Table A3.4.1 List of Drillhole

Hole No.	Site	Coordinate		Elevation (m)	Length (m)	Hole Diameter (mm)	Direction	Dip	Permeability Test (Stage)
		X	Y						
UB-1	Upper Dam	399,199.00	451,944.50	1,150.00	50.0	75.3 (NQ)		90°	6
UB-2	Ditto	399,294.00	451,945.00	1,103.20	50.0	Ditto	N -> S	60°	10
UB-3	Ditto	399,394.20	451,943.94	1,224.75	50.0	Ditto		90°	2
LB-1	Lower Dam	399,432.50	451,518.00	1,148.76	70.0	Ditto		90°	13
LB-2	Ditto	399,532.82	451,515.20	1,150.00	70.0	Ditto		90°	13
LB-3	Ditto	399,599.44	451,466.66	1,239.25	100.0	Ditto		90°	10
LB-4	Ditto	399,678.70	451,447.35	1,201.32	50.0	Ditto	S14° 43' E	60°	4
PB-1	Power Station	398,047.21	441,460.21	327.93	35.0	Ditto		90°	0
PB-2	Penstock Route	397,546.50	442,085.14	547.29	20.0			90°	0
TOTAL 9 Holes					495.0				58

Table A3.4.2 List of Adit

Adit No.	Site	Coordinate		Elevation (m)	Length (m)	Remark
		X	Y			
UA-1	Upper Dam	399.197.22	451,941.99	1,150.0	50.0	
LA-1	Lower Dam	399,430.75	451,512.99	1,148.76	50.0	
LA-2	Lower Dam	399,540.82	451,528.46	1,160.66	50.0	
TOTAL 3 Adits					150.0	

Table A3.4.3 List of Test Pit

Adit No.	Site	Coordinate		Elevation (m)	Length (m)	Remark
		X	Y			
CP-1	Borrow	399.565.96	453,500.23	1,258.35	5.0	
CP-1	Borrow	399,577.07	453,520.46	1,210.66	5.0	
CP-3	Borrow	399,522.56	453,531.96	1,192.61	5.0	
TOTAL 3 Pits					15.0	

A-3-5 Geologic Log of Drillehole

			Sheet No.
(1)	UB-1	(Drilled Length : 50 m)	1 to 3
(2)	UB-2	(Drilled Length : 50 m)	4 to 6
(3)	UB-3	(Drilled Length : 50 m)	7 to 9
(4)	LB-1	(Drilled Length : 70 m)	10 to 13
(5)	LB-2	(Drilled Length : 70 m)	14 to 17
(6)	LB-3	(Drilled Length : 100 m)	18 to 22
(7)	LB-4	(Drilled Length : 50 m)	23 to 25
(8)	PB-1	(Drilled Length : 35 m)	26 to 27
(9)	PB-2	(Drilled Length : 20 m)	28

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-1 (SHEET 1 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	10 - 2 -1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	2.90 m	COMPLETED	18 - 2 -1991
COORDINATE	X 399,199.00 Y 451,944.50	LENGTH OF ROCK DRILLING	47.10 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	45.51 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	91.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON 0–40)	DEPTH
0m			0→100%								0m
1	Overburden	△ ~ △ ~ △		NQ (Bit size) NX casing pipe	Brown				Gravelish cores at 0m–0.4m; slimes at 0.4m–2.9m. Topsoil, talus and probably residual soil or strongly weathered rocks at 0m–2.9m.		1
2									2.9		2
3	Medium-grained sandstone with fine-grained sandstone bands.				Brown ~ grey	4 / 3	2-3 / 3-4 / 2-3 / 5	3 / 4 / 3 / 5	Rather hard cores, discolored gravelis cores and slimes. Probably very loosened rocks.		3
4									4.2		4
5					dark grey	3 / 5 / (4)	3 / 5 / (4)	4 / 5 / 3	Generally gravelish, discolored cores and partially sound and rather fresh cores.		5
6											6
7					Dark brown	3	3 / 5 / 2	2 / 5 / 3	Probably loosened and weathered rocks. Laminae (dipping at about 15° from horizon) are recognizable in part.	(d) 5	7
8											8
9											9
10					Dark brown ~ grey	3 / 5 / (4)	3 / 5 / (4)	4 / 5 / (3)		(c) No Lugeon tests	10
11									11.5		11
12					Greyey brown ~ yellowish brown	3 / 5 / 4	3 / 5 / 4	4 / 5 / (5)	Core loss in part and gravelish and discolored cores only. Probably weathered, cracky and loosened at 11.5m–17.00m.		12
13							2	2-3			13
14		BP 15							17.0		14
15	Conglomerate	0			Dark grey ~ grey	2 / 1	2 / 5 / (3) / 3-4 / 2 / 5 / (3)	2 / 4-3 / 3	Sandstone interbedded with conglomerate. Cracky in part.	(c)	15
16											16
17	Medium-g. SS.					3	3	3-(4)			17
20											20

▶ driller's note ◀

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

core loss

RQD

1 (hard) – 5 (soft)

1 (fresh) – 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-1 (SHEET 2 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	10 - 2 -1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	2.90 m	COMPLETED	18 - 2 -1991
COORDINATE	X 399,199.00 Y 451,944.50	LENGTH OF ROCK DRILLING	47.10 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	45.51 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	91.0 %		

Rock name: Medium-grained sandstone with fine-grained sandstone bands; M.-grained SS; Fine-grained with f.-grained SS; sandstone

Cementation / kind of bit / casing: NQ (Bit size)

Observation of core:

Depth	Color	Weathering	Hardness	Core cutting	Description
20m–21.4	Dark grey (with brown ~ yellowish brown planes in part)	2	3	3 (4)	At 20m~40m, partially hard and massive, but somewhat cracky as a whole.
21.4–23.4	Dark grey (with brown ~ yellowish brown planes in part)	2	2 (1)	2 (3)	Longitudial cracks with weathered planes at 20.7m–21.4m.
23.4–28.8	Dark grey ~ grey	(3)	2 (3)	2 3	Dip of lamina (bedding plane) at 15°–20°
28.8–29.8	Brown ~ grey	3 ~ 4	3 4	3 (4)	Cracky and discolored due to weathering.
29.8–33.15	Dark grey ~ grey (Brown ~ grey)	2 (3)	2 (3)	2 3	
33.15–33.55	Dark grey ~ grey	3~4	3~4	3~4	Cracky and discolored by weathering.
33.55–40	Dark grey ~ grey	2 (3)	2 (3)	2 3	The finer-grained part, the darker-colored part (Fine-grained sandstone at 34.5m–37.3m).
	Dark grey ~ grey	2	2 (1)	2 1	

Water table / water pressure test / leakage of drilling water — Lugeon

No Lugeon test

21.8m (13 Lu) $P_{max} = 7.5$ kgf/cm²

25.0m (> 52.7 Lu) $P_{max} = 7.8$ kgf/cm²

30.0m 1.6 Lu $P_{max} = 13.3$ kgf/cm²

35.0 0.15 Lu $P_{max} = 14.0$ kgf/cm²

40.0m

B.P 10°; B.P 15°; B.P 20°; B.P 15°; B.P 15°

core loss; RQD

▶ driller's note ◀: 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain; 1 (hard) – 5 (soft); 1 (fresh) – 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-1 (SHEET 3 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	10 - 2 - 1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	2.90 m	COMPLETED	18 - 2 - 1991
COORDINATE	X 399,199.00 Y 451,944.00	LENGTH OF ROCK DRILLING	47.10 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	45.51 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	91.0 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER	LUGEON	DEPTH	ELEVATION
4.0m			0 → 100 %								0 — 40	4.0m	
1	Medium-grained sandstone with fine-grained sandstone			NQ (Bit size)	Grey ~ dark grey	2 ~ (3)	2 ~ (3)	2 ~ 3	Partially cracky and some planes are discolored.	(c)	40.0m; 3.3 Lu; Pmax = 13.2 kgf/cm²		
2							3~4 ~ (3)	3~4 ~ 3					
3					Grey ~ brownish grey	3 ~ (4)	3 ~ (4)	4 ~ 3	Gravelish and discolored cores are remarkable as a whole. Weathered and cracky part.	(d) ~ (c)	45.0m		
4													
5													
6		B.P 20°			Grey ~ dark grey	2 ~ (1)	2 ~ (1)	2 ~ (3)	Somewhat discolored planes are observable in part, but generally rather massive.	(c) ~ (b)	45.7m; 2.1 Lu; Pmax = 13.4 kgf/cm²		
7													
8		B.P 15°											
9											50.0m		
50									Bottom of hole at 50.0m			50	

Note on Lugeon tests;
- The Lugeon value with ( ) is estimated from the P-Q curve.

core loss
RQD
1 (fresh) – 5 (decomposed)
1 (hard) – 5 (soft)
▶ driller's note ◀
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-2 (SHEET 4 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	20-11-1990
ELEVATION	1,103.20 m	DEPTH OF OVERBURDEN	1.13 m	COMPLETED	30-11-1990
COORDINATE	X 399,294.00 / Y 451,945.00	LENGTH OF ROCK DRILLING	48.87 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	60.0°	TOTAL LENGTH OF CORE	48.85 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	N→S	CORE RECOVERY	97.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION / KIND OF BIT / CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION
0m			0 ⇔ 100%						
1.13–1.5	Riverbed deposits			NX Casing pipe	Yellowish brown				Medium-grained sand with a few small gravels.
1.5–20	Medium-grained sandstone with fine-grained sandstone bands	BP 30°, BP 25°, BP 30°		NQ (Bit size)	dark grey / Grey	2, 1	2, 3	2, 3, 2, 1	Full core recovery in rocks. Medium-grained sandstone with fine-grained sandstone bands. Obrique laminae (corresponding to the bedding planes) are recognized on the columnar cores in general. Most of cores are hard, compact and fresh, but very slightly exfoliative along the laminae, in part. Some of joints and/or cracks are slightly discolored along their planes. According to the Lugeon tests, rocks at 1.5m to about 20m are somewhat permeable, as a whole.
17.2							3	4	Quartz vein with some pyrite cristals at around 17.2m.
19.35							2		Obrique quartz vein (thickness: 1.5cm) at 19.35m.

WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER — LUGEON (0 – 40)

Depth	Lugeon	Pmax
1.8m	(4.2 Lu)	Pmax = 5.24 kgf/cm²
5.0m	(39 Lu)	Pmax = 5.2 kgf/cm²
10.0m	8 Lu	Pmax = 10.16 kgf/cm²
15.0m	19.5 Lu	Pmax = 10.23 kgf/cm²
20.0m		

(c) (b)

▶ driller's note ◀
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) – 5 (soft)
1 (fresh) – 5 (decomposed)
core loss
RQD

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-2 (SHEET 5 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	20-11-1990
ELEVATION	1,103.20 m	DEPTH OF OVERBURDEN	1.13 m	COMPLETED	30-11-1990
COORDINATE	X 399,294.00 Y 451,945.00	LENGTH OF ROCK DRILLING	48.87 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	60.0°	TOTAL LENGTH OF CORE	48.85 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	N→S	CORE RECOVERY	97.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION
20m–40m	Medium-grained sandstone with fine-grained sandstone bands	B.P 20°	0→100%	NQ (Bit size)	Grey ~ light grey ~ dark grey	1 / 2	2 / 1	1, 1, 2, 3, 1, 1, 2, 2, 1, 1, 2, 3, 2	At 20m–40m, hard compact and fresh as a whole, but very slightly exfoliative in part. Partially cross-joints (to lamina or bedding plane) with very slightly discolored planes are observable. Boundary between medium-grained sandstone and fine-grained sandstone shows a gradual change. According to the Lugeon tests, rocks are impermeable at 20m to 40m.

WATER TABLE
WATER PRESSURE TEST
LEAKAGE OF DRILLING WATER

LUGEON (0 → 40)

20.0m — 0.2 Lu — P_{max} = 10.2 kgf/cm²

25.0m — 0.6 Lu — P_{max} = 10.24 kgf/cm² (b)

30.0m — 0.95 Lu — P_{max} = 10.24 kgf/cm² (a)

35.0m — 1.65 Lu — P_{max} = 10.23 kgf/cm²

40.0m

driller's note: 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain

core loss

RQD

1 (hard) ~ 5 (soft)

1 (fresh) ~ 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB - 2 (SHEET 6 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	20 - 11 -1990
ELEVATION	1,103.20 m	DEPTH OF OVERBURDEN	1.13 m	COMPLETED	30 - 11 -1990
COORDINATE	X 399,294.00 Y 451,945.00	LENGTH OF ROCK DRILLING	48.87 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	60.0°	TOTAL LENGTH OF CORE	48.85 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	N→S	CORE RECOVERY	97.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE: COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
40m			0 ⇒ 100%							0 — LUGEON — 40	40m	m
1	Medium-grained sandstone with fine-grained sandstone bands			NQ (Bit size)	Grey			2	At 40m-49m, hard, compact, and fresh as a whole.	40.0m	1	
2						2		3	Some joints and/or cracks with very slightly discolored planes.	0.85 Lu	2	
3					Light grey		2	2	Whity cores at 41.3m-41.5m.	(b) Pmax = 10.23 Kgf/cm²	3	
4						5	5	5			4	
5						1		1		45.0m	5	
6					Grey ~ dark grey		1			(a) 2.2 Lu	6	
7								3			7	
8								2		Pmax = 10.23 Kgf/cm²	8	
9							2	3	Somewhat cracky at 49m-50m.		9	
50							5 (3)	5 (4)	Bottom of hole at 50.0m	50.0m	50	

Note on Lugeon tests:
- The Lugeon value with ( ) is estimated from the P-Q curve.

