON	m	0m	481.353m					
1	Limestone	[Pattern]	[Pattern]	[Pattern]	Gray	3	2	3	44.0	Lu = 66 P _{max} = 2.0 kg/cm ²	42.00	42.00						
2																		
3														Lu = 24.0 P _{max} = 8.0				
4																		
5															Lu = 8.0 P _{max} = 10.0			
6																45.45	45.45	
6																		
7																44.0 ~ 51.5m: Few solution crack.		
8																	47.8	48.2
8																		
9	47.8 ~ 48.2m: Fragment cores, many thin organic material layers.																	
50		45.10	48.20															
0																		
1		Lu = 5.3 P _{max} = 10.0																
2																		
3			Lu = 0 P _{max} = 10.0															
4				53.82m	49.10													
4																		
5				Lu = 0 P _{max} = 10.0														
6					49.10	49.10												
6																		
7	56.0 ~ 64.2m: Sandstone contained organic material.																	
8					54.46	52.29												
8																		
9		Lu = 0 P _{max} = 10.0																
60			54.46		465.353													
0																		

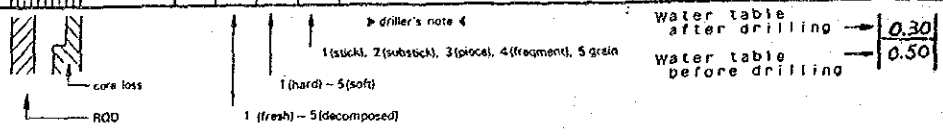


GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT **HOLE No. PB-2 (SHEET 4 of 4)**

LOCATION **PENSTOCK** DEPTH OF HOLE **70.00 m** COMMENCED **7 - 4 - 1988**
 ELEVATION **521.353 m** DEPTH OF OVERBURDEN **2.25 m** COMPLETED **24 - 5 - 1988**
 COORDINATE **X: 462,565.39** LENGTH OF ROCK DRILLING **67.75 m** DRILLED BY **DSI**
Y: 4,162,145.90 TOTAL LENGTH OF CORE **68.85 m** LOGGED BY **JICA**
 ANGLE FROM HORIZONTAL **90°** CORE RECOVERY **98.4 %**
 BEARING OF ANGLE HOLE **-**

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
0m			0 → 100%							LUGEON	m	0m	447.353 m
0-1	Sandstone	[Pattern]			Dark gray	2	4	4	5	Cores are brittle. Core recovery 60~90%.	Lu=0	54.46	457.153
1-2											P _{o max.} = 10.0 kg/cm ²	54.46	
2-3											Lu=0	54.60	
3-4											P _{o max.} = 10.0	54.60	
4-5	Limestone	[Pattern]			Gray	2	3	3	64.2~70.0m (End of drill hole): Limestone	Lu=0	54.60		
5-6										P _{o max.} = 10.0	50.24		
6-7										Lu=0	49.56		
7-8									67.80~67.95m core: Microscopic observation.	P _{o max.} = 10.0	49.56		
8-9									68.8~69.2m core: Laboratory test.	Lu=0			
9-10									70.0 End of drill hole	P _{o max.} = 10.0	51.56	457.353	
10-11									R.Q.D (Av.) = 56%				



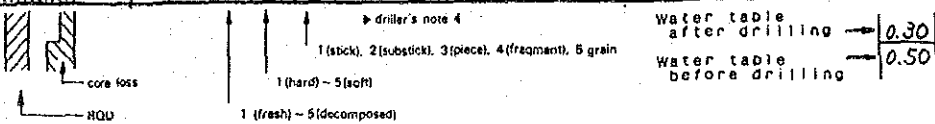
GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SSK-1 (SHEET 1 of 3)

LOCATION Alternative Power Plant DEPTH OF HOLE 50.00 m COMMENCED 23-9-1987
 ELEVATION 520.518 m DEPTH OF OVERBURDEN 35.50 m COMPLETED 9-10-1987
 COORDINATE X 453.591.59 LENGTH OF ROCK DRILLING 15.50 m DRILLED BY DSI
Y 4177.144.65 TOTAL LENGTH OF CORE 31.35 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90° CORE RECOVERY 62.7 %
 BEARING OF ANGLE HOLE -

