Fig. APP.2-9 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA								
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY				**DATE**	28/JAN./1996 ~ 6/FEB./1996			
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD				**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD			
B.H.No.	LM-1	**Elevation**	R.L.	219.879 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE	
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits				Diameter of Hole : NX (mm)		**Sheet No.**	OF	

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery — x — (%) RQD (%)	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1				OVERBURDEN	BASALT BOULDER AND SOIL	(0)							
2						(59)							
3	216.90	3.00			3.0 to 6.25m HIGHLY WEATHERED SOIL	(92)	D	0.40 km/s	NIL	50/17			
4						(0)							
5													
6	213.65	6.25		COMPACT PORPHYRITIC BASALT (WEATHERED)	6.25 to 10.50m CLOSELY SPACED JOINTS SOME JOINTS ARE STAINED WITH BROWN	(0) (64) (64)							
7													
8						(47) (58)	C						
9					9.00 to 10.50m ALL JOINTS ARE STAINED PIECE NO.18,28,29,30 THE ROCK IS IN HIGHLYWEATHERED STATE	(93) (97)					9.00	9.45	
10	209.40	10.50										9.68 980 10.40	
11						(50) (87)				13			
12					JOINTS ARE STAINED						12.00		
13						(97) (100)							
14						(100) (100) (96) (100)	B	4.00 km/s		13			
15											15.00		
16					15.85 to 17.20m PIECE NO.42 TO PIECE NO.51 ALL JOINTS AT ALL DERECTYON SPLITTING THE ROCK IN TO A NO.OF PIECES WEATHERING ALONG THOSE JOINTS STAINED	(84) (100)				14			
17	202.70	17.20											
18				COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS		(100)					18.00		
19						(100)				0			
20					MAXIMUM LENGTH OF PIECE (64 TO 106CM)	(100)							
21						(100)					21.00		
22						(100)	A					21.90 677 22.20	
23						(100)				0			
24					23.40 to 24.35m PIECE NO.65 TO 69 ALL JOINTS ARE STAINED	(100)					24.00		
25						(100)				0			
26						(99)							
27	193.30	26.60									27.00		

FIELD PERMEABILITY TEST(9 to 60m)

HIGHLY WEATHERED SOIL

213.65 6.25 — COMPACT PORPHYRITIC BASALT (WEATHERED)

6.25 to 10.50m
CLOSELY SPACED JOINTS
SOME JOINTS ARE STAINED WITH BROWN

9.00 to 10.50m
ALL JOINTS ARE STAINED
PIECE NO.18,28,29,30 THE ROCK IS IN HIGHLYWEATHERED STATE

209.40 10.50

JOINTS ARE STAINED

15.85 to 17.20m
PIECE NO.42 TO PIECE NO.51 ALL JOINTS AT ALL DERECTYON SPLITTING THE ROCK IN TO A NO.OF PIECES WEATHERING ALONG THOSE JOINTS STAINED

202.70 17.20 — COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS

MAXIMUM LENGTH OF PIECE (64 TO 106CM)

23.40 to 24.35m
PIECE NO.65 TO 69 ALL JOINTS ARE STAINED

193.30 26.60

FRAGMENT CAUGHT UP IN HYDROTHERMALLY ALTERED RED LAVA MATRIX AT PLACES
SOME PIECES ARE COATED WITH WAX
ON EXPOSURE TO THE ATOMOSPHERE, THE ROCK DISINTIGRATES IN TO SOFT LOOSE MATERIAL
SOME PIECES ARE BROKEN BY HANDS

VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)

181.65 38.25

COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS

D 0.40 km/s
C
B 4.00 km/s
A
C
A

FIELD PERMEABILITY TEST (9 to 60m)

9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
33.00
36.00
39.00
42.00
45.00

13
13
14
0
0
0
0
0
0
0
0

9.45
9.68
980
10.40

21.90
677
22.20

31.09
218
31.37

44.83
589
45.33

24			PIECE NO.65 TO 69 ALL JOINTS ARE STAINED		(100)				
25					(100)				
26	193.30	26.60			(99)				
27					(0) (100)		27.00	0	
28								0	
29					(0) (99)				
30			FRAGMENT CAUGHT UP IN HYDROTHERMALLY ALTERED RED LAVA MATRIX AT PLACES SOME PIECES ARE COATED WITH WAX ON EXPOSURE TO THE ATOMOSPHERE, THE ROCK DISINTIGRATES IN TO SOFT LOOSE MATERIAL SOME PIECES ARE BROKEN BY HANDS	(0) (100)		30.00		
31								0	31.09 / 218 / 31.87
32		VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)		(20) (100)	C				
33				(20) (100)			33.00		
34								0	
35				(0) (100)					
36				(0) (100)			36.00		
37								0	
38	181.65	38.25		(0) (100)					
39				(90) (100)			39.00		
40								0	
41		COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS		(100) (100)					
42				(100) (100)	A		42.00		
43								0	
44				(100) (100)					
45							45.00		44.83 / 589 / 45.33
46	173.49	46.41		(100) (100)				0	
47		VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	FRAGMENT CAUGHT UP IN HYDROTHERMALLY ALTERED RED LAVA MATRIX AT PLACES PIECES ARE WAX COATED	(0) (100)	C				
48							48.00		
49	170.45	49.45		(0) (100)				0	
50				(100) (100)					
51							51.00		
52				(100) (100)				0	
53				(100) (100)					53.52 / 494 / 53.88
54		VOLCANIC BRECCIA WITH TACHYLYTIC BASALT		(97) (100)	A		54.00		
55								0	
56				(100) (100)					
57			55.49 to 56.69m FROM PIECE NO.148A 3MM GREEN STAINING UPTO PIECE NO.151				57.00		
58				(84) (91)				0	57.85 / 655 / 58.17
59									
60	159.90	60.00		(96) (100)			60.00		

Fig. APP.2-10 DRILLING LOG

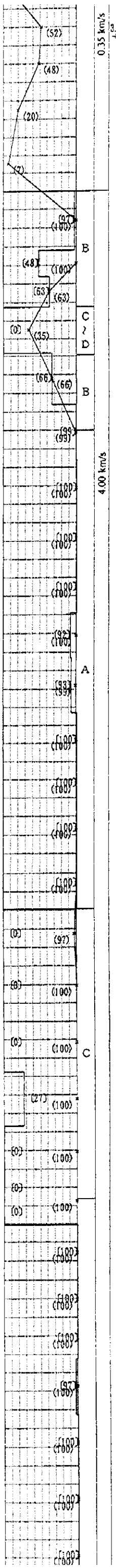
PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	16/JAN./1996 ~ 25/FEB./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**LM-2**	**Elevation**	R.L. 159.942 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

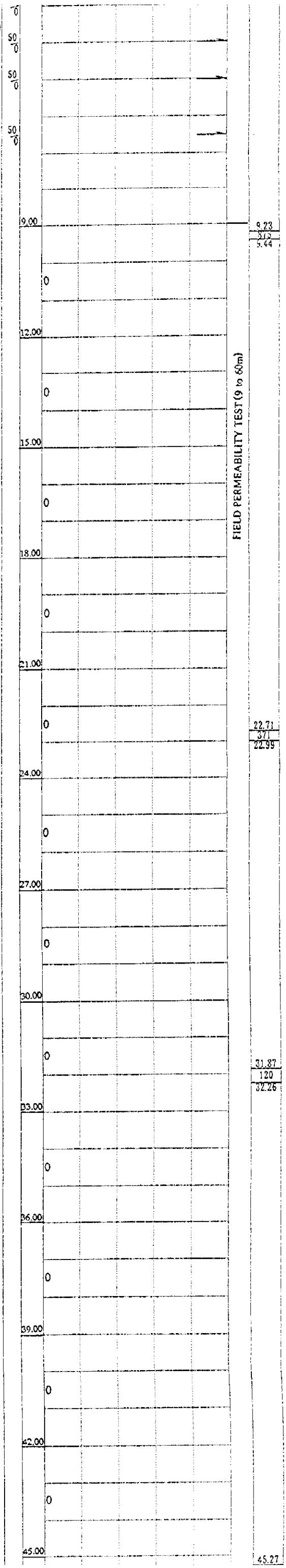
Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD ⌐¬ [%] (0 50 100)	Rock Classification	VP (km/s)	Water Table	N-Value (LUGEON VALUE 0 10 20 / S.P.T N VALUE 0 10 20 30 40 50)	U.C.S (kgf/cm²)	Remarks
1				RIVER DEPOSIT	BASALT BOULDER ,SAND, SOIL THE LENGTH OF PIECE IS 20 TO 30CM	(0) (0) (52) (48) (20) (7)		0.35 km/s	3.80	50/0		
8	151.94	8.00		PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS	8.00 to 9.60m PIECE NO.13 TO 19 STAINED	(93) (100) (48) (100) (63) (63)	B			50/0		
11	148.82	11.12		RED TACHYRITIC BASALT	SOFT ROCK ALL PIECES ARE WAX COATED	(0) (35)	C ~ D			0		
12	147.54	12.40		VOLCANIC BRECCIA	ALTERED RED COMPARATIVELY HARD 13.80 to 15.30m PIECE NO.68 & 69 ZEOLITE POCKET	(66) (66)	B			0		
14	145.44	14.50			15.30 to 16.80m CAVITY (ZEOLITE)	(99) (100) (100) (100) (100)		4.00 km/s		0		
20				PORPHYRITIC BASALT	MAXIMUM LENGTH OF CORE (52 TO 76CM) 24.55 to 26.07m PIECE NO.106 TO 109 ZEOLITE POCKET	(92) (100) (93) (99) (100) (100)	A			0		
27												

FIELD PERMEABILITY TEST (9 to 60m)

9.00 — 9.23 / 8.75 / 9.44
12.00
15.00
18.00
21.00
24.00 — 22.71 / 37 / 22.99
27.00