core loss — RQD — ▶ driller's note ◀ — 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain — 1 (hard) ~ 5 (soft) — 1 (fresh) ~ 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
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GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-3 (SHEET 7 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	30 - 10 - 1990
ELEVATION	1,224.75 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	11 - 11 - 1990
COORDINATE	X 399,394.20 Y 451,943.94	LENGTH OF ROCK DRILLING	50.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0 °	TOTAL LENGTH OF CORE	43.36 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	86.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE: COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON 0–40)	DEPTH	ELEVATION
0m			0 → 100%								0m	m
1–5.0	Residual soil & strongly weathered sandstone (mainly medium-grained)		Core	NX Casing pipe	Cores: Brown~grey Slimes: Brown	5	5	5	Gravelish and discolored cores and brownish sandy slime at 0m–5m. Probably residual soil and strongly weathered sandstone.	(e)		
						5	5	5				
						4	4	(4)		5		
5.0–10.2				NQ (Bit size)	Brown ~ grey	4	4	4	At 5.0m–10.0m. core recovery is about 50% or less. Only brown~grey gravelish cores are recovered. Probably brittle, cracky, and loosened rocks by weathering.	(d)		
						5	5	5				
						(5)	(5)	5				
10.2–20	Medium-grained sandstone partially with fine-grained sandstone bands.				Grey ~ greyey brown ~ brown		3	3	Generally core length is less than 15cm. Discolored and gravelish cores in part.			
							5	5				
							(4)	(4)				
							3~4	4~3				
						3			Possibly very cracky and somewhat loosened rocks.	(d)		
							3	3				
						5				5		
							5	5				
							(2)	(4)		(c)		
						(4)						
							3~4	4~3				
							3~(2)	3~(4)				

No Lugeon tests

core loss — RQD — 1 (fresh) – 5 (decomposed) — 1 (hard) – 5 (soft) — driller's note: 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-3 (SHEET 8 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	30 - 10 - 1990
ELEVATION	1,224.75 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	11 - 11 - 1990
COORDINATE	X 399,394.20 Y 451,943.94	LENGTH OF ROCK DRILLING	50.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	43.36 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	86.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION
20m			0 ⇒ 100%						
1	Medium-grained sandstone, partially with fine-grained sandstone bands.			NQ (Bit size)	Grey ~ brownish grey	3	3	3	Generally very cracky
						5	5	5	
						(4)	2	(4)	
									21.5
2					Greyey brown	3	3	4	Discolored and gravelish cores with partially clayey materials at 21.5m-23.5m.
						5	5	5	
3						4	4	(3)	
									23.5
4					Grey ~ brownish grey		3	3	Mainly medium-grained sandstone, partially with fine-grained sandstone bands. A few quartz veins along cross-joints. Sorting structure (dipping at 15°-20° from horizontal level) is dimly observable as a whole.
							5	5	
5							(4)	4	
6							2	3	
7							5	5	
8							3	(4)	
9						3			Generally cracky and somwhat weathered rocks at 23.5m-42.15m.
30							3	4	
1						5	5	5	Longwise cracks or joints at 24.0m-24.5m, 31.0m-31.8m and 32.4m-33.2m.
2							(4)	3	
						(4)			
3							3	3	
4							5	5	
5							2	(4)	
6		BP 20°			White grey		3	4	Clear laminae dipping about 20° at 36.0m-36.2m.
							5	5	
7					Grey ~ brownish grey		(4)	3	Some cracks and/or joints are discolored along their planes.
8							3	3	
							5	5	
9							2	(4)	
40									

OBSERVATION OF CORE

WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER — LUGEON (0 – 40)

(d) 5 (c) 5 (d)

No Lugeon tests

35.6m

Packer could not be set at 35.6m.

40.0m

DEPTH — ELEVATION

core loss — ROD — 1 (fresh) ~ 5 (decomposed) — 1 (hard) ~ 5 (soft) — driller's note: 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. UB-3 (SHEET 9 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	30-10-1990
ELEVATION	1,224.75 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	11-11-1990
COORDINATE	X 399,394.20 Y 451,843.94	LENGTH OF ROCK DRILLING	50.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	43.36 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	86.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION, KIND OF BIT, CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON)	DEPTH
40m	Medium-grained sandstone, partially with fine-grained sandstone bands; Coarse-grained sandstone	JP 80°	0 ▸ 100%	NQ (Bit size)	Grey ~ brownish grey	3 / 5 / (4)	3 / 5 / 2 / (4)	3 / 5 / (4)	Lithologically hard but cracky in general.	(C) 40.5m; (d) (13.6 Lu)	40m
									42.15		
					Grey ~ dark grey	2 / 5 / (3)	2 / 5 / (3)	3 / 5 / (2)	Generally hard, compact, and fresh, but somewhat cracky. Some cracks and/or joints are rather discolored along their planes.	Pmax = 9.0 kgf/cm²	
						5	3 / 5 / 2	3 / 5 / 4		(C) 45.0m	
					Grey	(3)	2 / 5 / (3)	3 / 5 / (2)	Partially interbedded with coarse-grained sandstone.	(b) (21 Lu)	
									47.8		
					Dark grey ~ grey	2	2 / 5 / 1	2 / 5 / (3)	Coarse-grained sandstone at 48.1m – 49.0m. Generally massive and fresh.	Pmax = 9.5 kgf/cm²	
50									Bottom of hole at 50.0m	50.0m	50

Notes on Lugeon tests;

- The Lugeon value with ( ) is estimated from the P-Q curve.
- A injection pressure at 10 kgf/cm² could not be kept at 45.0m – 50.0m.

▸ driller's note ◂

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

core loss

RQD

1 (hard) – 5 (soft)

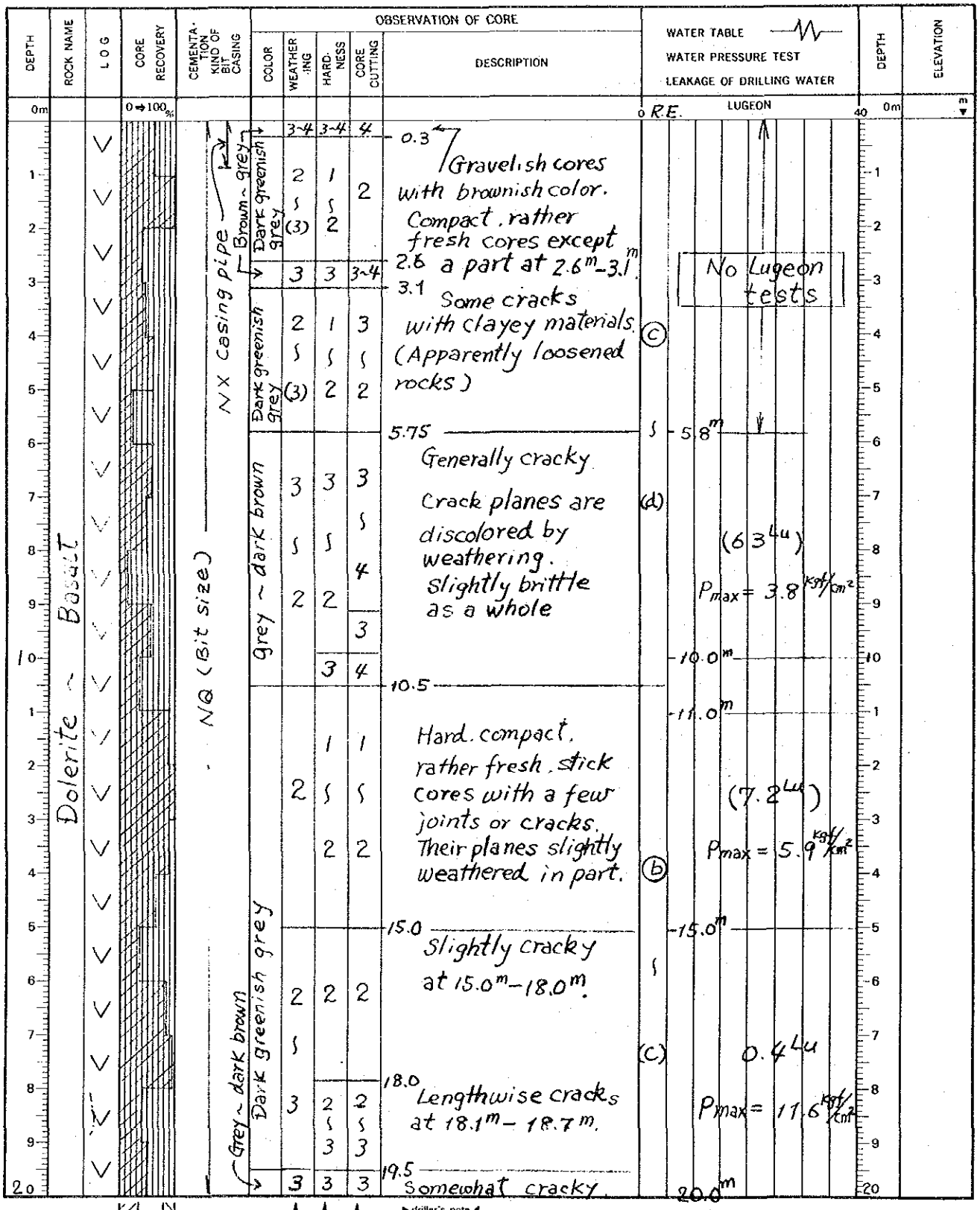
1 (fresh) – 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-1 (SHEET 10 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	5 - 4 -1991
ELEVATION	1,148.76 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	13 - 4 -1991
COORDINATE	X 399,432.50 Y 451,518.00	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.80 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20 %		



ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-1 (SHEET 11 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	5 - 4 -1991
ELEVATION	1,148.76 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	13 - 4 -1991
COORDINATE	X 399,432.50 Y 451,518.00	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.80 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON)	DEPTH	ELEVATION
20m			0 → 100%							0 — 40	20m	m
	Dolerite ~ Basalt			NQ (Bit size)	Grey~dark brown	3	3	3	Somewhat cracky	20.0m		
20.5					Dark greenish grey	2	1	2	Hard, compact. rather fresh. Partially a few calcite veins.	(b) 0.2 Lu; Pmax = 11.5 kgf/cm²		
						2	5	5		(c)		
							2	1				
25.0										25.0m		
					Grey ~ yellowish grey	2	2	3	Somewhat cracky as a whole. Partially discolored by weathering. Slightly brittle at cracky parts.	(c) 1.9 Lu; Pmax = 11.9 kgf/cm²		
						5	5	5	Cracks (dip: 60°~80°) with yellow clay films at 28.3m ~ 29.3m.	30.0m		
						3	3	2		(d) 0.2 Lu; Pmax = 11.9 kgf/cm²		
34.2												
					Grey ~ greenish grey		1	2	Hard, compact, rather fresh. Partially a few calcite veins.	35.0m; (b) 0.2 Lu; Pmax = 13.2 kgf/cm²		
						2	5	5		(c)		
							2	1				
40.3										40.0m		
40											40	

core loss

RQD

1 (fresh) ~ 5 (decomposed)

1 (hard) ~ 5 (soft)

▶ driller's note ◀

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

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-1 (SHEET 12 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	5 - 4 -1991
ELEVATION	1,148.76 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	13 - 4 -1991
COORDINATE	X 399,432.50 Y 451,518.00	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.80 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE: COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION
4.0m			0 ⇒ 100%			2	1~2	2~1	40.3
1	Basalt ~ Dolerite			NQ (Bit size)	Grey ~ brownish grey ~ yellowish brown at joint/crack planes	2	2	3	Generally somewhat cracky. Cracky parts are discolored and slightly brittle by weathering.
2							3	2	Longitudinal cracks with weathered planes at 41.3m – 42.3m and 48.8m – 49.9m.
3							2	2	White and/or calcite veins in part. Slightly brittle in part with veins.
4							(3)	(3)	
5						3	2	3	
6							3	2	
7							2	2	
8							(3)	(3)	
9							2	3	
60							3	2	59.5

WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER	LUGEON	DEPTH	ELEVATION
0 – 40	40.0m	4.0m	m
	16 Lu		
	Pmax = 11.0 kgf/cm²		
	45.0m		
	0.1 Lu		
©	Pmax = 14.2 kgf/cm²		
(d)	50.0m		
	0 Lu		
	Pmax = 14.2 kgf/cm²		
	55.0m		
	0 Lu		
	Pmax = 14.9 kgf/cm²		
	60.0m		

▶ driller's note ◀
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) ~ 5 (soft)
1 (fresh) ~ 5 (decomposed)
core loss
RQD

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-1 (SHEET 13 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00m	COMMENCED	5 - 4 -1991
ELEVATION	1,148.76m	DEPTH OF OVERBURDEN	0.00m	COMPLETED	13 - 4 -1991
COORDINATE	X 399,432.50 Y 451,518.00	LENGTH OF ROCK DRILLING	70.00m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.80m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20%		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE: COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER	LUGEON	DEPTH	ELEVATION
60m			0→100%								0 — 40	60m	m
1–70	Dolerite ~ Basalt			NQ (Bit size)	grey ~ dark grey	2	2	2	Generally fresh. partially somewhat cracky.				
							3	3		(c)	0 Lu; Pmax=14.9 Kgf/cm²		
							2	2					
											65.0m		
							2-3	3		(b)	0 Lu		
					Dark greenish grey		2 ~ 1	2	Longitudinal cracks with slightly weathered planes at 69.4m - 70.0m		Pmax=14.9 Kgf/cm²		
							2-3	3					
70									Bottom of hole at 70.0m		70.0m		

Note on Lugeon tests:
- The Lugeon value with ( ) is estimated from the P-Q curve.