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION						
0m			0 → 100%									LUGEON	m	0m	520.518
0.7						Brown									
1															
2															
3													1.50		
4															
5															
6															
7															
8															
9															
10	Alluvium														
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															500.518



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT HOLE No. SSK-1 (SHEET 2 of 3)

LOCATION Alternative Power Plant DEPTH OF HOLE 50.00 m COMMENCED 23-9-1987

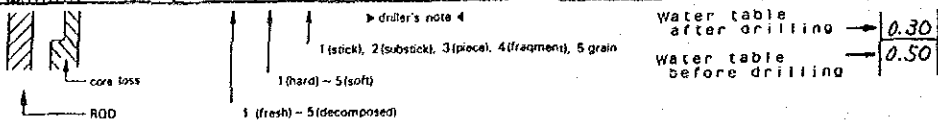
ELEVATION 520.518 m DEPTH OF OVERBURDEN 35.50 m COMPLETED 9-10-1987

COORDINATE X 453.591.39 LENGTH OF ROCK DRILLING 15.50 m DRILLED BY DSI

ANGLE FROM HORIZONTAL 90° TOTAL LENGTH OF CORE 31.35 m LOGGED BY JICA

BEARING OF ANGLE HOLE - CORE RECOVERY 62.7 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER			
20.0			0 → 100%							LUGEON	MT	0m	520.518 m	
1		○							ditto.			20.00	1	
2		○											2	
3		○											3	
4		○											23.00	4
5		○									24.80M		22.50	5
6		○											22.50	6
7	Alluvium	○											19.00	7
8		○											27.00	8
9		○											27.00	9
30		○											27.00	0
1		○										27.00	1	
2		○										29.00	2	
3		○										26.00	3	
4		○										28.50	4	
5		○										26.00	5	
6		○						35.5				10.50	6	
7		○										5.50	7	
8		○										26.50	8	
9	Peridotite	∨						4	Cracky peridotite. Thin serpentine layers are seen along the cracks.	Lu = 4.1			9	
		∨						2		P _{0max} = 10.0 kg/cm ²				
		∨						3						
		∨						3		Lu = 1.7				
		∨						1		P _{0max} = 10.0				
		∨						4				26.00	9	
40												16.00	0	



GEOLOGIC LOG OF DRILL HOLE

GOKTAS PROJECT

HOLE No. SSK-1 (SHEET 3 OF 3)

LOCATION	<u>Alternative Power Plant</u>	DEPTH OF HOLE	<u>50.00</u> m	COMMENCED	<u>23-9-1987</u>
ELEVATION	<u>520.518</u> m	DEPTH OF OVERBURDEN	<u>35.50</u> m	COMPLETED	<u>9-10-1987</u>
COORDINATE	<u>X 463.591.59</u> <u>Y 4.177.144.65</u>	LENGTH OF ROCK DRILLING	<u>15.50</u> m	DRILLED BY	<u>DSI</u>
ANGLE FROM HORIZONTAL	<u>90°</u>	TOTAL LENGTH OF CORE	<u>31.35</u> m	LOGGED BY	<u>JICA</u>
BEARING OF ANGLE HOLE	<u>-</u>	CORE RECOVERY	<u>62.7</u> %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		LEAKAGE OF DRILLING WATER	LUGEON		
4.0m			0 → 100%								m	0m	480.518m
1	Peridotite	✓							Piece and fragment cores continue.	Lu = 1.3		1	
2		✓							No oxidization along cracks.	P _{max} = 10.0 kg/cm ²		2	
3		✓								Lu = 1.0		3	
4		✓								P _{max} = 10.0		4	
5		✓								Lu = 0		5	
6		✓								P _{max} = 10.0		6	
7		✓								Lu = 0		7	
8		✓								P _{max} = 10.0		8	
9		✓								Lu = 0		9	
10		✓								P _{max} = 10.0		10	
50.0									R-Q-D (Av.) = 10%		0	470.518	
									50.0 End of drill hole		0		