151.94	8.00	RIVER DEPOSIT	BASALT BOULDER ,SAND, SOIL THE LENGTH OF PIECE IS 20 TO 30CM
148.82	11.12	PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS	8.00 to 9.60m PIECE NO.13 TO 19 STAINED
147.54	12.40	RED TACHYRITIC BASALT	SOFT ROCK ALL PIECES ARE WAX COATED
145.44	14.50	VOLCANIC BRECCIA	ALTERED RED COMPARATIVELY HARD 13.80 to 15.30m PIECE NO.68 & 69 ZEOLITE POCKET
			15.30 to 16.80m CAVITY (ZEOLITE)
		PORPHYRITIC BASALT	MAXIMUM LENGTH OF CORE (52 TO 76CM)
			24.55 to 26.07m PIECE NO.106 TO 109 ZEOLITE POCKET
132.48	27.46	VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	30.27 to 31.87m PIECE NO.122 TO 141 SAME LAVA FLOW BUT LAVA MATRIX IS GREY FRAGMENTS CAUGHT UP IN HYDROTHERMALLY ALTERED RED LAVA MATRIX PIECES ARE WAX COATED , EASILY BROKEN BY HANDS PARTLY COHESIVE
124.63	35.31		GREY FRESH HARD BASALT 37.53 to 38.49m PIECE NO.155 ZEOLITE POCKET MAXIMUM ENGTH OF CORE (55 TO 134CM)





24			24.55 to 26.07m PIECE NO.106 TO 109 ZEOLITE POCKET	(100) (100)		24.00		
25				(100) (100)			0	
26								
27	132.48	27.46		(100) (100)		27.00		
28			30.27 to 31.87m PIECE NO.122 TO 141 SAME LAVA FLOW BUT LAVA MATRIX IS GREY	(0) (97)			0	
29								
30			FRAGMENTS CAUGHT UP IN HYDROTHERMALLY ALTERED RED LAVA MATRIX PIECES ARE WAX COATED , EASILY BROKEN BY HANDS PARTLY COHESIVE	(0) (100)		30.00		
31			VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	(0) (100)	C		0	31.87 120 32.26
32				(27) (100)				
33						33.00		
34				(0) (100)			0	
35	124.63	35.31		(0) (100)				
36			GREY FRESH HARD BASALT			36.00		
37				(100) (100)			0	
38			37.53 to 38.49m PIECE NO.155 ZEOLITE POCKET					
39				(100) (100)		39.00		
40				(97) (100)			0	
41								
42				(100) (100)		42.00		
43			MAXIMUM ENGTH OF CORE (55 TO 134CM)	(100) (100)			0	
44								
45				(100) (100)		45.00		45.27 961 45.68
46				(98) (100)			0	
47			COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN AND AT PLACES WHITE INFILLINGS		A			
48				(100) (100)		48.00		
49				(100) (100)			0	
50				(100) (100)				
51				(100) (100)		51.00		
52				(100) (100)			0	
53								
54				(90) (95)		54.00		
55				(93) (100)			0	
56			56.10 to 57.60m PIECE NO.230 & 231 ZEROLITE POCKET					
57			57.60 to 59.10m PIECE NO.232 TO 238 BROWN DUE TO HYDROTHERMALALTERATION CONCENTRATION OF WHITE INFILLINGS	(97) (100)		57.00		
58				(100) (100)			0	58.65 754 58.86
59	100.84	59.10						
60	99.94	60.00	RED TACHYLYTIC BASALT	(0) (100)	C	60.00		

Fig. APP.2-11 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	27/JAN./1996 ~ 4/FEB./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	LM-3	**Elevation**	R.L. 220.618 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description
1				OVERBURDEN	SOIL AND BOULDER POOR CORE RECOVERY
2					
3					
4					
5					
6	214.72	5.90		PORPHYRITIC BASALT (WEATHERED)	SOME JOINTS ARE STAINED WITH BROWN BY OXIDATION PARTIALLY POOR RECOVERY BECAUSE OF CLAY MATERIAL ROCK IS HARD
7					
8					
9	211.22	9.40			
10					GREY, FRESH VERY HARD BASALT MAXIMUM LENGTH OF CORE (63 TO 72CM)
11					
12					
13					
14					
15					15.59 to 17.11m PIECE NO.50A TO 50D ALL JOINTS ARE STAINED
16					
17	203.51	17.11			17.11 to 17.81m VERTICAL JOINTS
18	202.81	17.81		PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS	
19					
20					
21					
22					
23					
24					
25					25.74 to 27.08m PIECE NO.86A TO 86C & 87 STAINED
26					
27	193.54	27.08			

Core Recovery —x— (%)
RQD [%]
0 50 100

(0) (0) (0) (47) (27) (47) (83) (83) (67) (67) (99) (99) (90) (100) (98) (98) (94) (98) (96) (100) (95) (100) (46) (94) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100)

Rock Classification: C ~ B | A | B | A | A

VP (km/s): 0.35 km/s | 4.00 km/s

Water Table: NIL

N-Value

LUGEON VALUE
0 10 20

S. P. T
N VALUE
0 10 20 30 40 50

9 23 21 12 9 0.5 0.3 0.2 0 0

9.00 12.00 15.00 18.00 21.00 24.00 27.00

U.C.S (kgf/cm²)

10.41 862 10.36

21.69 1463 21.99

Remarks

FIELD PERMEABILITY TEST (9 to 60m)

214.72	5.90	PORPHYRITIC BASALT (WEATHERED)	SOME JOINTS ARE STAINED WITH BROWN BY OXIDATION PARTIALLY POOR RECOVERY BECAUSE OF CLAY MATERIAL ROCK IS HARD
211.22	9.40		GREY, FRESH VERY HARD BASALT MAXIMUM LENGTH OF CORE (63 TO 72CM)
203.51	17.11		15.59 to 17.11m PIECE NO.50A TO 50D ALL JOINTS ARE STAINED
202.81	17.81	PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS	17.11 to 17.81m VERTICAL JOINTS
193.54	27.08		25.74 to 27.08m PIECE NO.86A TO 86C & 87 STAINED
189.62	31.00	VOLCANIC BRECCIA WITH FRAGMENTS CAUGHT UP IN HYDROTHERMALLY ALTERED RED TACHYLYTIC BASALT	27.08 to 31.00m PIECES ARE SLIGHTLY SHORT RELATIVELY HARD, PARTIALLY FINE CRACK EXIST
183.49	37.13		37.13 to 42.00m PIECES ARE SLIGHTLY SHORT
178.62	42.00		GENERALLY GREY, VERY HARD FRESH BASALT MAXIMUM LENGTH OF CORE (OVER 100CM) 44.72 to 46.28m ZEOLITE VEIN

4.00 km/s

FIELD PERMEABILITY TEST (9 to 60m)

9.00	9	10.41 852 10.86
12.00	0.5	
15.00	0.3	
18.00	0.2	
21.00	0	21.69 1463 21.99
24.00	0	
27.00	0	29.00 109 29.19
30.00	0	
33.00	0	
36.00	0	
39.00	0	
42.00	0	
45.00		

193.54	27.08			25.74 to 27.08m PIECE NO.86A TO 86C & 87 STAINED	(100) (100)			
					(100) (100)			
					(100) (100)			
				27.08 to 31.00m PIECES ARE SLIGHTLY SHORT	(98) (98)	B	0	
					(96) (96)			29.00 (09) 29.19
189.62	31.00		VOLCANIC BRECCIA WITH FRAGMENTS CAUGHT UP IN HYDROTHERMALLY ALTERED RED TACHYLYTIC BASALT	RELATIVELY HARD, PARTIALLY FINE CRACK EXIST	(97) (97)		0	
					(98) (98)		0	
					(99) (99)	A	0	
					(99) (99)		0	
					(99) (99)		0	
183.49	37.13			37.13 to 42.00m PIECES ARE SLIGHTLY SHORT	(85) (100) *		0	
					(82) (100) *	B	0	
					(84) (84) *		0	
178.62	42.00			GENERALLY GREY, VERY HARD FRESH BASALT MAXIMUM LENGTH OF CORE (OVER 100CM)	(95)* (100)		0	
					(92) (92)		0	
				44.72 to 46.28m ZEOLITE VEIN	(100) (100)		0	46.44 568 46.79
			PORPHYRITIC BASALT WITH SMALL TO LARGE GREEN INFILLINGS		(100) (100)		0	
					(100) (100)		0	
					(100) (100)	A	0	
					(100) (100)		0	
					(100) (100)		0	
					(99) (99)		0	56.24 567 56.66
					(100) (100)		0	
161.61	59.01		RED TACHYLYTIC BASALT	ALTERED RED SOFT ROCK PIECES ARE WAX COATED	(0) (100)	C		
160.62	60.00							

24.00 27.00 30.00 33.00 36.00 39.00 42.00 45.00 48.00 51.00 54.00 57.00 60.00

Fig. APP.2-12 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	27/DEC./1995 ~ 7/JAN./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**LM-4**	**Elevation**	R.L. 239.292 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD [%]	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T / N VALUE	U.C.S (kgf/cm²)	Remarks
1				OVERBURDEN	BROWN SILT WITH GRAVELS BLACKISH RED WEATHERED ROCK PIECES	(0)			NIL	50/28			
2						(0)				50/28			
3						(0)				50/27			
4	234.79	4.50						0.40 km/s					
5				LATERITE	RED LATERITE SOIL POOR RECOVERY	(0)	D			50/18			
6													
7	231.79	7.50				(0)				50/19			
8				PORPHYRITIC BASALT (WEATHERED)	ALL JOINTS AT VARIOUS ANGLES STAINED SLIGHT WEATHERED	(22) (22)	C						
9	230.29	9.00									9.00		
10					GREY FRESH VERY HARD BASALT METAL SOUND BY HAMMER BLOW	(99) (99)					0	9.94 770 10.25	
11					11.45 to 13.10m ALL JOINTS ARE STAINED BROWN RED GREEN	(99) (99)							
12						(99) (99)					12.00		
13											0		
14						(100) (100)							
15						(100) (100)					15.00		
16						(97) (97)		4.00 km/s			0		
17													
18						(100) (100)					18.00		
19					18.62 to 19.99m DEPOSITION OF1 TO 2MM WEATHERED MATERIAL BROWN RED	(100) (100)					0		
20				PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS PHENOCRYSTS ARE IN CLUSTER AT PLACES SMALL TO MEDIUM GREEN INFILLINGS		(100) (100)	A					20.20 375 20.68	
21						(100) (100)					21.00		
22						(100) (100)					0		
23													
24						(100) (100)					24.00		
25						(100) (100)					0		
26													
27						(100) (100)					27.00		
28													