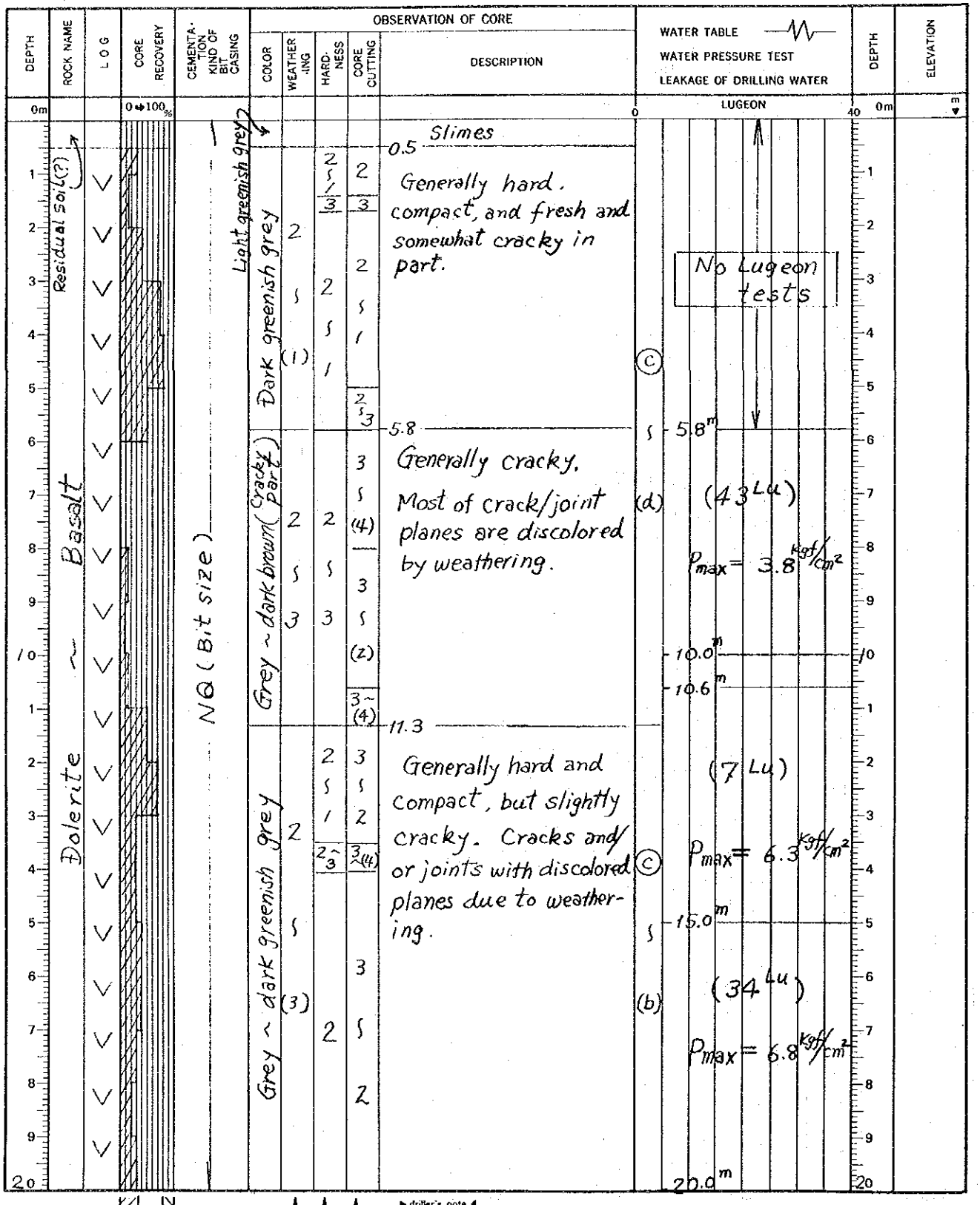
core loss
RQD
▶ driller's note ◀
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) ~ 5 (soft)
1 (fresh) ~ 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB - 2 (SHEET 14 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	8 - 3 -1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	22 - 3 -1991
COORDINATE	X 399,532.82 Y 451,515.20	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.3 %		



▶ driller's note ◀

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

1 (hard) – 5 (soft)

1 (fresh) – 5 (decomposed)

core loss

RQD

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-2 (SHEET 15 of 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	8 - 3 - 1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	22 - 3 - 1991
COORDINATE	X 399,532.82 Y 451,515.20	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
2.0m			0→100%							0 LUGEON 40	2.0m	m
	Dolerite ~ Basalt			NQ (Bit size)	Grey ~ dark greenish grey	2 ~ (3)	2	3 ~ 2	Lithologically hard and compact, but slightly cracky.	(c) ~ (b)		
									21.6	20.0m (7.2 Lu)		
					Grey ~ Yellowish brown (cracky part)	2 ~ 3	2 ~ 3	3	Generally rather cracky.			
						3	3 ~ 2	3 ~ 4	Gravelish and discolored cores at 23.0m ~ 24.0m and 26.4m ~ 26.75m.	(c) ~ (d)		
						2 ~ 3	2 ~ 3	3		25.0m (3 Lu)		
						3	3	3~4	26.75			
					Grey ~ dark greenish grey	2 ~ (3)	2 ~ (3)	2 ~ (3)	Generally hard and compact, but slightly cracky. Most of crack/joint planes are more or less discolored due to weathering.	(c) ~ (b)	30.0m (1.8 Lu)	
							3	3 ~ 4	32.8 Cracky, slightly brittle			
							2 ~ 1	2 ~ (1)	38.7 Recovered some stick cores.			
									36.0			
						2 ~ 3	2 ~ 3	3	Somewhat cracky as a whole. Small/thin white veins in part.	(c) ~ (d)	40.0m (15 Lu)	
							3	3 ~ 4	38.1			
						3	2 ~ (3)	3	39.0 Lengthwise cracks at 39.5m ~ 40.1m 40.6			

▶ driller's note ◀

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

1 (hard) ~ 5 (soft)

1 (fresh) ~ 5 (decomposed)

core loss

RQD

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-2 (SHEET 16 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	8 - 3 -1991
ELEVATION	1,150.00m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	22 - 3 -1991
COORDINATE	X 399,532.82 / Y 451,515.20	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION / KIND OF BIT / CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON)	DEPTH	ELEVATION
4.0m			0→100%							0 — 40	4.0m	
	Dolerite ~ Basalt			NQ (Bit size)	Grey ~ dark greenish grey	2~3	2~(3)	3	Ⓒ ~ (d) 40.6			
1							2	2	Generally hard and compact, but slightly cracky.			
							~ (3)	~ (3)				
2						2	2	2		Ⓒ		
3							~	~				
4						~	1	(1)	Longitudial cracks and/or joints at 45.0m-45.5m, 45.7m-46.2m, and 48.0m-48.9m.	~		
5										(b) 45.0m		
6						(3)	2	2				
7							~	~		14.0 Lu		
8							(3)	(3)		Pmax = 13.8 kgf/cm²		
									48.5			
9					Yellowish brown (Cracky part)		2	3	Somewhat cracky as a whole.			
50							~	~				
							(3)	(2)	Discolored along crack and/or joint planes.	50.0m / 50.5m		
1						2	3	3		Ⓒ		
						~	~	~				
2							(2)	(4)		~		
3					Grey ~ dark greenish grey	(3)	2	2	Longitudial cracks and/or joints at 50.4m-51.0m, 54.0m-54.5m, and 56.2m-57.1m.	0.7 Lu		
							~	~				
4							1	(1)		(d) Pmax = 13.8 kgf/cm²		
								3 (4)				
5							2	3	Somewhat brittle at cracky part.	55.0m / 55.5m		
							~	~				
6							(2)					
							3	3~				
7								(4)	57.0	1.2 Lu		
8					Dark greenish grey	1	2	2	Hard, compact and fresh in lithologic.	Ⓑ		
						~	~	~		~		
9						2	1	1	Generally massive.	(a) Pmax = 13.7 Lu		
60										60.0m		

▶ driller's note ◀

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

1 (hard) – 5 (soft)

1 (fresh) – 5 (decomposed)

core loss

RQD

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB – 2 (SHEET 17 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	8 – 3 –1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	22 – 3 –1991
COORDINATE	X 399,552.82 Y 451,515.20	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER / LUGEON (0 – 40)	DEPTH	ELEVATION
6.0m			0→100%								6.0m	m
1	Dolerite ~ Basalt	✓		NQ (Bit size)	Dark greenish grey	1	2	2	Lithologically hard, compact and fresh. Generally massive. Partially a few oblique joints with very slightly discolored planes.	60.0m; 0.2 Lu; (b) P_{max} = 13.9 kgf/cm²; 5; 65.0m; (a) 0 Lu; P_{max} = 13.9 kgf/cm²; 70.0m		
						1	1	1				
						2	1	1				
7.0									Bottom of hole at 70.0m			

Note on Lugeon tests:
- The Lugeon value with( ) is estimated from the P–Q curve.

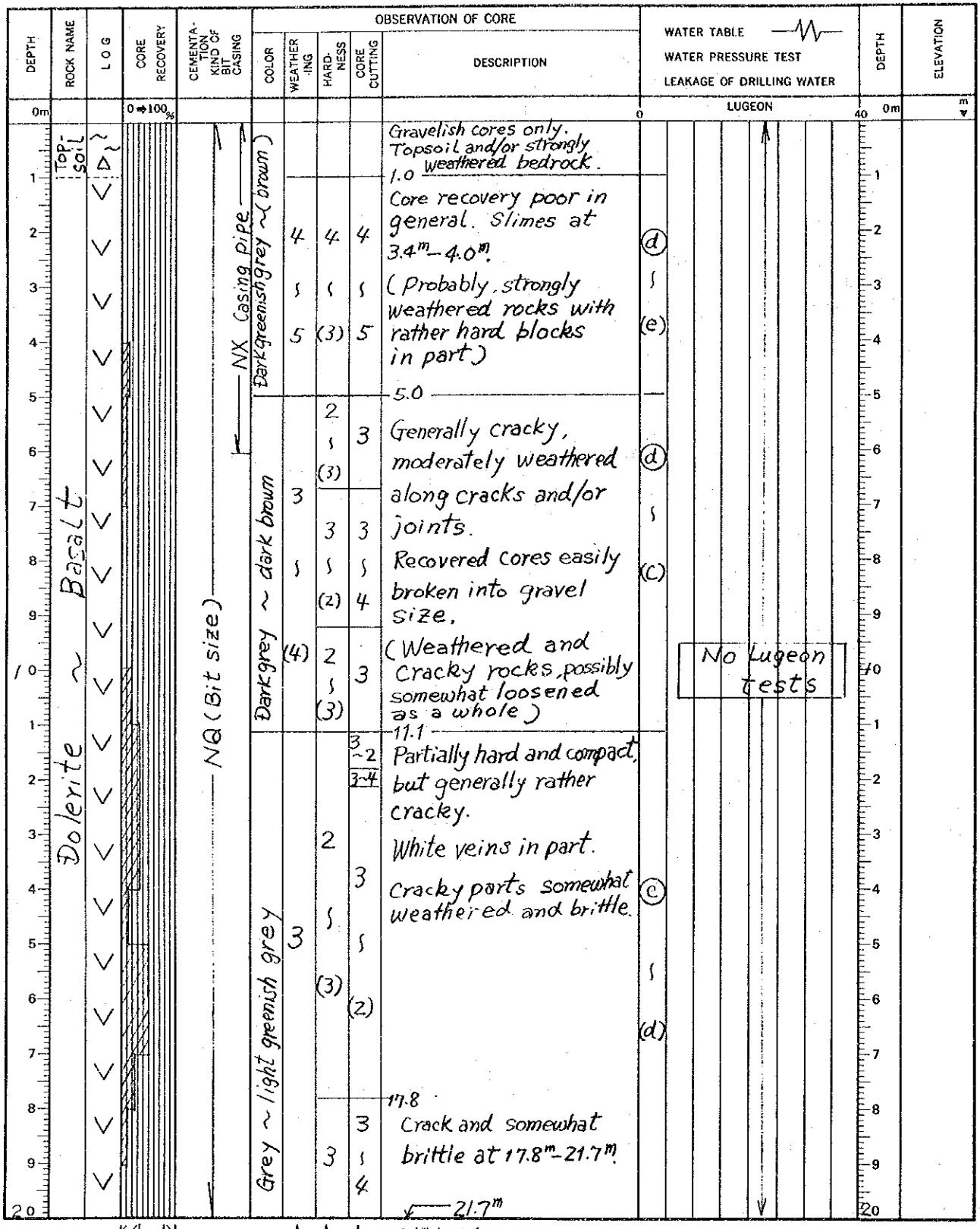
core loss
RQD
▶ driller's note ◀
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) – 5 (soft)
1 (fresh) – 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-3 (SHEET 18 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11 - 12 -1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7 - 1 -1991
COORDINATE	X 399,599.44 Y 451,466.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90°	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9 %		

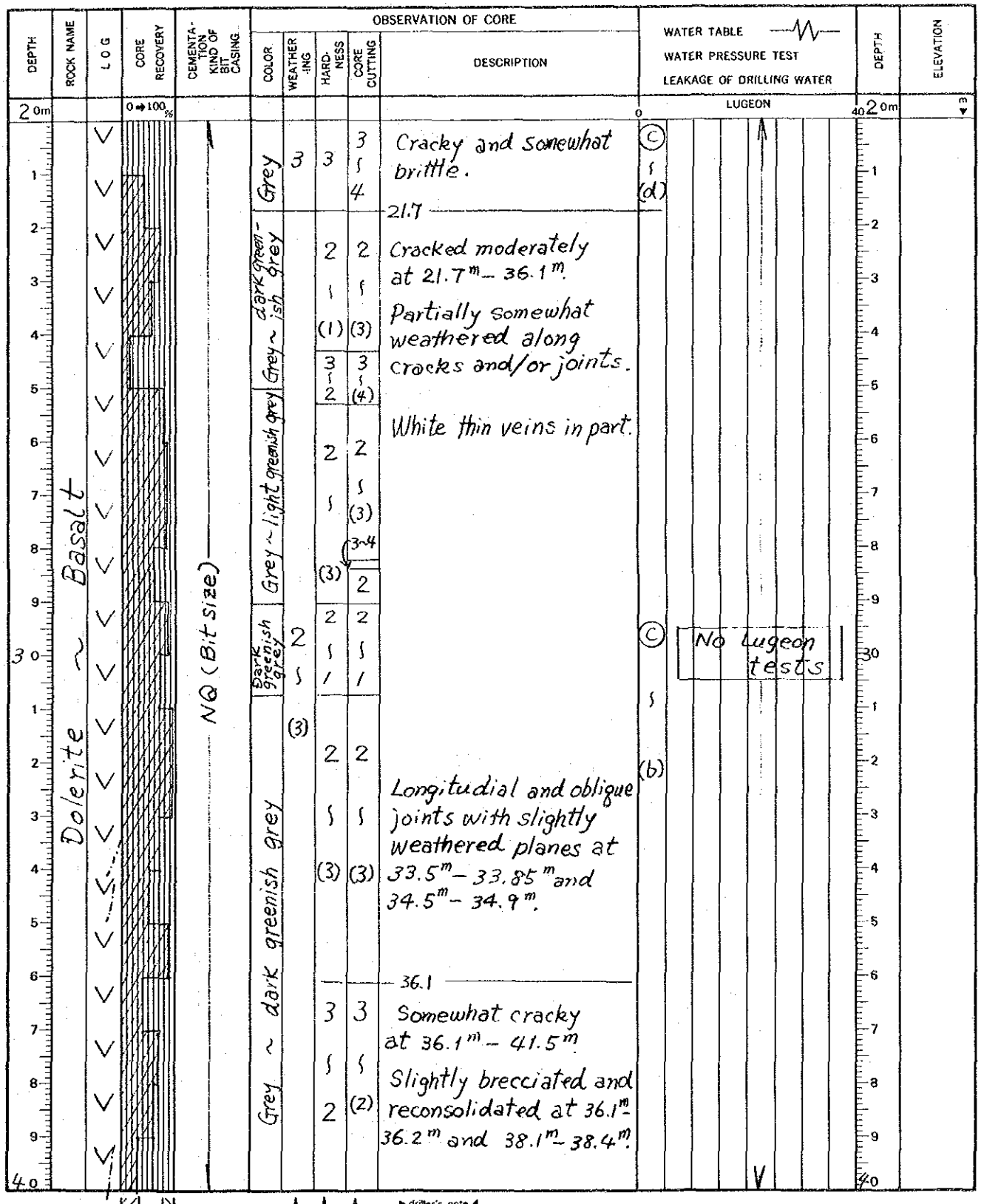


ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-3 (SHEET 19 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11-12-1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7-1-1991
COORDINATE	X 399,599.44 Y 451,466.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90°	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9 %		