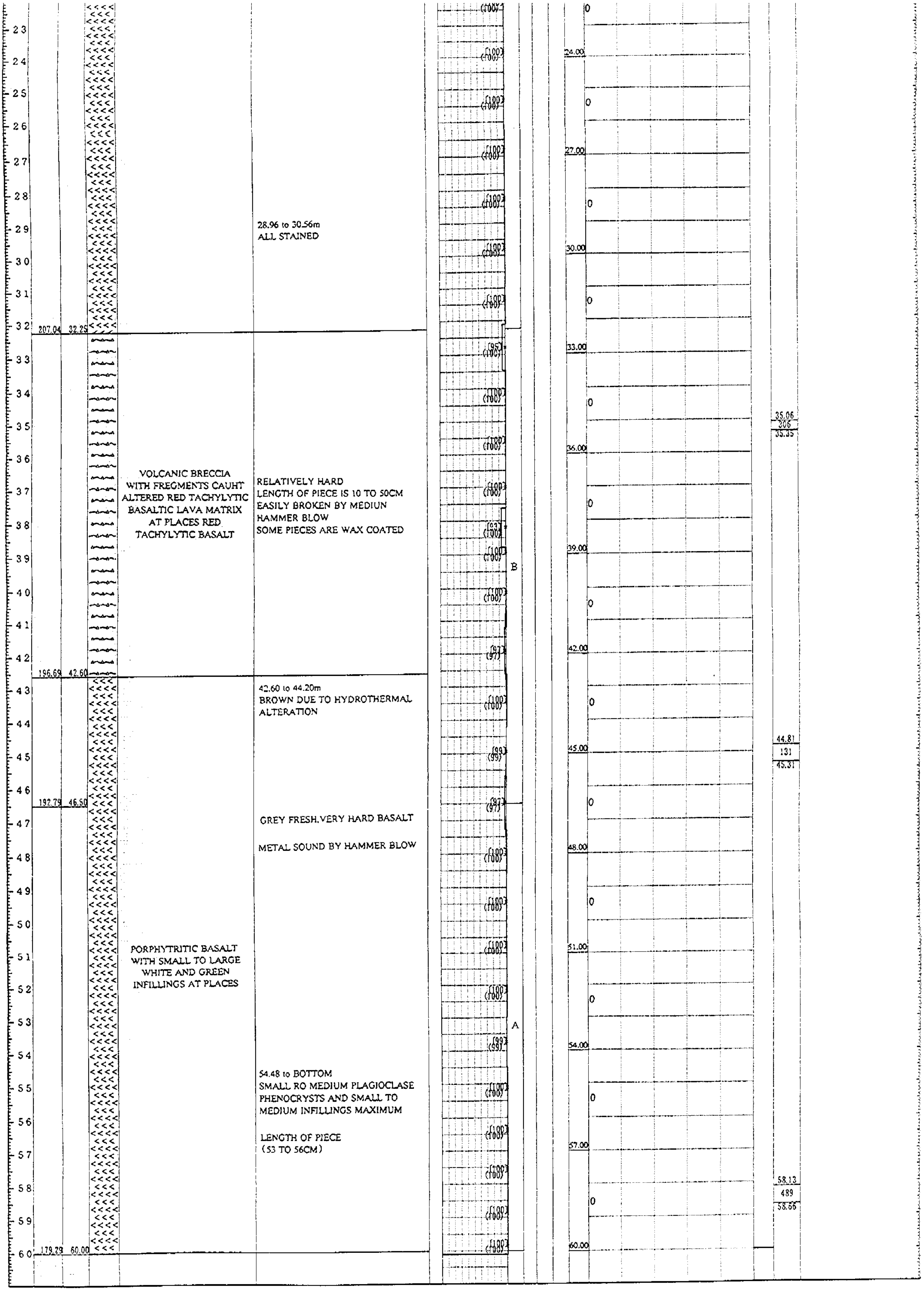
FIELD PERMEABILITY TEST (9 to 60m)

234.79	4.50		
231.79	7.50	LATERITE	RED LATERITE SOIL POOR RECOVERY
230.29	9.00	PORPHYRITIC BASALT (WEATHERED)	ALL JOINTS AT VARIOUS ANGLES STAINED SLIGHT WEATHERED
			GREY FRESH VERY HARD BASALT METAL SOUND BY HAMMER BLOW 11.45 to 13.10m ALL JOINTS ARE STAINED BROWN RED GREEN
		PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS PHENOCRYSTS ARE IN CLUSTER AT PLACES SMALL TO MEDIUM GREEN INFILLINGS	18.62 to 19.99m DEPOSITION OF1 TO 2MM WEATHERED MATERIAL BROWN RED 28.96 to 30.56m ALL STAINED
207.04	32.25	VOLCANIC BRECCIA WITH FREGMENTS CAUHT ALTERED RED TACHYLYTIC BASALTIC LAVA MATRIX AT PLACES RED TACHYLYTIC BASALT	RELATIVELY HARD LENGTH OF PIECE IS 10 TO 50CM EASILY BROKEN BY MEDIUN HAMMER BLOW SOME PIECES ARE WAX COATED
196.69	42.60		42.60 to 44.20m BROWN DUE TO HYDROTHERMAL ALTERATION

0.40 km/s | D | C | 4.00 km/s | A | B

50/27 | 50/18 | 50/19 | 0 | 9.94 / 270 / 10.25 | 20.20 / 375 / 20.68 | 35.06 / 306 / 35.35 | 44.81 / 131 / 45.31

FIELD PERMEABILITY TEST (9 to 60m)



28.96 to 30.56m
ALL STAINED

VOLCANIC BRECCIA
WITH FREGMENTS CAUHT
ALTERED RED TACHYLYTIC
BASALTIC LAVA MATRIX
AT PLACES RED
TACHYLYTIC BASALT

RELATIVELY HARD
LENGTH OF PIECE IS 10 TO 50CM
EASILY BROKEN BY MEDIUN
HAMMER BLOW
SOME PIECES ARE WAX COATED

42.60 to 44.20m
BROWN DUE TO HYDROTHERMAL
ALTERATION

GREY FRESH.VERY HARD BASALT

METAL SOUND BY HAMMER BLOW

PORPHYTRITIC BASALT
WITH SMALL TO LARGE
WHITE AND GREEN
INFILLINGS AT PLACES

54.48 to BOTTOM
SMALL RO MEDIUM PLAGIOCLASE
PHENOCRYSTS AND SMALL TO
MEDIUM INFILLINGS MAXIMUM

LENGTH OF PIECE
(53 TO 56CM)

77

Fig. APP.2-13 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	12/DEC./1995 ~ 26/DEC./1995		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	LM-5	**Elevation**	R.L. 174.073 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description
1	172.94	1.13		RIVER DEPOSIT	BASALT BOULDER
2					1.13 to 3.00m PARTIALLY JOINT STAINED
3	171.07	3.00			DARK GREY VERY HARD FRESH BASALT
4					METAL SOUND BY HAMMER BLOW
5					
6				PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS	
7					7.89 to 9.26m ZEOLITE VEIN
8					
9					
10					
11					
12	161.63	12.44			
13				VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	GENERALLY SOFT ROCK CONDITION PIECES ARE WAX COATED
14					ON EXPOSURE TO THE ATOMOSPHERE THE ROCK DISINTIGRATES IN TO SOFT LOOSE MATERIAL
15					
16					15.44 to 17.0m PIECES PARTIALLY HARD
17	157.07	17.00			
18				AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS	RELATIVELY HARD LENGTH OF PIECE (11 TO 38CM)
19					
20					
21	152.42	21.65			
22				VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	21.65 to 23.30m PIECE NO.90 & PIECE NO.91 TACHYLYTIC BASALT INJECTIONS
23					
24					ROCK HAS BECOME BROWN DUE TO HYDROTHERMAL ALTERATION PIECES ARE WAX COATED
25					
26	147.89	26.18			

Core Recovery —×— (%)
RQD [%]
0 50 100

Rock Classification: B, B ~ C, C, B, C, B

VP (km/s): 0.90 km/s, 4.00 km/s

Water Table: 1.10 m

N-Value

LUGEON VALUE
0 10 20

S. P. T
N VALUE
0 10 20 30 40 50

3.00, 6.00, 9.00, 12.00, 15.00, 18.00, 21.00, 24.00, 27.00

U.C.S (kgf/cm²)

FIELD PERMEABILITY TEST (1 to 60m)
4.20 888 4.50
16.69 655 17.00

Remarks

BASALT

METAL SOUND BY HAMMER BLOW

PORPHYRITIC AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS

7.89 to 9.26m
ZEOLITE VEIN

161.63 12.44

GENERALLY SOFT ROCK CONDITION
PIECES ARE WAX COATED

ON EXPOSURE TO THE ATOMOSPHERE THE ROCK DISINTIGRATES IN TO SOFT LOOSE MATERIAL

VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)

15.44 to 17.0m
PIECES PARTIALLY HARD

157.07 17.00

RELATIVELY HARD
LENGTH OF PIECE
(11 TO 38CM)

AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS

152.42 21.65

21.65 to 23.30m
PIECE NO.90 & PIECE NO.91
TACHYLYTIC BASALT INJECTIONS

VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)

ROCK HAS BECOME BROWN DUE TO HYDROTHERMAL ALTERATION
PIECES ARE WAX COATED

147.89 26.18

AMYGDALOIDAL BASALT WITH SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS

GREYISH HARD BASALT
PIECES ARE SLIGHTLY SHORT

144.07 30.00

RED TACHYLYTIC BASALT

WAX COATED

143.07 31.00

GREYISH HARD BASALT

35.2 to 36.45m
PIECE NO.145 AND PIECE NO.146
R.T.B. INJECTIONS

AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS

36.45 to 37.87m
CHLOROPHAEITE DEPOSITION

131.71 42.36

SOFT ROCK CONDITION
PIECES ARE WAX COATED

A
B
C
B
C
B
B

4.00 km/s

FIELD PERMEABILITY TEST (3 to 60m)

4.20
888
4.50

16.69
655
17.00

29.50
148
30.00

44.60
281
44.92

196.96	21.65						
		VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	21.65 to 23.30m PIECE NO.90 & PIECE NO.91 TACHYLYTIC BASALT INJECTIONS ROCK HAS BECOME BROWN DUE TO HYDROTHERMAL ALTERATION PIECES ARE WAX COATED	(0) (100) (0) (97) (0) (98)	C	24.00	
147.89	26.18						
		AMYGDALOIDAL BASALT WITH SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS	GREYISH HARD BASALT PIECES ARE SLIGHTLY SHORT	(100) (100) (97) (97) (100) (100) (100)	B	27.00 30.00	29.50 148 30.00
144.07	30.00						
		RED TACHYLYTIC BASALT	WAX COATED	(0) (97)	C		
143.07	31.00						
		AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE WHITE AND AT PLACES GREEN INFILLINGS	GREYISH HARD BASALT 35.2 to 36.45m PIECE NO.145 AND PIECE NO.146 R.T.B. INJECTIONS 36.45 to 37.87m CHLOROPHAEITE DEPOSITION	(88) (88) (92) (92) (95) (95) (90) (90) (86) (86) (95) (95) (99) (93) (93) (100)	B	33.00 36.00 39.00 42.00	
131.71	42.36						
		VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (RED TACHYLYTIC BASALT)	SOFT ROCK CONDITION PIECES ARE WAX COATED ON EXPOSURE TO THE ATOMOSPHERE THE ROCK DISINTIGRATES IN TO SOFT LOOSE MATERIAL	(0) (100) (0) (97) (0) (95) (0) (97) (0) (99)	C	45.00	44.60 281 44.92
124.60	49.47						49.47 673 49.78
		COMPACT PORPHYYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS AND SMALL TO LARGE WHITE AND GREEN INFILLINGS	52.52 to 53.92m ZEOLITE VEIN 53.92 to 55.32m PIECE NO.283 TO 286 THROUGHOUT STAINED	(97) (97) (79) (79) (98) (98) (94) (99) (98) (98)	B	51.00 54.00 57.00	51.00 26 51.20 56.87 281 57.38
118.75	55.32						
		VOLCANIC BRECCIA	57.55 to 59.20m BIG CAVITY IN PIECE NO.294	(99) (99) (99) (99) (100) (100)		60.00	
115.07	60.00						

Fig. APP.2-14 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	17/DEC./1995 ~ 3/JAN./1996		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**LM-6**	**Elevation**	R.L. 251.26 m	**Total Depth**	60.00 m	**Location**	MARLESHWAR PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description
1				OVERBURDEN	BROWNISH ORGANIC CLAY AND WEATHERED BOULDER
2					
3					
	247.46	3.80			
4					GENERALLY GREYISH VERY HARD BASALT METAL SOUND BY HAMMER BLOW 3.8 to 4.75m SLIGHTLY WEATHERED
5					
6					ANGLE OF JOINT (HORZL.. 45 ~ 75)
7					
8					8.10 to 9.35m VERTICAL VEIN
9					
10					
11					
12					
13					
14					
15					15 to 23m PARTIALLY VERTICAL JOINTS
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					

Core Recovery —×— (%)
RQD
[%]
0 50 100

Rock Classification
VP (km/s)
0.40 km/s
4.00 km/s
Water Table
NIL
N-Value
LUGEON VALUE
0 10 20
S. P. T
N VALUE
0 10 20 30 40 50

(0) (0) (23) (89) (89) (99) (99) (90) (90) (91) (91) (86) (86) (96) (96) (100) (100) (99) (99) (100) (100) (94) (100) (100) (99) (85) (99) (99) (91) (91) (100) (100) (98) (98) (99) (99) (100)

30 37 38
6.00 9.00 12.00 15.00 18.00 21.00 24.00
2 0 0 0 0 0 0

U.C.S (kgf/cm²)
Remarks
FIELD PERMEABILITY TEST (6 to 60m)
6.51
880
6.94
23.45
724
23.79

247.46 3.80

GENERALLY GREYISH VERY HARD BASALT
METAL SOUND BY HAMMER BLOW
3.8 to 4.75m
SLIGHTLY WEATHERED

ANGLE OF JOINT
(HORZL. 45 ~ 75)

8.10 to 9.35m
VERTICAL VEIN

15 to 23m
PARTIALLY VERTICAL JOINTS

PORPHYRITIC BASALT WITH SMALL TO LARGE WHITE AND GREEN INFILLINGS

28.10 to 29.60m
PIECE NO.69C TO 72A SLL JOINTS ARE STAINED

31.20 to 32.75m
ALL STAINED DEPOSITION OF CHLOROPHAEITE

PARTIALLY VERTICAL JOINTS

4.00 km/s

A

FIELD PERMEABILITY TEST (6 to 60m)

6.00
9.00
12.00
15.00
18.00
21.00
24.00
27.00
30.00
33.00
36.00
39.00
42.00
45.00

2
0

6.51
880
6.94

23.45
724
23.79

38.52
597
38.87

196.42	54.84	PORPHYRITIC BASALT WITH SMALL TO LARGE WHITE AND GREEN INFILLINGS	28.10 to 29.60m PIECE NO.69C TO 72A SLL JOINTS ARE STAINED 31.20 to 32.75m ALL STAINED DEPOSITION OF CHLOROPHAEITE PARTIALLY VERTICAL JOINTS	A
194.20	57.06	VOLCANIC BRECCIA WITH TACHYLITIC BASALT (RED TACHYLYTIC BASALT)	SOFT ROCK CONDITIONS SMALL PIECES ARE WAX COATED	C
191.26	60.00	PORPHYRITIC BASALT	HARD BUT PIECES CONTAIN FINE CRACK	B

23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

[98] (98)
[99] (99)
[100] (100)
[99] (99)
[97] (100)
[100] (100)
[99] (99)
[100] (100)
[99] (99)
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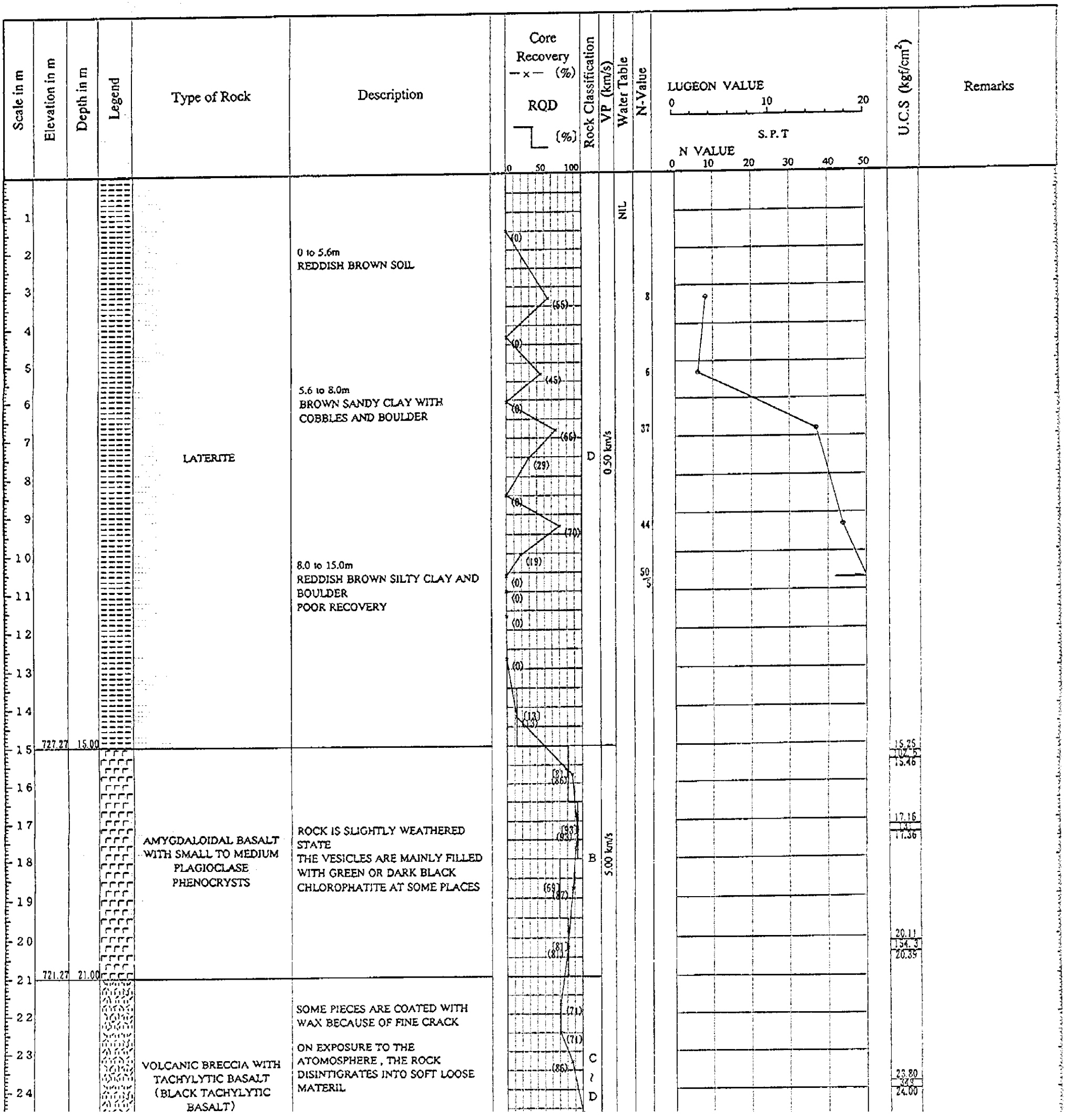
[100] (100)
[100] (100)
[100] (100)
[100] (100)
[100] (100)
[100] (100)
[100] (100)
[94] (100)
[0] (100)
[0] (100)
[100] (100)
[100] (100)