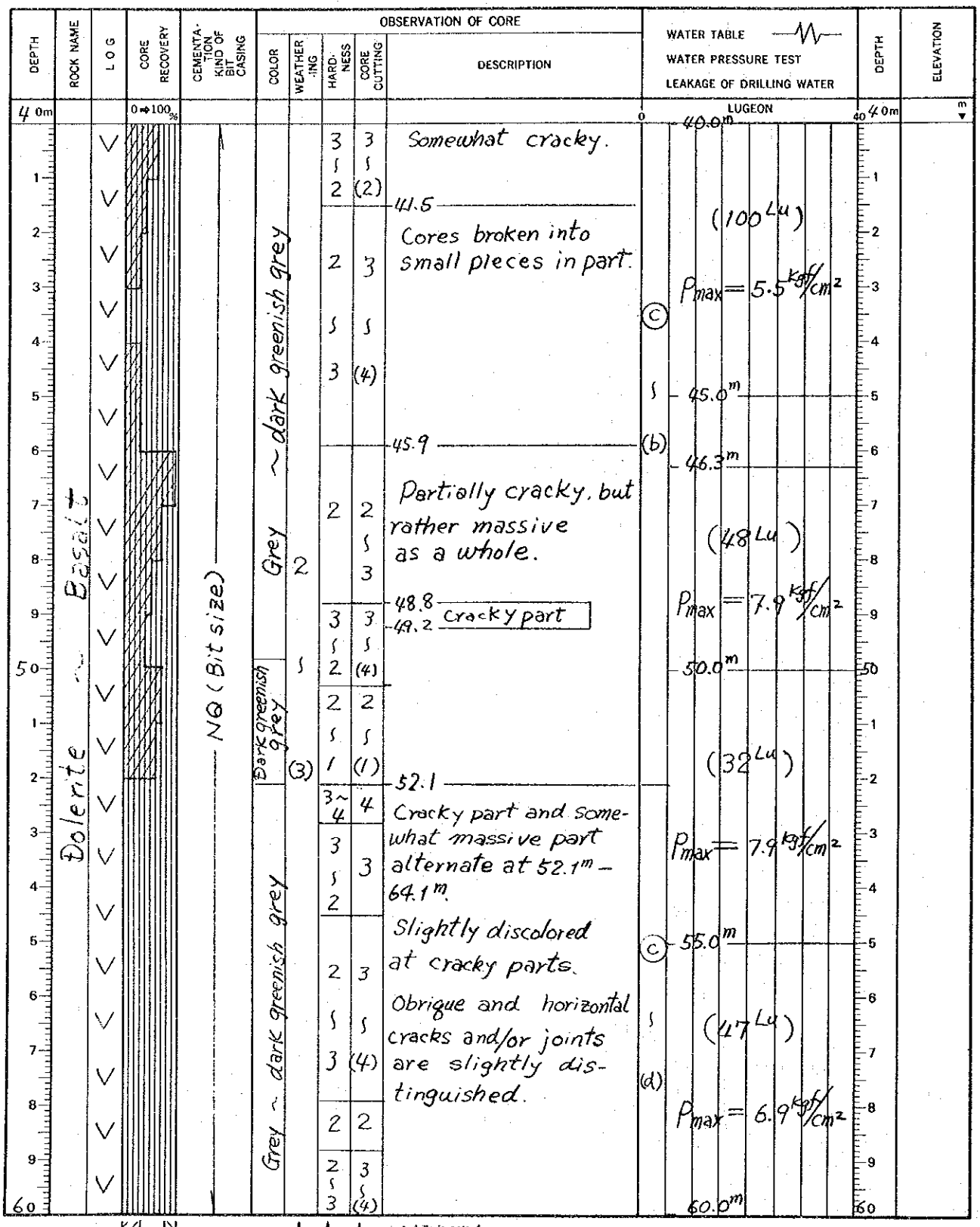


ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. L B - 3 (SHEET 20 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11 - 12 -1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7 - 1 -1991
COORDINATE	X 399,599.44 Y 451,466.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90 °	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9 %		

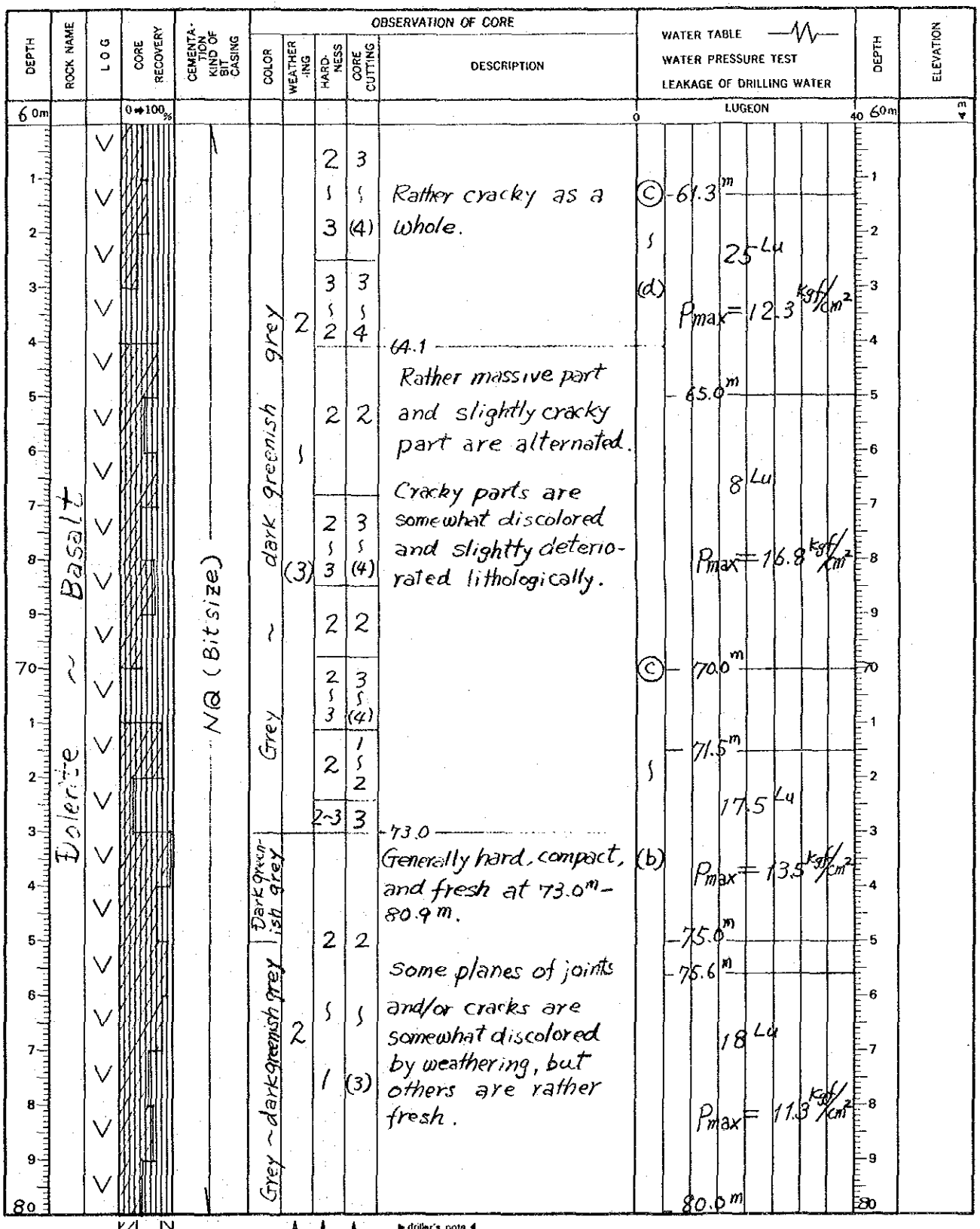


ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-3 (SHEET 21 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11 - 12 -1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7 - 1 -1991
COORDINATE	X 399,599.44 / Y 451,466.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90°	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9 %		

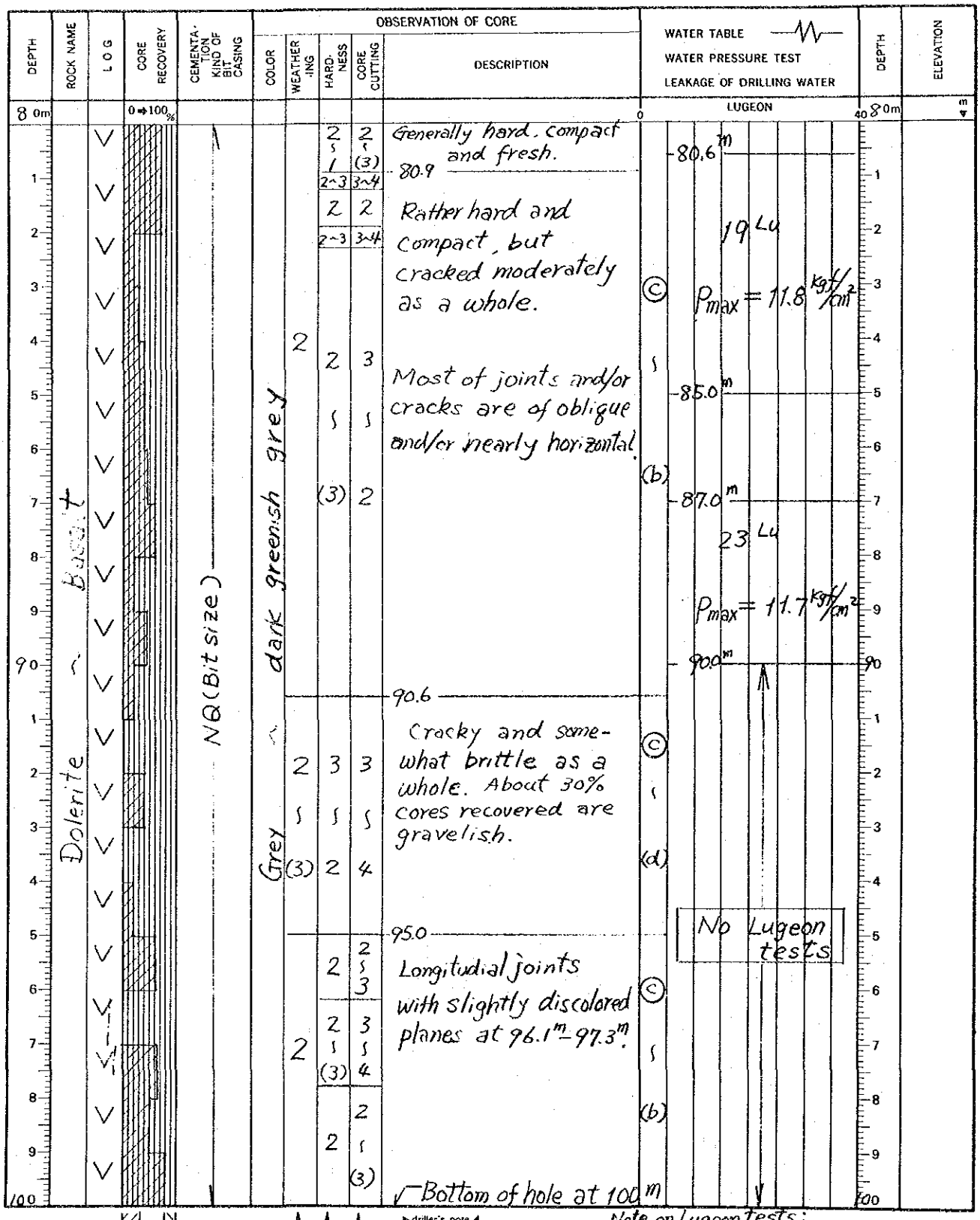


ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-3 (SHEET 22 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11-12-1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7-1-1991
COORDINATE	X 399,599.44 Y 451,466.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90°	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9 %		



Note on Lugeon tests;
- The Lugeon value with ( ) is estimated from the P-Q curve.