24.00	0
27.00	0
30.00	0
33.00	0
36.00	0
39.00	0
42.00	0
45.00	0
48.00	0
51.00	0
54.00	0
57.00	1.5
60.00	

23.45	724	23.79
38.52	697	38.87
47.57	830	47.95
57.93	144	58.27

Fig. APP.2-15 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			DATE	30/OCT./1995 ~ 20/NOV./1995		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			DRILLER	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	UH-1	Elevation	R.L. 742.27 m	Total Depth	30.00 m	Location	HEVALE PROJECT SITE
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		Sheet No.	OF



Equipment and Method CALYX Rotary Coring Water Flush and with Diamond Bits

Diameter of Hole : NX (mm)

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD ⌐ (%) 0 50 100	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE 0 10 20 S.P.T N VALUE 0 10 20 30 40 50	U.C.S (kgf/cm²)	Remarks
1					0 to 5.6m REDDISH BROWN SOIL	(0)			NIL				
2													
3						(55)				8			
4						(0)							
5						(45)				6			
6					5.6 to 8.0m BROWN SANDY CLAY WITH COBBLES AND BOULDER	(0)							
7				LATERITE		(66)	D	0.50 km/s		37			
8						(29)							
9						(0)				44			
10						(70)							
11					8.0 to 15.0m REDDISH BROWN SILTY CLAY AND BOULDER POOR RECOVERY	(19)				50 s/l			
12						(0)							
13						(0)							
14						(0)							
15	727.27	15.00				(13)						15.25 102.5 15.46	
16						(81) (86)							
17				AMYGDALOIDAL BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS	ROCK IS SLIGHTLY WEATHERED STATE THE VESICLES ARE MAINLY FILLED WITH GREEN OR DARK BLACK CHLOROPHATITE AT SOME PLACES	(93) (93)	B	5.00 km/s				17.16 41 17.36	
18													
19						(69) (87)							
20						(81) (81)						20.11 154.3 20.39	
21	721.27	21.00											
22					SOME PIECES ARE COATED WITH WAX BECAUSE OF FINE CRACK	(71)							
23				VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (BLACK TACHYLYTIC BASALT)	ON EXPOSURE TO THE ATOMOSPHERE , THE ROCK DISINTIGRATES INTO SOFT LOOSE MATERIL	(86)	C ~ D						
24												23.80 24.00	
25						(100)							
26	715.87	26.40				(100)						25.40 416.3 26.70	
27				COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS	THE PHENOCRYSTS ARE IN CLUSTERS BEARING SMALL TO LARGE GREEN INFILLINGS	(88) (100)							
28						(86) (93)	B						
29						(69) (76)						29.70 63.5 29.85	
30	712.27	30.00											

Fig. APP.2-16 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA							
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	29/OCT./1995 ~ 14/NOV./1995			
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD			
B.H.No.	UH-2	**Elevation**	R.L. 713.019 m	**Total Depth**	30.00 m	**Location**	HEVALE PROJECT SITE	
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF	

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD [%]	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T N VALUE	U.C.S (kgf/cm²)	Remarks
1					0 TO 2.1m CLOSELY SPACED JOINTS ALL JOINTS ARE STAINED WITH YELLOW BROWN AND RED SOIL				NIL				
2					2.1 to 3.0m INCIPENT ZEOLITE VEIN								
3					3.0 to 4.0m ZEOLITE POCKET								
4					4.0 to 7.4m ZEOLITE VEIN FOUND PARTLY								
5												5.13 568 5.48	
6													
7					7.40 to 8.70m PIPE AMYGDALES								
8													
9					8.7 to BOTTOM SMALL PLAGIOCLASE PHENOCRYSTS PHENOCRYSTS ARE IN CLUSTERS			4.90 km/s				9.56 9.68	
10					CLOSE TO 10M PYRITE CONCENTRATED THROUGH JOINT								
11					10.75 to 11.85m VERTICAL JOINT								
12													
13					13.10 to 14.15m ZEOLITE VEIN								
14				COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS	14.15 to 15.65m THROUGHOUT							14.03 14.15	
15							B						
16					15.65 to 17.10m ZEOLITE VEIN								
17													
18												18.53 551.6 18.91	
19													
20													
21					closely to 20.95m $CaCO_3$ DEPOSITS								
22													
23												23.47 23.62	
					23.30 to 24.55m								

LUGEON VALUE 0 10 20
S. P. T
N VALUE 0 10 20 30 40 50

3.00 0.3 6.00 0.2 9.00 0.2 12.00 0.1 15.00 0.2 18.00 0.1 21.00 0.3

FIELD PERMEABILITY TEST (3 to 30m)

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description
1					0 TO 2.1m CLOSELY SPACED JOINTS ALL JOINTS ARE STAINED WITH YELLOW BROWN AND RED SOIL
2					2.1 to 3.0m INCIPENT ZEOLITE VEIN
3					3.0 to 4.0m ZEOLITE POCKET
4					4.0 to 7.4m ZEOLITE VEIN FOUND PARTLY
5					
6					
7					7.40 to 8.70m PIPE AMYGDALES
8					
9					8.7 to BOTTOM SMALL PLAGIOCLASE PHENOCRYSTS PHENOCRYSTS ARE IN CLUSTERS
10					CLOSE TO 10M PYRITE CONCENTRATED THROUGH JOINT
11					10.75 to 11.85m VERTICAL JOINT
12					
13					13.10 to 14.15m ZEOLITE VEIN
14				COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS	14.15 to 15.65m THROUGHOUT
15					
16					15.65 to 17.10m ZEOLITE VEIN
17					
18					
19					
20					
21					closely to 20.95m $CaCO_3$ DEPOSITS
22					
23					
24					23.30 to 24.55m ZEOLITE VEIN
25					25.70 to 27.10m CHLOROPHACITE VEIN
26					
27					
28					
29					29.3 to 30m VERTICAL JOINT
30	683.02	30.00			

RQD (%) — (%)

Rock Classific

VP (km/s

Water Tabl

N-Value

LUGEON VALUE 0 10 20

S.P.T N VALUE 0 10 20 30 40 50

U.C.S (kgf/

Remarks

Water Table: NIL

VP: 4.90 km/s

Rock Classification: B

FIELD PERMEABILITY TEST (3 to 30m)

3.00	
6.00	0.3
9.00	0.2
12.00	0.2
15.00	0.1
18.00	0.2
21.00	0.1
24.00	0.3
27.00	0.2
30.00	0.2

U.C.S (kgf/cm²)

5.13	568	5.48
9.56		9.68
14.03		14.15
18.53	651.6	18.91
23.47		23.62
29.30		29.47

Fig. APP.2-17 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA							
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	27/OCT./1995 ~ 13/OCT./1995			
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD			
B.H.No.	UH-3	**Elevation**	R.L. 699.434 m	**Total Depth**	30.00 m	**Location**	HEVALE PROJECT SITE	
Equipment and Method	CALYX Rotary Coring Water Flush and with Diamond Bits				Diameter of Hole : NX (mm)	**Sheet No.**	OF	

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD [%]	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T / N VALUE	U.C.S (kgf/cm²)	Remarks
1					0 TO 2.35m SMALL PIECES ALL BROKEN ALONG JOINTS AT VARIOUS ANGLES MAINLY VERTICAL ALL JOINTS ARE STAINED BROWN RED ETC. THE SOME PLACES. THE ROCK IS IN WEATHERED STATE THERFORE RECOVERY IS POOR	(80) [0] (61)	B ~ C		NIL				
2	697.08	2.35											
3						(85) (100)					3.00		
4					4.00 to 5.65m ZEOLITE VEIN						0.2		
5						(100) (100)						5.46 5.65	
6											6.00		
7				COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS; PHENOCRYSTS ARE IN CLUSTERS		(100) (100)							
8					7.25 to 8.90m CHLOROPHAEITE						0.1		
9					8.90 to 10.50m ZEOLITE VEIN	(95) (100)	B	4.90 km/s			9.00		
10						(93) (98)						10.09 10.26 10.46	
11					10.50 to 12.10m CHLOROPHAEITE VEINS						0.3		
12						(100) (100)					12.00		
13						(78) (83) (90) (94)					0.1	13.68 13.83	
14						(100) (100)							
15											15.00		
16	683.07	16.36				(78) (98)					0.2		
17				VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (BLACK TACHYLYTIC BASALT)	THE DIAMETER OF THE CORE HAS BEEN REDUCED TO 35mm. ON EXPOSURE TO THE ATOMOSPHERE THE ROCK DISINTIGRATES IN TOSOFT LOOSE MATERIAL. EASY SCRATCH WITH NAIL (SOFT ROCK CONDITION)	[0] (69)	C ~ D					17.45 17.55	
18											18.00		
19	680.13	19.30				[0] (84)					0.3		
20					19.30 to 20.85m PIECE NO 146 TO PIECE NO 183 LARGE NO.OF SMALL PIECES OF REDUCED DIAMETER	(71) (96)						20.86 20.95	
21											21.00		
22						[61] (61)					0.6		
23				COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE PLAGIOCLASE PHENOCRYST EMBEDDED IN VESICULAR AMYGDALOIDAL	22.35 to 23.60m THERE ARE LARGE NO.OF SMALL PIECES RECOVERY IS VERY LESS EVEN UPTO 50%	[67] (67)							
24					23.60to 24.85m THROUGHOUT ZEOLITE VEIN	[40] (64)	B ~ C				24.00		
25													

FIELD PERMEABILITY TEST (3 to 30m)

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description	Core Recovery —×— (%) RQD [%]	Rock Classification	VP (km/s)	Water Table	N-Value	LUGEON VALUE / S.P.T / N VALUE	U.C.S (kgf/cm²)	Remarks
1					0 TO 2.35m SMALL PIECES ALL BROKEN ALONG JOINTS AT VARIOUS ANGLES MAINLY VERTICAL ALL JOINTS ARE STAINED BROWN RED ETC. THE SOME PLACES. THE ROCK IS IN WEATHERED STATE THERFORE RECOVERY IS POOR	(80) [10] (64)	B ? C		NIL				
2	697.08	2.35											
3						(85) (100)					3.00		
4					4.00 to 5.65m ZEOLITE VEIN						0.2		
5						(100) (100)						5.46 5.65	
6											6.00		
7				COMPACT PORPHYRITIC BASALT WITH SMALL TO MEDIUM PLAGIOCLASE PHENOCRYSTS; PHENOCRYSTS ARE IN CLUSTERS	7.25 to 8.90m CHLOROPHAEITE	(100)					0.1		
8						(96) (100)							
9					8.90 to 10.50m ZEOLITE VEIN		B	4.90 km/s			9.00		
10						(93) (98)						10.09 10.26 10.46	
11					10.50 to 12.10m CHLOROPHAEITE VEINS	(100) (100)					0.3		
12											12.00		
13						(78) (90) (94)					0.1	13.68 13.83	
14						(100) (100)							
15											15.00		
16	683.07	16.36				(78) (88)					0.2		
17				VOLCANIC BRECCIA WITH TACHYLYTIC BASALT (BLACK TACHYLYTIC BASALT)	THE DIAMETER OF THE CORE HAS BEEN REDUCED TO 35mm. ON EXPOSURE TO THE ATOMOSPHERE THE ROCK DISINTIGRATES IN TOSOFT LOOSE MATERIAL.	(0) (69)	C ? D					17.45 17.55	
18											18.00		
19	680.13	19.30			EASY SCRATCH WITH NAIL (SOFT ROCK CONDITION)	(0) (84)					0.3		
20					19.30 to 20.85m PIECE NO 146 TO PIECE NO 183 LARGE NO.OF SMALL PIECES OF REDUCED DIAMETER	(77) (96)						20.85 20.95	
21											21.00		
22					22.35 to 23.60m THERE ARE LARGE NO.OF SMALL PIECES RECOVERY IS VERY LESS EVEN UPTO 50%	(61)					0.6		
23				COMPACT PORPHYRITIC BASALT WITH SMALL TO LARGE PLAGIOCLASE PHENOCRYST EMBEDDED IN VESICULAR AMYGDALOIDAL GROUNDMASS VESICLES ARE FILLED WITH WHITE AND GREY		(57) (62)							
24					23.60to 24.85m THROUGHOUT ZEOLITE VEIN	(40) (64)	B ? C				24.00		
25					24.85 to 26.45m ZEOLITE VEIN						0.4		
26						(71) (71)							
27						(50) (50)					27.00		
28					28.75 to 30.02m PIECE NO.228 TO PIECE NO 238 LARGE NO OF SMALL PIECES.SOME BROKEN ALONG JOINTS WHICH ARE STAINED. ROCK IS SLIGHTLY WEATHERED	(68) (73)					0.2	28.65 28.75	
29						(64)							
30	669.43	30.00									30.00		

FIELD PERMEABILITY TEST (3 to 30m)

Fig. APP.2-18 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	11/NOV./1995 ~ 26/NOV./1995		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**LH-1**	**Elevation**	R.L. 238.751 m	**Total Depth**	65.00 m	**Location**	HEVALE PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description
1					0 to 2.7m YELLOWISH BROWN SILTY CLAY WITH BOULDER
2					
3					2.7 to 3.3m YELLOWISH BROWN SILTY CLAY WITH MOORUM
4					
5				OVERBURDEN	3.3 to 9.73m YELLOWISH BROWN SILTY CLAY WITH GRAVELS AND BOULDER
6					
7					
8					
9					9.73 to 10.1m BOULDER BROKEN PIECES
10	228.65	10.10			
	228.25	10.50			
11					
12	226.75	12.00			12.05 to 12.66m QTZ. BANDS OF 2CM TO 3CM
13					
14					14.01 to 15.10m QTZ. BANDS OF 1CM TO 5CM
15					
16					
17					
18					
19					
20					19.83 to 20.80m GNEISSIC BANDS OF THE BOTTOM
21					
22					
23					23.08 to 24.52m QTZ. BAND OF 5CM
24					
25					26.00 to 27.48m QTZ. BAND
26					GNEISSIC BAND
27					26.00 to 27.48m

Core Recovery —×— (%) RQD ⌐¬ (%) 0 50 100

Rock Classification: (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (12) (95) (100) (66) (100) (93) (100) (100) (100) (100) (98) (100) (100) (100) (100) (100) (100) (100) (94) (100) (100) (93) (100)

C B A

VP (km/s): 0.40 km/s 5.00 km/s

Water Table: NIL

N-Value

LUGEON VALUE 0 10 20

S. P. T

N VALUE 0 10 20 30 40 50

14 23 50/0 49 23 50/0

FIELD PERMEABILITY TEST (10.25 to 64.25m)

10.25 0.5 13.25 0.3 16.25 0.1 19.25 0.5 22.25 0.5 25.25 0.3

U.C.S (kgf/cm²)

13.80 12.43 14.01 23.08 13.54 23.30

Remarks

OVERBURDEN

WITH MOORUM

3.3 to 9.73m
YELLOWISH BROWN SILTY CLAY
WITH GRAVELS AND BOULDER

9.73 to 10.1m
BOULDER BROKEN PIECES

228.65 10.10
228.25 10.50

226.75 12.00

12.05 to 12.66m
QTZ. BANDS OF 2CM TO 3CM

14.01 to 15.10m
QTZ. BANDS OF 1CM TO 5CM

19.83 to 20.80m
GNEISSIC BANDS OF THE BOTTOM

23.08 to 24.52m
QTZ. BAND OF 5CM

26.00 to 27.48m
QTZ. BAND
GNEISSIC BAND

26.00 to 27.48m
NOT VERY PROMINENT QTZ.VEINS
27.48 to 28.85m
QTZ. BAND AT THE TOP
GNEISSIC BANDING

28.85 to 30.24m
GNEISSIC QTZ.BAND AT THE TOP
GNEISSIC BANDING
QTZ. BAND AT THE MIDDLE

32.47 to 33.76m
QTZ. BAND AT THE TOP

33.76 to 35.17m
IRREGULAR JOINT VEIN AT THE
BOTTOM

35.17 to 36.67m
VERTICAL VEIN PRESENT
QTZ. BAND AT THE TOP
20 DEG. AT THE BOTTOM

201.75 37.00

CRYSTALLINE SCHIST
ALTERNATING BANDS OF
QUARTZITE AND MICA
SCHIST WITH GARNET

36.67 to 38.07m
PIECE NO.102 TO 124 PARTIALLY
ORIENTED PLANES OF WEAKNESS
VEIN IN BET. QTZ. BAND

38.07 to 39.43m
WITH SMALL IRREGULAR VEIN
SMALL VEIN
NEARLY VERTICAL

198.75 40.00

39.43 to 40.73m
WITH QTZ. VEIN
1CM QTZ. VEIN

40.73 to 42.19m
AUGEN SHAPE QTZ. BAND
VERTICAL QTZ. INTRUSION 2CM

42.19 to 43.21m
INCLINED QTZ. BAND
QTZ. BAND 3CM AT THE BOTTOM
13CM QTZ. BAND AT THE TOP

43.21 to 44.51m
QTZ. BAND JUST ABOVE MIDDLE
2CM QTZ. BAND AT THE TOP

44.51 to 45.86m
QTZ. POCKET

0.40 km/s

5.00 km/s

FIELD PERMEABILITY TEST (10.25 to 64.25m)

10.25 0.5 13.25 0.3 16.25 0.1 19.25 0.5 22.25 0.5 25.25 0.3 28.25 0.5 31.25 0.4 34.25 1.3 37.25 2 40.25 0 43.25 0.1