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-4 (SHEET 23 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	12 - 1 -1991
ELEVATION	1,201.32 m	DEPTH OF OVERBURDEN	18.25 m	COMPLETED	17 - 1 -1991
COORDINATE	X 399,678.10 Y 451,447.35	LENGTH OF ROCK DRILLING	31.75 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	60 0 °	TOTAL LENGTH OF CORE	32.23 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S14°43'E	CORE RECOVERY	64.5 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON 0–40)	DEPTH
0m			0→100%								0m
1–7	Overburden (Topsoil and talus deposits)			NQ (Bit size) NX Casing pipe	Brown				Recovered brownish slimes (sandy silt) only at 0m – 8.0m.		1–7
8					Brownish grey				8.0 Recovered brownish grey slimes (sand) only at 8.0m – 9.7m.		8
9.7–10.0									Gravelish cores only.	No Lugeon tests	9–10
10–17					Brown ~ yellowish brown				Recovered mainly sandy slimes. Gravelish cores at 13.85m – 14.0m and 15.95m – 16.0m.		10–17
17.7	Dolerite ~ Basalt			Dark brown ~ brownish grey		4 1 3	4 1 3	4	17.7 Weathered rocks. Cores easily broken into pieces.	(d)	17.7
19.0						3~ (2)	3 ~2	2 3~4	19.0 Somewhat weathered rocks at 19.0m – 24.35m.	(c) ~ (d)	19
20											20

▶ driller's note ◀

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

1 (hard) – 5 (soft)

1 (fresh) – 5 (decomposed)

core loss

RQD

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-4 (SHEET 24 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	12 - 1 -1991
ELEVATION	1,201.32 m	DEPTH OF OVERBURDEN	18.25 m	COMPLETED	17 - 1 -1991
COORDINATE	X 399,678.70 Y 451,447.35	LENGTH OF ROCK DRILLING	31.75 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	60.0 °	TOTAL LENGTH OF CORE	32.23 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S14°43'E	CORE RECOVERY	64.5 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE: COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON)	DEPTH
20m			0→100%							0 — 40	20m
0–24.35	Basalt ~ Dolerite			NQ (Bit size)	Dark greenish grey ~ grey and yellowish brown/dark brown along cracks/joints.	3	3	3-4, 2, 3	Partially somewhat hard, compact and massive, but cracky and weathered along most of cracks and/or joints.	ⓒ, (d)	
						(2)	2	3, 4, 2-3		No Lugeon test	
24.35–30.3						2	2	2	Hard and compact but somewhat cracky in part. Most of cracks and/or joints are discolored due to weathering.	ⓒ, (b)	
						(3)	(3)	3		(60 Lu) Pmax = 4.4 kgf/cm²	
30.3–40						2	2	3	Somewhat cracky as a whole. Oblique cross-joint sets are slightly remarkable.	No Lugeon test	
						3	3	(4)	Somewhat discolored and gravelish cores in part.	ⓒ	
							3	3-4		2.5 Lu, Pmax = 12.3 kgf/cm²	

25.5 m — 30.0 m — 35.5 m — 40.0 m

core loss — RQD — 1 (fresh) ~ 5 (decomposed) — 1 (hard) ~ 5 (soft) — driller's note: 1 (stick), 2 (subatick), 3 (piece), 4 (fragment), 5 grain

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. LB-4 (SHEET 25 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	12 - 1 -1991
ELEVATION	1,201.32 m	DEPTH OF OVERBURDEN	18.25 m	COMPLETED	17 - 1 -1991
COORDINATE	X 399,678.70 Y 451,447.35	LENGTH OF ROCK DRILLING	31.75 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	60.0°	TOTAL LENGTH OF CORE	32.23 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S14°43'E	CORE RECOVERY	64.5 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE: COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER / LUGEON	DEPTH
4.0m			0 ⇒ 100%							0 — 40	4.0m
1–4.55	Basalt ~ Dolerite			NQ (Bit size)	Grey ~ dark greenish grey	2	2	2	Hard and compact, but slightly crack as a whole.	ⓒ 40.9m; 2.7 Lu; (b) P_{max}=12.4 kgf/cm²	
4.55–8.15					Greyey brown ~ dark green	3	3	3	Mostly gravelish and discolored cores. Weathered and cracky zone.	ⓓ 45.0m; (22 Lu); (c) P_{max}= 3.4 kgf/cm²	
8.15–50.0					Grey	2	2	2	Somewhat massive.	ⓒ 50.0m; (b)	
50.0									Bottom of hole at 50.0m		

Note on Lugeon tests;
- The Lugeon value with ( ) is estimated from the P-Q curve.

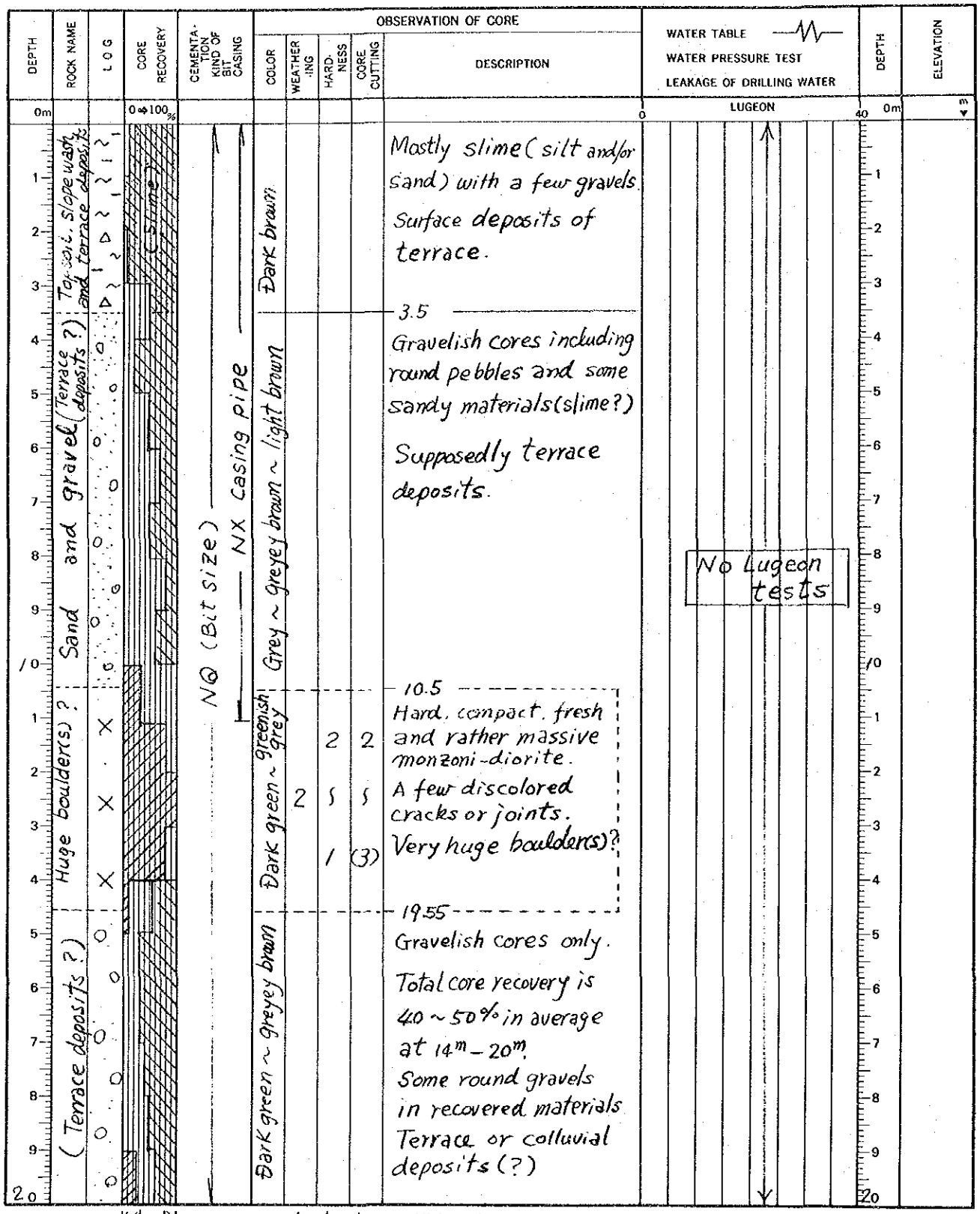
core loss
RQD
▶ driller's note 4
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) ~ 5 (soft)
1 (fresh) ~ 5 (decomposed)

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. PB-1 (SHEET 26 OF 28)

LOCATION	POWER STATION	DEPTH OF HOLE	35.00 m	COMMENCED	15 - 3 -1991
ELEVATION	327.93 m	DEPTH OF OVERBURDEN	35.00 m	COMPLETED	7 - 4 -1991
COORDINATE	X 398,047.21 Y 441,460.21	LENGTH OF ROCK DRILLING	0 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	16.56 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	47.3 %		



ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. PB-1 (SHEET 27 OF 28)

LOCATION	POWER STATION	DEPTH OF HOLE	35.00 m	COMMENCED	15 - 3 -1991
ELEVATION	327.93 m	DEPTH OF OVERBURDEN	35.00 m	COMPLETED	7 - 4 -1991
COORDINATE	X 398,041.21 Y 441,460.21	LENGTH OF ROCK DRILLING	0 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	16.56 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	47.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE: COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION	WATER TABLE / WATER PRESSURE TEST / LEAKAGE OF DRILLING WATER (LUGEON)	DEPTH	ELEVATION
20m	(Terrace deposits ?)		0 → 100 %	NQ (Bit size)	Dark green ~ greenish grey ~ dark grey ~ grey				Partially, 10cm ~ 20cm long cores which are hard and fresh in lithologic are recovered, but mostly gravelish cores including some round gravels. At 20m - 35m, core recovery is 30 ~ 40% in average. Terrace or colluvial deposits ?	0 — 40 LUGEON; No Lugeon tests	20m	m

Bottom of hole at 35.0m

▶ driller's note ◀

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

1 (hard) ~ 5 (soft)

1 (fresh) ~ 5 (decomposed)

core loss

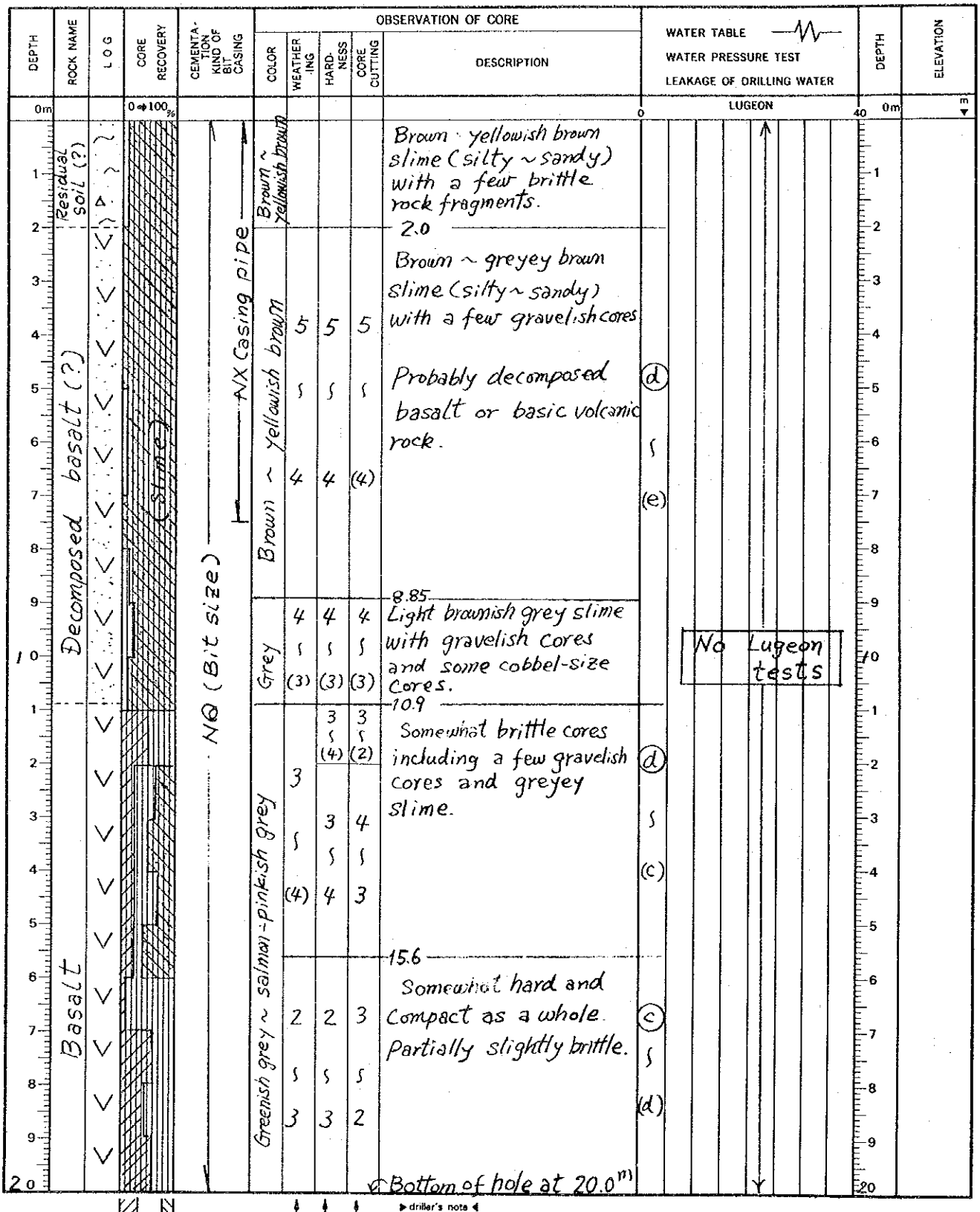
RQD

ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT — HOLE No. PB-2 (SHEET 28 OF 28)

LOCATION	PENSTOCK ROUTE	DEPTH OF HOLE	20.00 m	COMMENCED	10-3-1991
ELEVATION	547.29 m	DEPTH OF OVERBURDEN	11.00 m	COMPLETED	13-3-1991
COORDINATE	X 397.546.50 Y 442.685.14	LENGTH OF ROCK DRILLING	9.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HOLIZONTAL	90.0°	TOTAL LENGTH OF CORE	7.67 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	38.4 %		



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A-3-6 Core Photograph

		Sheet No.
(1)	UB-1	1 to 2
(2)	UB-2	3 to 4
(3)	UB-3	5 to 6
(4)	LB-1	7 to 4
(5)	LB-2	10 to 12
(6)	LB-3	13 to 16
(7)	LB-4	17 to 18
(8)	PB-1	19 to 20
(9)	PB-2	21