13.80 14.01

23.08 1354 23.50

30.89 31.13

39.23 39.33

201.75 37.00

198.75 40.00

173.75 65.00

CRYSTALLINE SCHIST
ALTERNATING BANDS OF
QUARTZITE AND MICA
SCHIST WITH GARNET

26.00 to 27.48m
NOT VERY PROMINENT QTZ.VEINS
27.48 to 28.85m
QTZ. BAND AT THE TOP
GNEISSIC BANDING

28.85 to 30.24m
GNEISSIC QTZ.BAND AT THE TOP
GNEISSIC BANDING
QTZ. BAND AT THE MIDDLE

32.47 to 33.76m
QTZ. BAND AT THE TOP

33.76 to 35.17m
IRREGULAR JOINT VEIN AT THE
BOTTOM

35.17 to 36.67m
VERTICAL VEIN PRESENT
QTZ. BAND AT THE TOP
20 DEG. AT THE BOTTOM

36.67 to 38.07m
PIECE NO.102 TO 124 PARTIALLY
ORIENTED PLANES OF WEAKNESS
VEIN IN BET. QTZ. BAND

38.07 to 39.43m
WITH SMALL IRREGULAR VEIN
SMALL VEIN
NEARLY VERTICAL

39.43 to 40.73m
WITH QTZ. VEIN
1CM QTZ. VEIN

40.73 to 42.19m
AUGEN SHAPE QTZ. BAND
VERTICAL QTZ. INTRUSION 2CM

42.19 to 43.21m
INCLINED QTZ. BAND
QTZ. BAND 3CM AT THE BOTTOM
13CM QTZ. BAND AT THE TOP

43.21 to 44.51m
QTZ. BAND JUST ABOVE MIDDLE
2CM QTZ. BAND AT THE TOP

44.51 to 45.86m
QTZ. POCKET

47.78 to 48.95m
NO PIECES OF BROKEN ALOMG THE
PLANE OF WEAKNESS
QTZ. POCKET UP TO 1 TO 4CM

48.95 to 50.47m
QTZ. BAND THROUGHOUT PIECE

55.99 to 57.37m
QTZ. VEIN

58.34 to 59.80m
QTZ. BAND
BIG GNEISSIC BAND AT THE TOP
THIN QTZ. BAND AT THE TOP

59.80 to 61.01m
SMALL QTZ.POCKET
QTZ. POCKET AT THE TOP

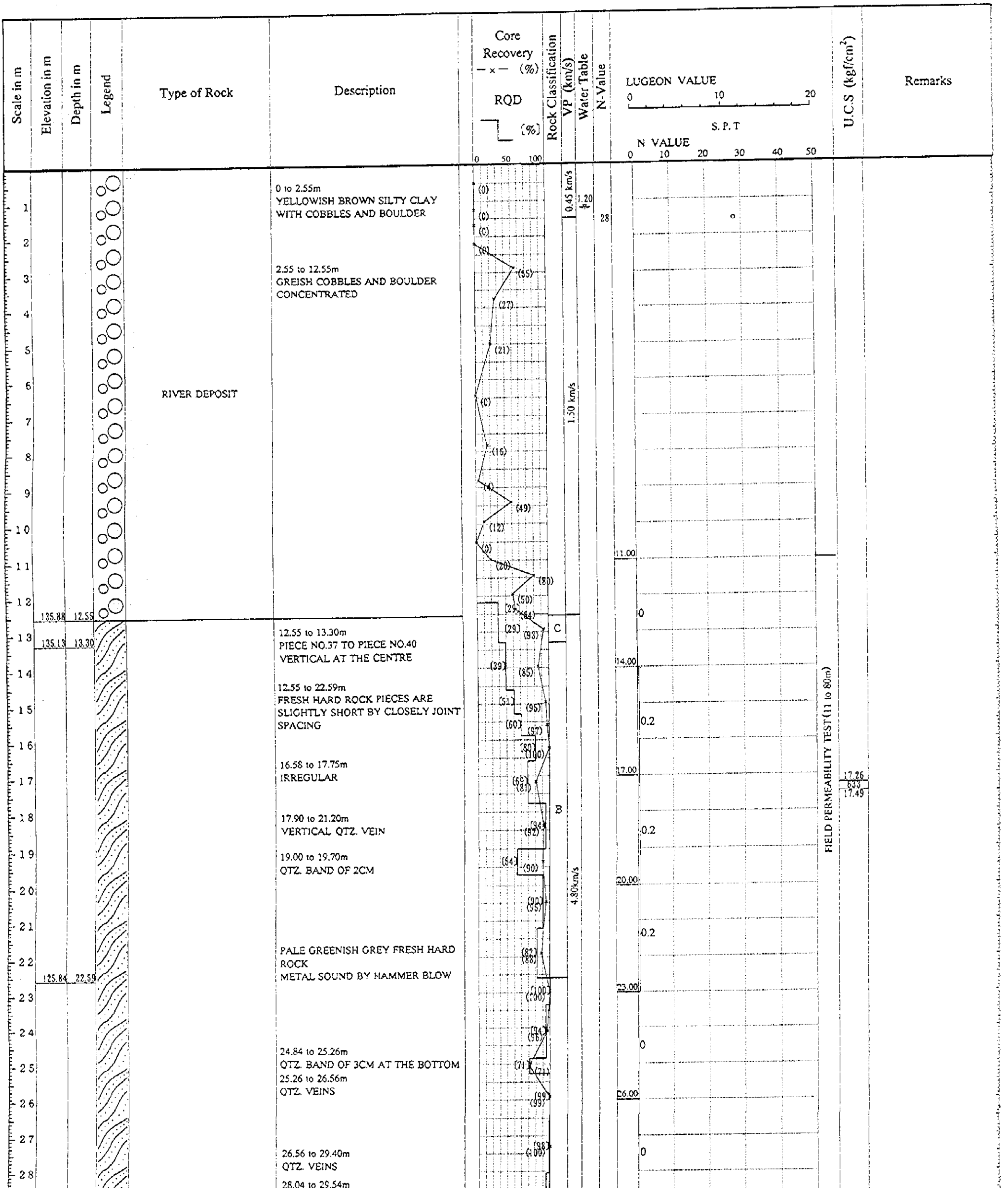
B

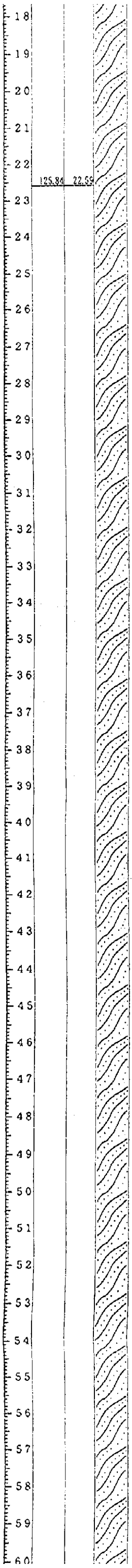
A

0.3
28.25
0.5
31.25
30.89
649 2
31.13
0.4
34.25
1.3
37.25
2
39.23
706 1
39.35
40.25
0
43.25
0.1
46.25
0.1
48.25
32 0
48.45
49.25
0.2
52.25
0.3
55.25
0.2
58.25
0.1
61.25
0.1
62.46
786
62.84
64.25

Fig. APP.2-19 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	4/OCT./1995 ~ 13/NOV./1995		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	LH-2	**Elevation**	R.L. 148.43 m	**Total Depth**	80.00 m	**Location**	HEVALE PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits			Diameter of Hole : NX (mm)		**Sheet No.**	OF





17.90 to 21.20m
VERTICAL QTZ. VEIN

19.00 to 19.70m
QTZ. BAND OF 2CM

PALE GREENISH GREY FRESH HARD ROCK
METAL SOUND BY HAMMER BLOW

24.84 to 25.26m
QTZ. BAND OF 3CM AT THE BOTTOM
25.26 to 26.56m
QTZ. VEINS

26.56 to 29.40m
QTZ. VEINS

28.04 to 29.54m
SEVRAL QTZ. VEIN

29.54 to 30.24m
CORE PIECES NO 152 TO 158
HAVE NOT BEEN USED
QTZ. BAND AT THE TOP

30.24 to 31.11m
INCLIEND QTZ. VEIN
$CaCO_3$ DEPOSETS
QTZ. BAND AT THE TOP & BOTTOM

32.61 to 34.11m
QTZ. VEIN & QTZ. BAND

34.11 to 35.61m
2 QTZ. BANDO OF 2CM

35.61 to 37.11m
6CM BAND AT THE TOP

37.11 to 38.59m
QTZ. BAND OF 4CM AT THE TOP
QTZ.BAND OF 5.5CM AT THE BOTTOM

38.59 to 40.11m
IRREGULAR WITH QTZ.BAND

40.11 to 41.61m
QTZ. POCKET AT THE BOTTOM

43.05 to 44.55m
WITH QTZ. VEIN
QTZ. BAND OF 4CM AT THE BOTTOM

CRYSTALLINE SCHIST
ALTERNATING BANDS OF QUARTZITE AND MICA SCHIST WITH GARNET

46.05 to 47.55m
PIECES IRREGULAR

51.88 to 53.29m
QTZ. BAND OF 2CM

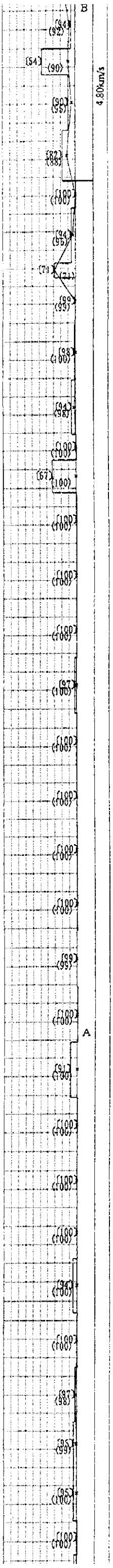
53.29 to 54.75m
$CaCO_3$ DEPOSITS

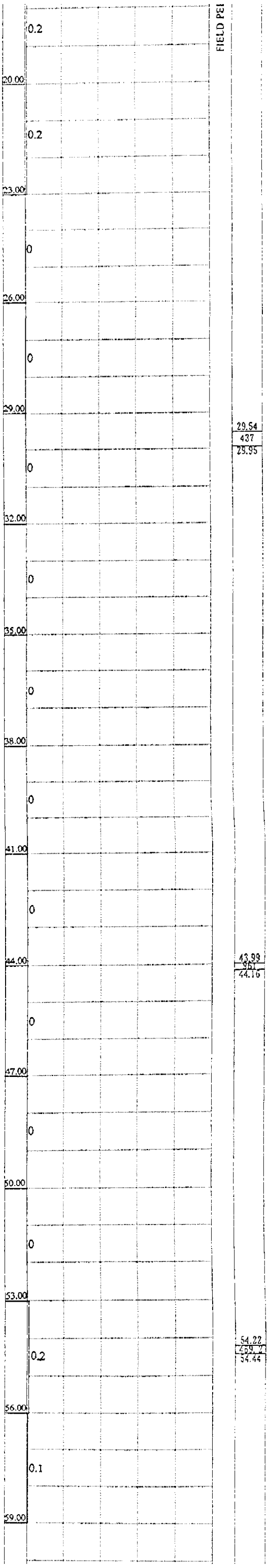
54.75 to 56.23m
QTZ. BAND OF 2.5CM AT THE BOTTOM
QTZ. BAND OF 7.5CM AT THE TOP
QTZ. BAND OF 20CM AT THE TOP
QTZ. BAND OF 1 TO 2CM AT THE TOP
56.23 to 57.46m
QTZ. BAND OF 7CM