DRILLHOLE UB-1

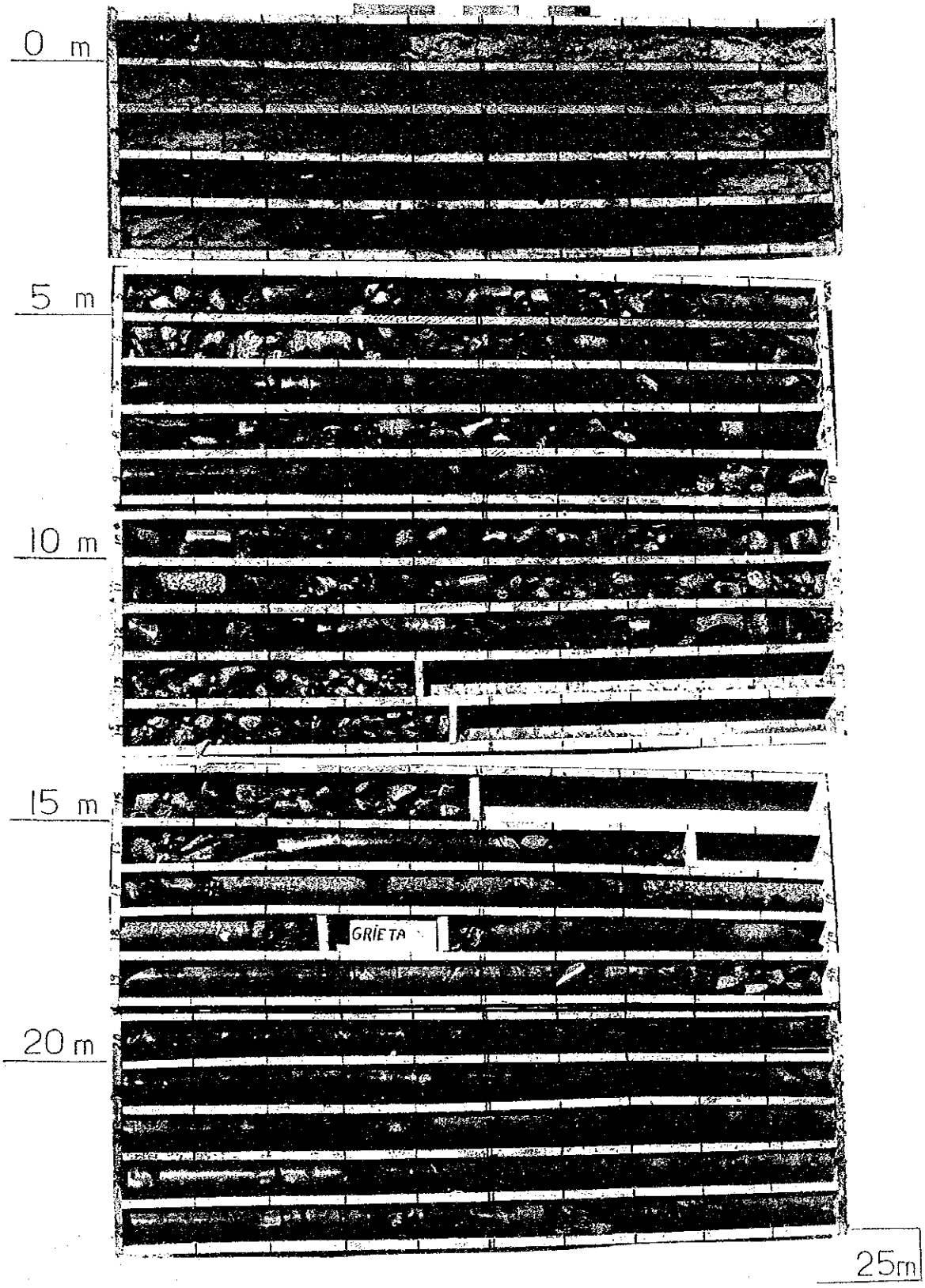
Sheet (1 -21)

DEPTH

From 0 m

To 25 m

HP PIRRIS UB-1

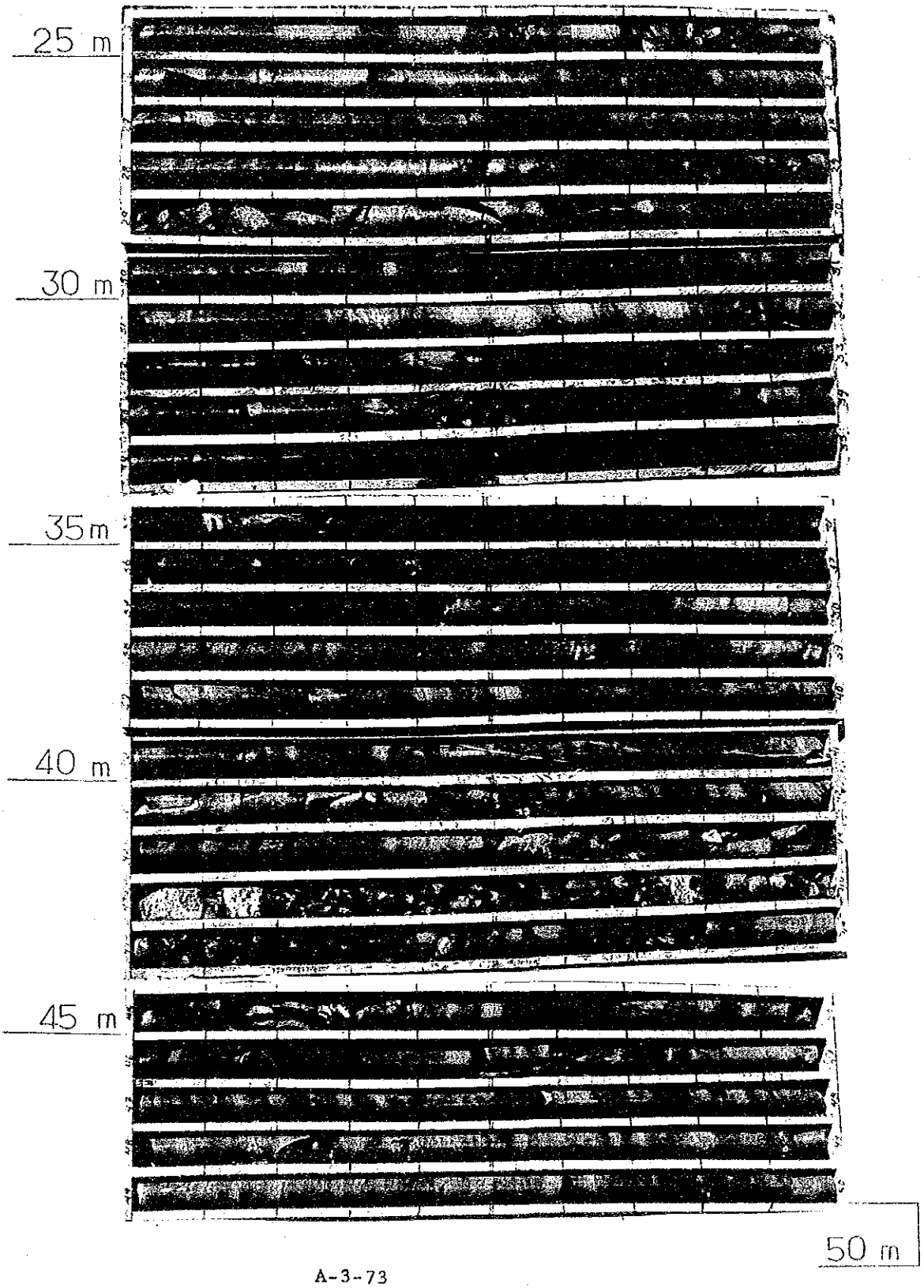


DRILLHOLE UB-1

DEPTH

From 25 m

To 50 m



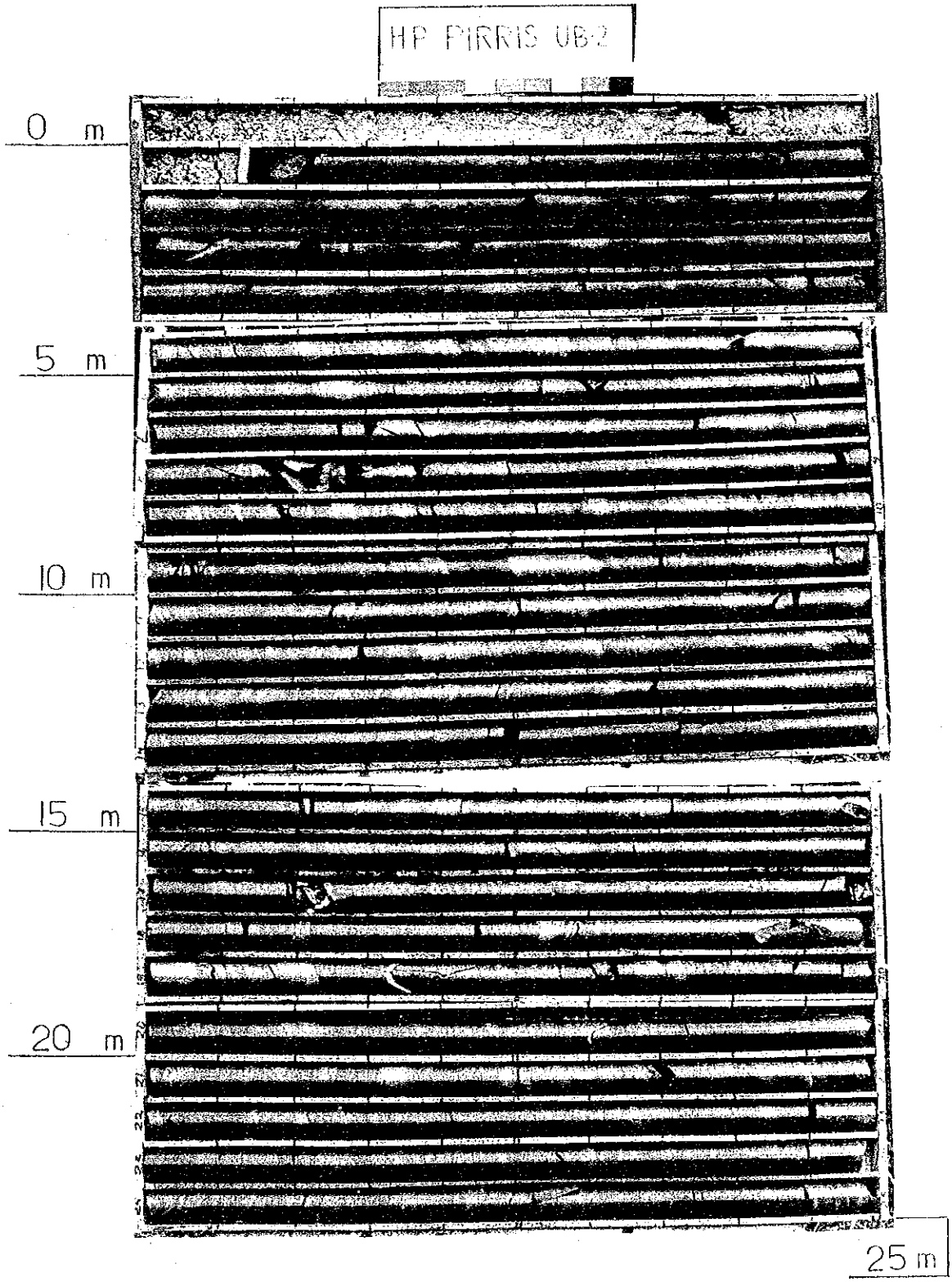
DRILLHOLE UB-2

Sheet (3 -21)

DEPTH

From 0 m

To 25 m



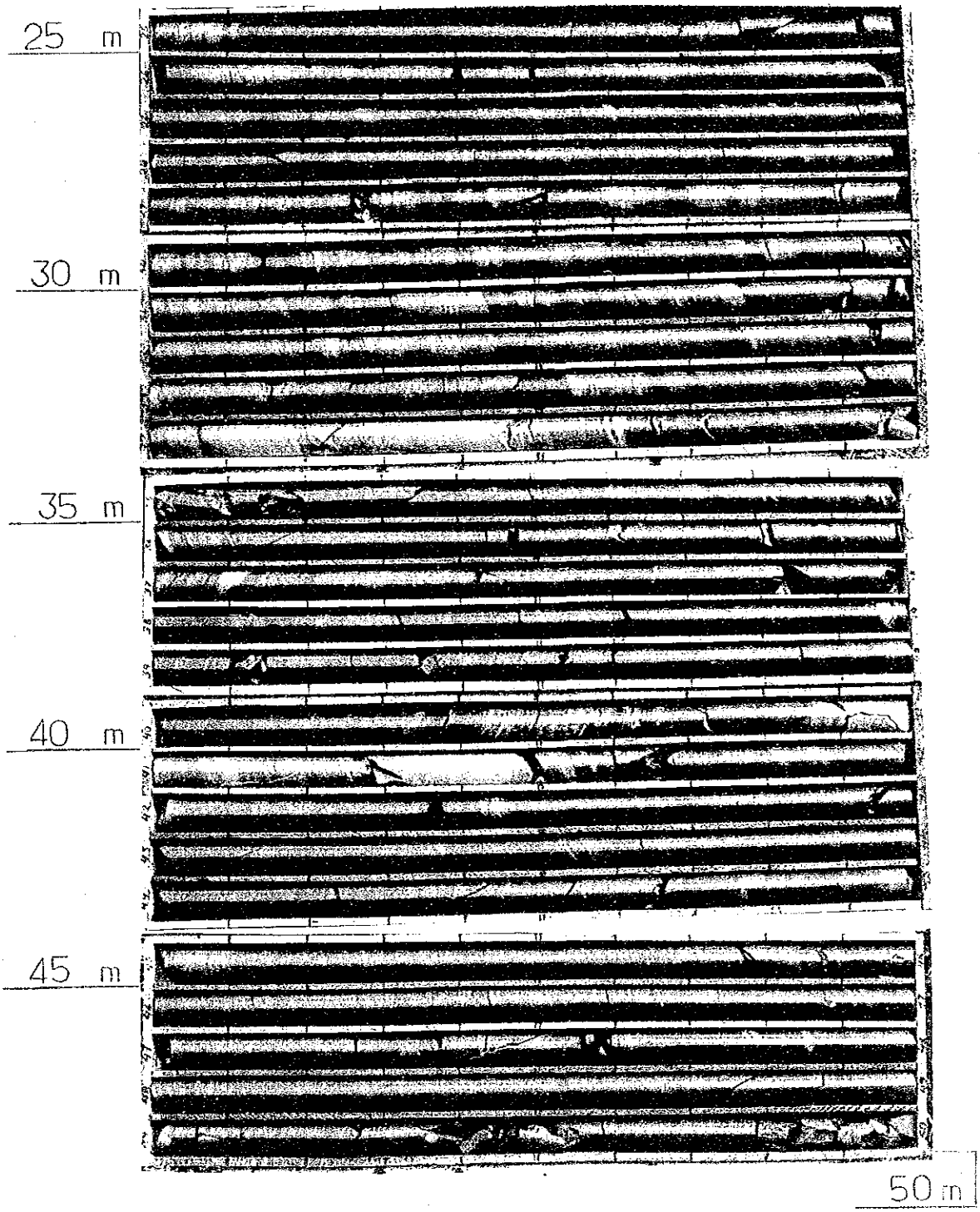
DRILLHOLE UB-2

Sheet (4-21)

DEPTH

From 25 m

To 50 m



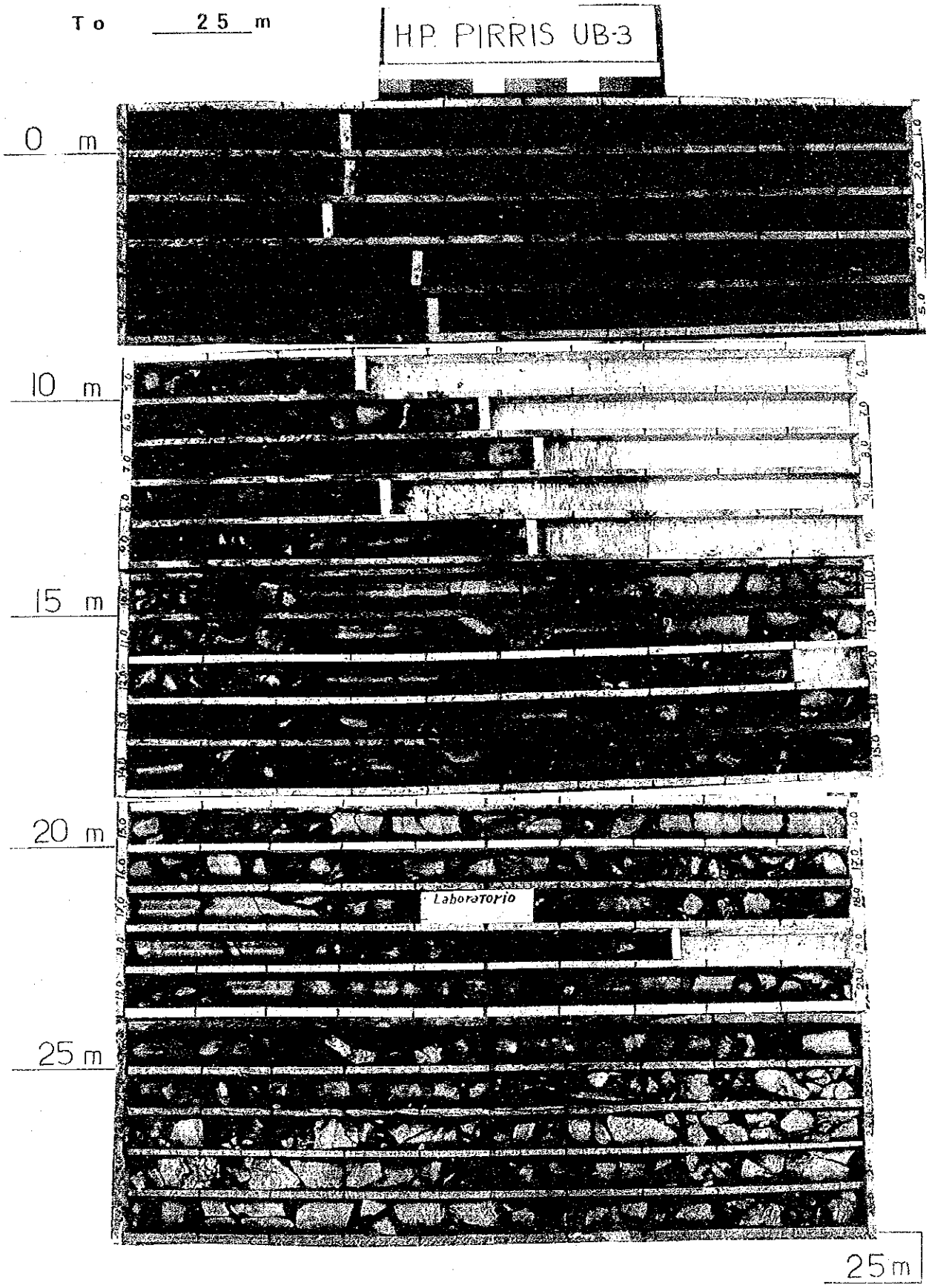
DRILLHOLE UB-3

Sheet (5 -21)

DEPTH

From 0 m

To 25 m



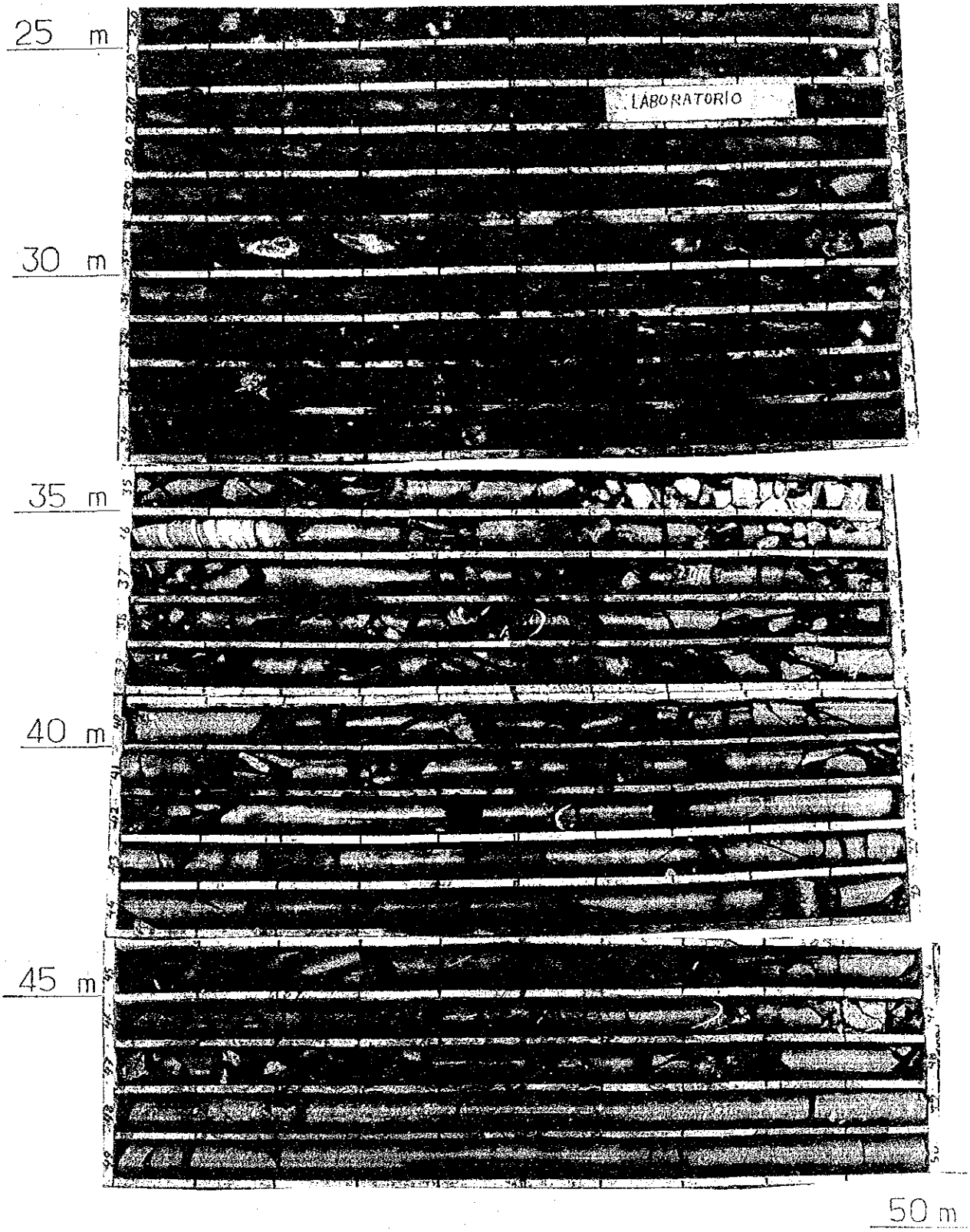
DRILLHOLE UB-3

Sheet (6 -21)

DEPTH

From 25 m

To 50 m



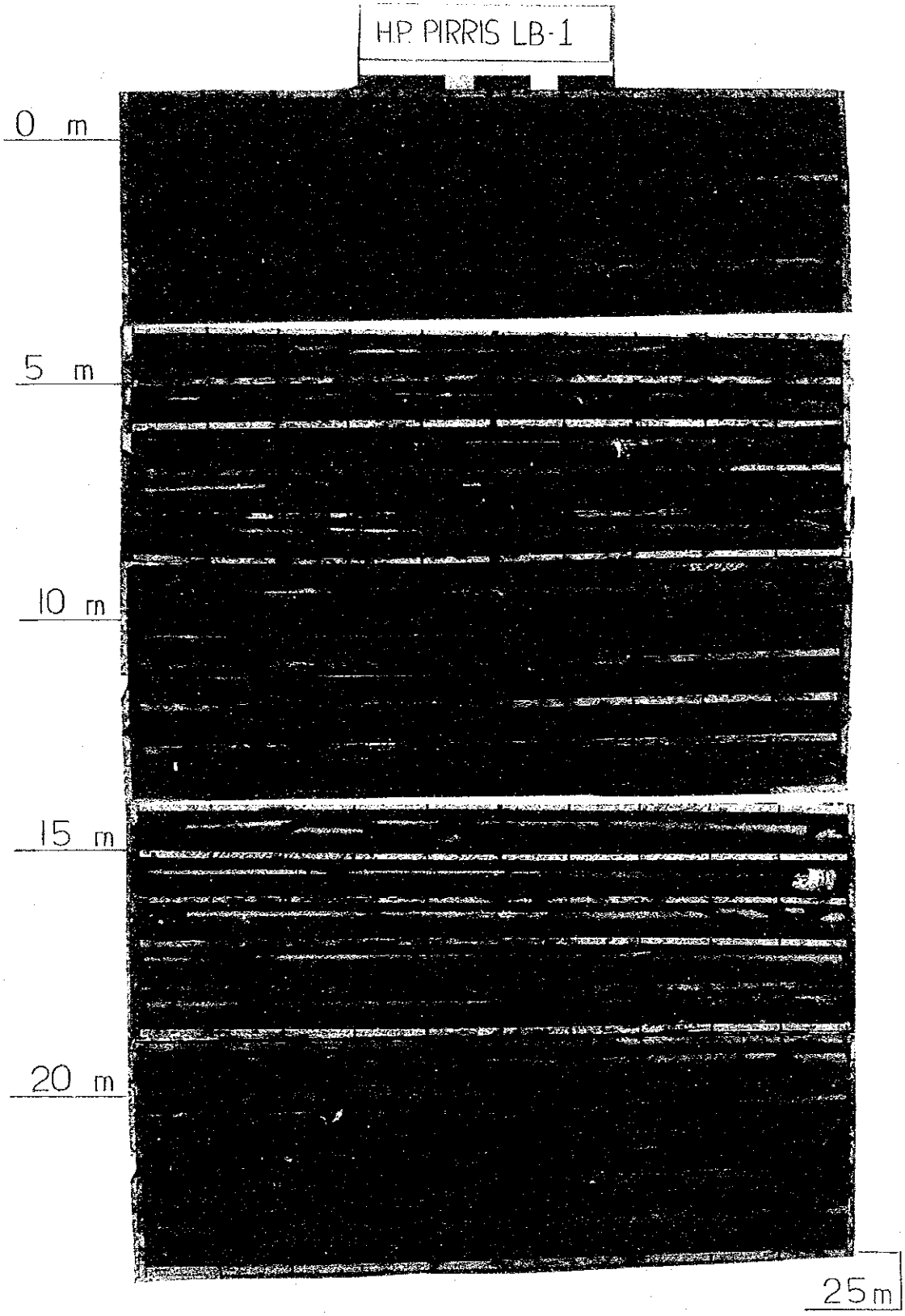
DRILLHOLE LB-1

Sheet (7 -21)

DEPTH

From 0 m

To 25 m



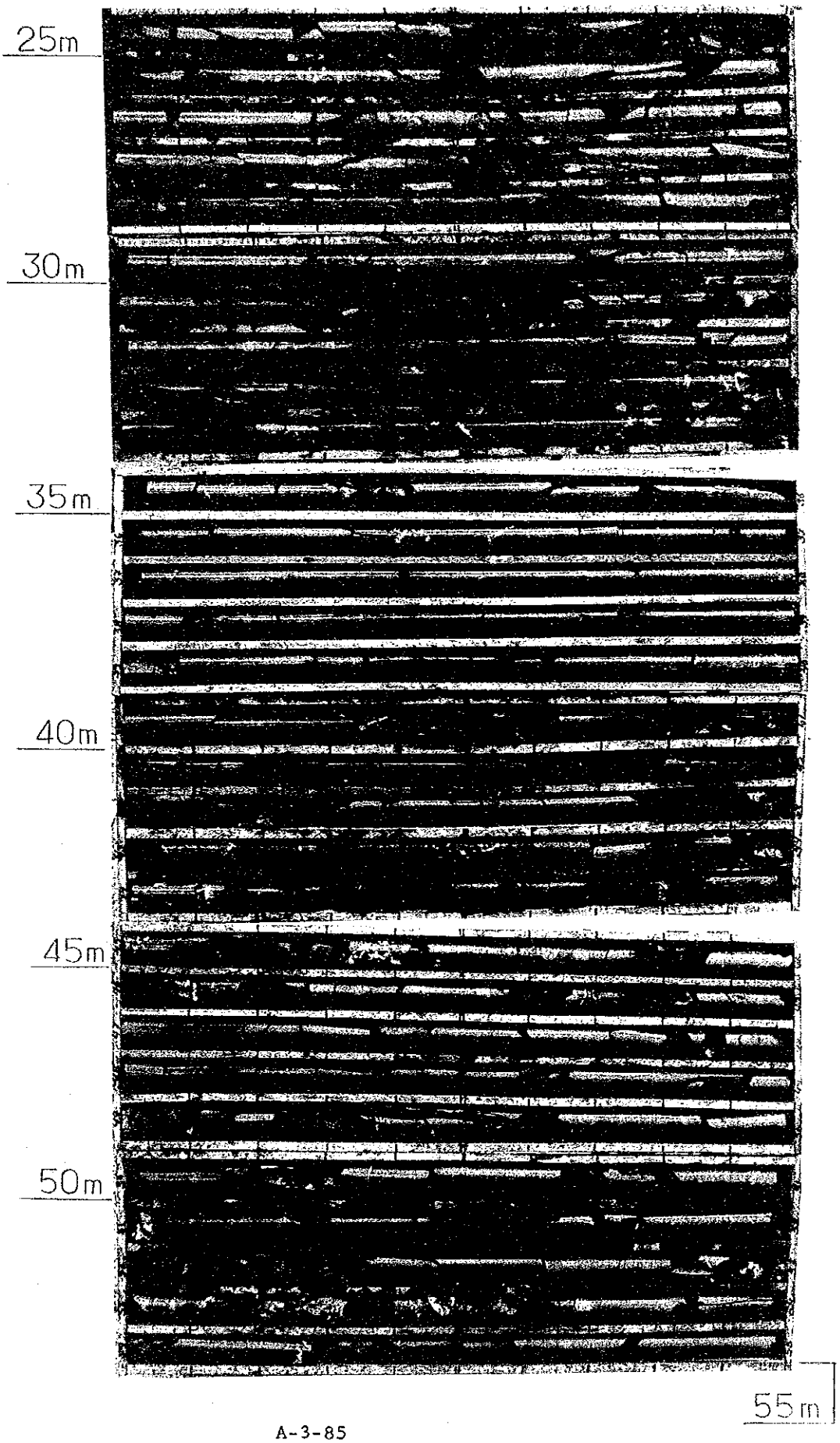
DRILLHOLE LB-1

DEPTH

From 25 m

To 55 m

Sheet (8 -21)



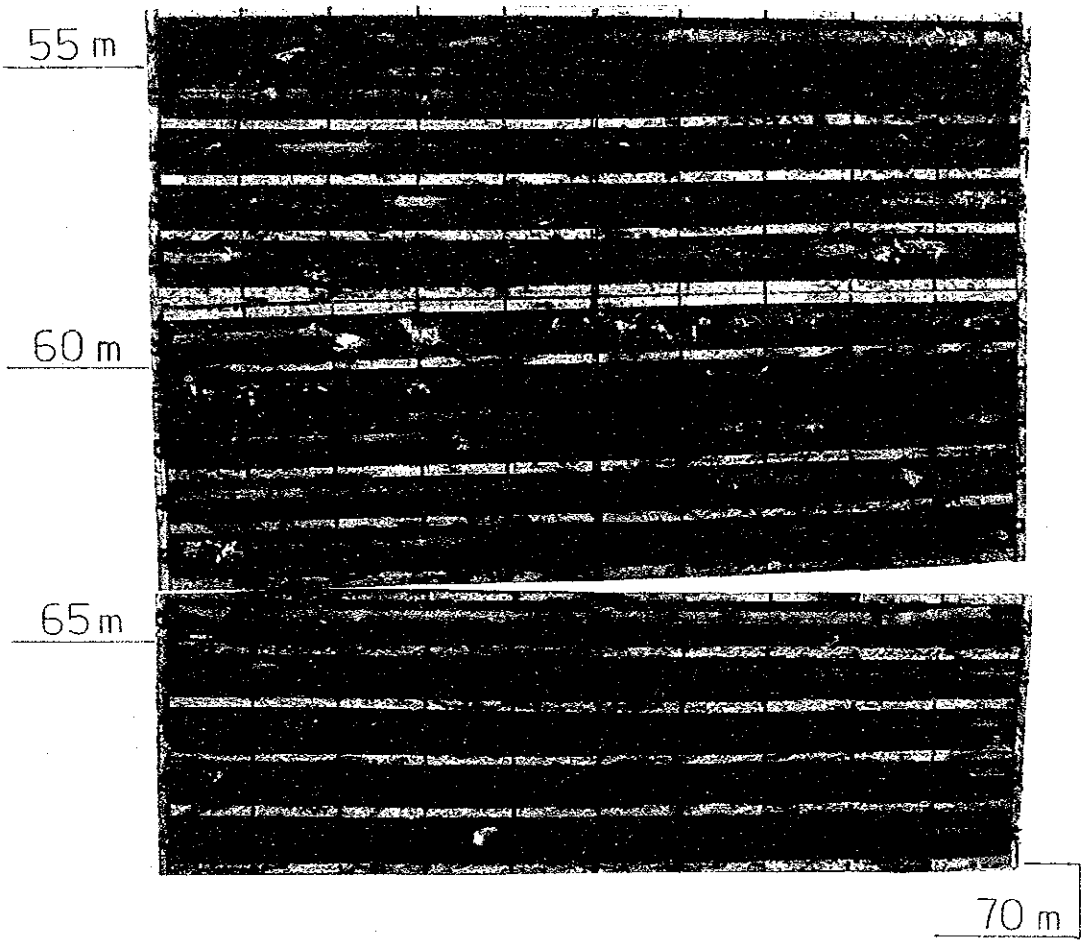
DRILLHOLE LB-1

Sheet (9 -21)

DEPTH

From 55 m

To 70 m



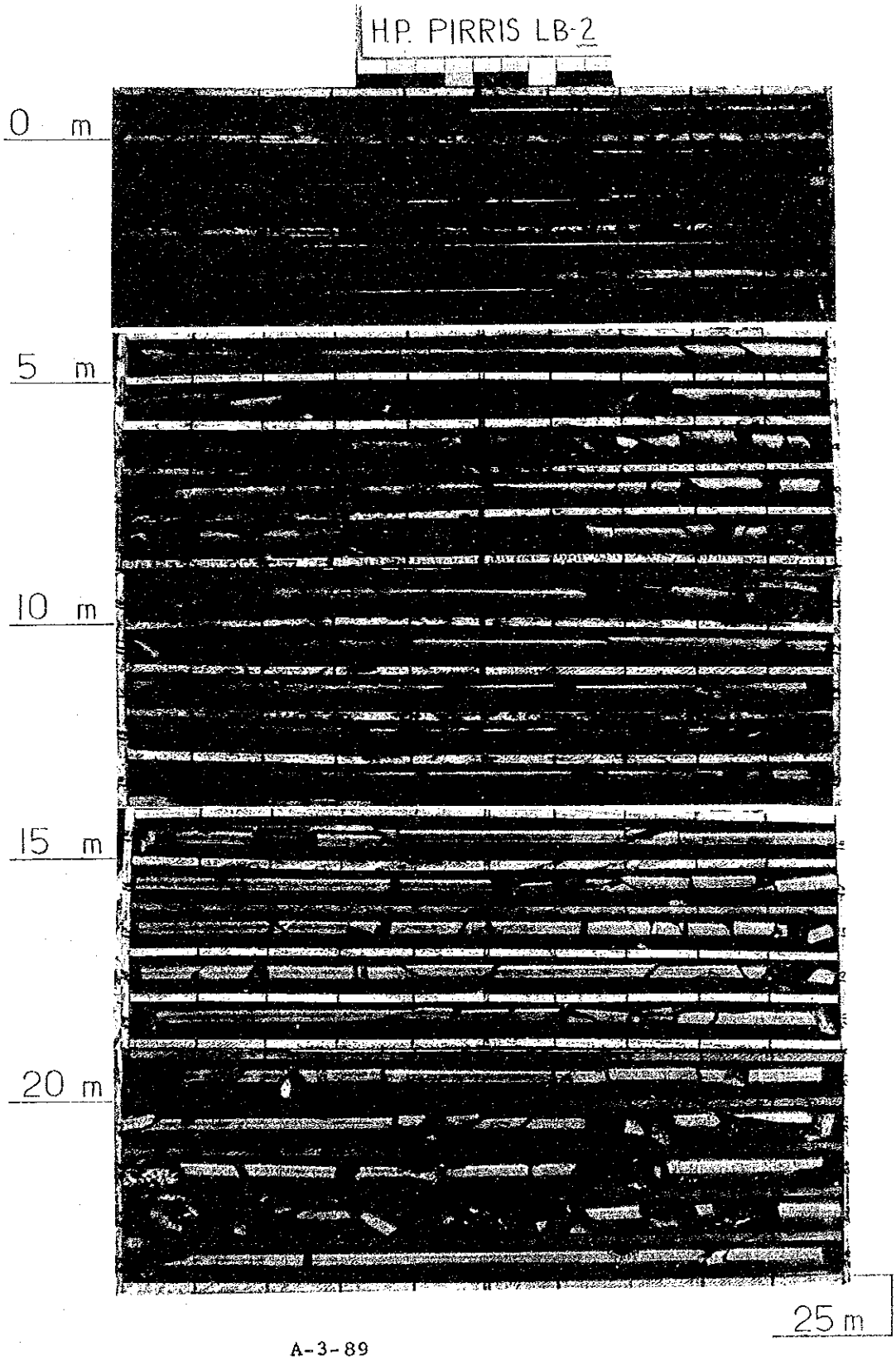
DRILLHOLE LB-2

Sheet (10-21)

DEPTH

From 0 m

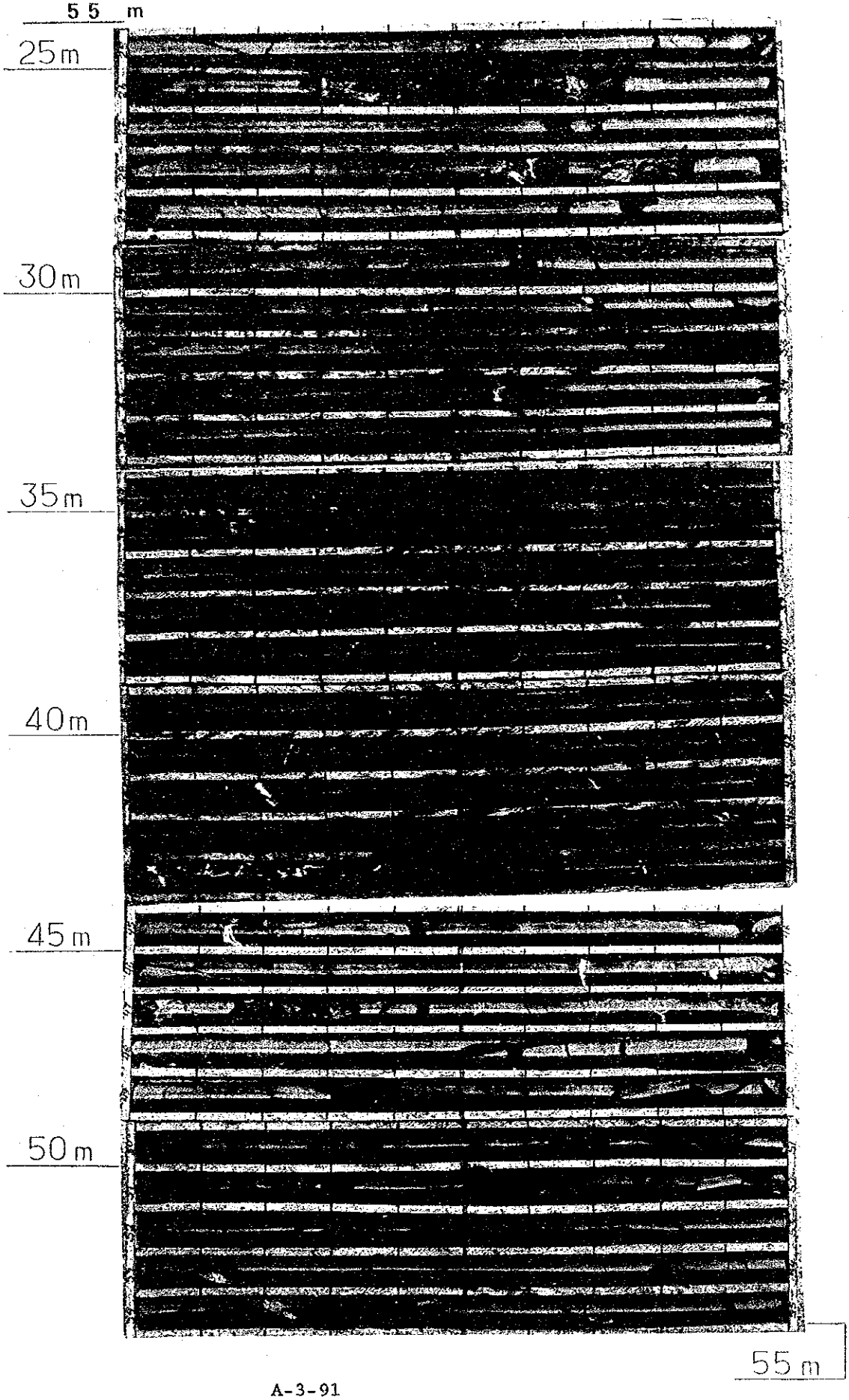
To 25 m



DRILLHOLE LB-2

DEPTH

Sheet (11-21)

From 25 m

To 55 m