57.46 to 58.94m
2 BANDS OF QTZ.
11CM QTZ. BAND AT THE BOTTOM

58.94 to 59.84m
QTZ. OF 7CM AT THE TOP

59.84 to 61.20m





CRYSTALLINE SCHIST
ALTERNATING BANDS OF QUARTZITE AND MICA SCHIST WITH GARNET

43.05 to 44.55m
WITH QTZ. VEIN
QTZ. BAND OF 4CM AT THE BOTTOM

46.05 to 47.55m
PIECES IRREGULAR

51.88 to 53.29m
QTZ. BAND OF 2CM

53.29 to 54.75m
$CaCO_3$ DEPOSITS

54.75 to 56.23m
QTZ. BAND OF 2.5CM AT THE BOTTOM
QTZ. BAND OF 7.5CM AT THE TOP
QTZ. BAND OF 20CM AT THE TOP
QTZ. BAND OF 1 TO 2CM AT THE TOP

56.23 to 57.46m
QTZ. BAND OF 7CM

57.46 to 58.94m
2 BANDS OF QTZ.
11CM QTZ. BAND AT THE BOTTOM

58.94 to 59.84m
QTZ. OF 7CM AT THE TOP

59.84 to 61.20m
2CM QTZ. BAND

61.20 to 62.70m
QTZ. BAND 4CM AT THE BOTTOM

62.70 to 64.20m
QTZ. BAND TOP 2CM
PREDOMINANTLY QTZ. BAND

65.63 to 67.11m
QTZ. BAND OF 1CM

68.40 to 69.90m
QTZ. BAND OF 3.5CM

69.90 to 71.34m
WITH QTZ. VEIN

71.34 to 72.84m
3CM QTZ. BAND AT THE BOTTOM

72.84 to 74.34m
QTZ. BAND OF 5CM

74.34 to 75.84m
QTZ. BAND OF 2CM

77.34 to 78.79m
QTZ. BAND 3CM AT THE BOTTOM
NO.OF BROKEN PIECES

79.43 69.00

68.43 80.00

A

B

44.00 47.00 50.00 53.00 56.00 59.00 62.00 65.00 68.00 71.00 74.00 77.00 80.00

0 0 0 0 0 0.2 0.1 0 0.1 0.1 0.1 0.1

43.99 95 44.16

54.22 459.2 54.44

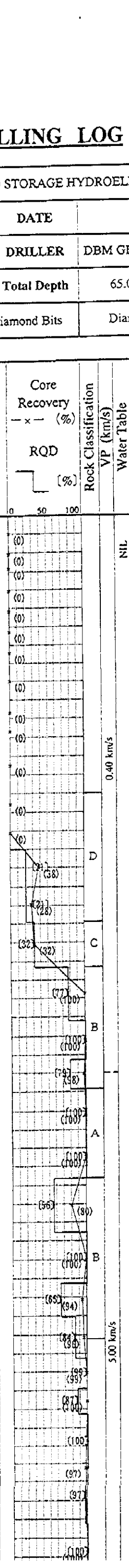
65.63 65.77

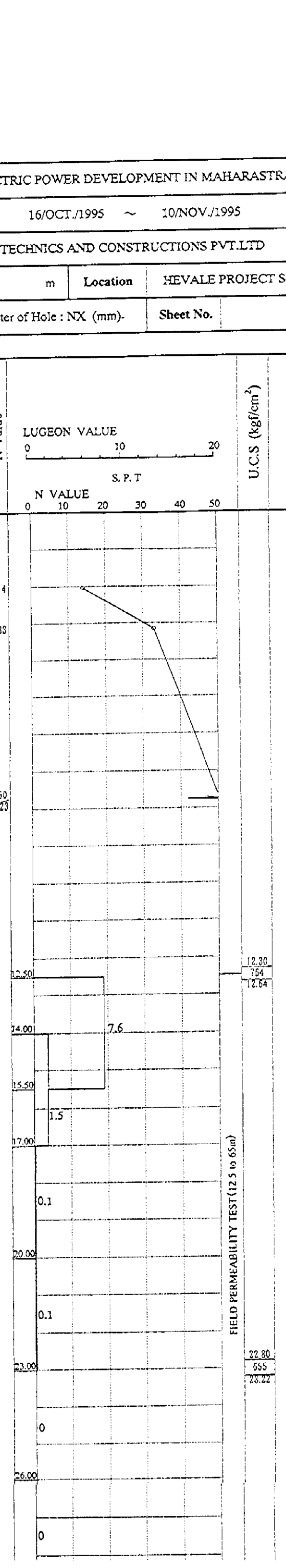
74.34 611 74.68

Fig. APP.2-20 DRILLING LOG

PROJECT	GEOLOGICAL SURVEY FOR MASTER PLAN STUDY ON POMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT IN MAHARASTRA STATE ,INDIA						
CLIENT	JAPAN INTERNATIONAL COOPERATION AGENCY			**DATE**	16/OCT./1995 ~ 10/NOV./1995		
CONSULTANT	CONSULTING ENGINEERING SERVICES (I) PVT. LTD			**DRILLER**	DBM GEOTECHNICS AND CONSTRUCTIONS PVT.LTD		
B.H.No.	**LH-3**	**Elevation**	R.L. 239.071 m	**Total Depth**	65.00 m	**Location**	HEVALE PROJECT SITE
Equipment and Method	SWENSKA Rotary Coring Water Flush and with Diamond Bits				Diameter of Hole : NX (mm)-	**Sheet No.**	OF

Scale in m	Elevation in m	Depth in m	Legend	Type of Rock	Description
1				OVERBURDEN	0 to 4.5m REDDISH BROWN SILTY CLAY WITH PEBBLES
2					
3					
4					4.5 to 5.7m YELLOWISH BROWN SILTY CLAY
5					
6					5.7 to 6.0m SILTY SAND WITH BOULDERS
7	231.57	7.50			
8				CRYSTALLINE SCHIST (WEATHERED)	7.5 to 8.1m BROWN WEATHERED ROCK
9					POOR CORE RECOVERY WITH WATER FLASH DRILLING
10					
11	228.12	10.95			
12	226.92	12.15			10.95 to 12.15m JOINTS ARE STAINED BROWN POOR CORE RECOVERY
13					12.15 to 13.60m QTZ. VEIN
14					12.15 to bottom PALE GREENISH GREY FRESH HARD ROCK JOINTS STAINED PARTIALLY UP TO 15M
15	223.65	15.42			PALE GREENISH GREY FRESH HARD ROCK
16					METAL SOUND BY HAMMER BLOW
17					
18	221.26	17.81			
19					
20					
21					
22	216.96	22.11			
23					
24					
25					
26					
27					
28					MAXIMUM LENGTH OF PIECE IS





U.C.S (kgf/cm²)	Remarks

231.58 (.50)

CRYSTALLINE SCHIST
(WEATHERED)

7.5 to 8.1m
BROWN WEATHERED ROCK

POOR CORE RECOVERY WITH WATER FLASH DRILLING

228.12 10.95

10.95 to 12.15m
JOINTS ARE STAINED BROWN
POOR CORE RECOVERY

12.15 to 13.60m
QTZ. VEIN

12.15 to bottom
PALE GREENISH GREY FRESH HARD ROCK
JOINTS STAINED PARTIALLY UP TO 15M

226.92 12.15

PALE GREENISH GREY FRESH HARD ROCK

METAL SOUND BY HAMMER BLOW

223.69 15.42

221.26 17.81

MAXIMUM LENGTH OF PIECE IS OVER 100CM

34.51 to 35.97m
QTZ. BAND & VEINS

216.96 22.11

CRYSTALLINE SCHIST
ALTERNATING BANDS OF QUARTZ AND MICA SCHIST WITH GARNET

39.84 to 41.10m
QTZ. BANDING

45.26 to 46.56m
BANDING (QTZ. FELSPAR)

47.44 to 48.81m
QTZ. BANDS

49.57 to 51.07m

(0) (0) (34) (38) (2) (28) (32) (32) (77) (100) (100) (100) (79) (98) (100) (100) (100) (100) (56) (80) (100) (100) (65) (94) (84) (98) (99) (99) (87) (100) (100) (97) (97) (100) (100) (95) (95) (100) (100) (100) (100) (94) (100) (100) (100) (100) (100) (100) (100) (100)

D C B A B A

5.00 km/s

23

12.50
7.6
14.00
15.50
1.5
17.00
0.1
20.00
0.1
23.00
0
26.00
0
29.00
0
32.00
0.1
35.00
0
38.00
0
41.00
0.1
44.00
0
47.00
0

FIELD PERMEABILITY TEST (12.5 to 65m)

12.80
764
12.64

22.80
655
23.22

31.33
1162
31.51

39.21
1162
39.34

45.69
1162
46.06

MAXIMUM LENGTH OF PIECE IS OVER 100CM

34.51 to 35.97m
QTZ. BAND & VEINS

CRYSTALLINE SCHIST
ALTERNATING BANDS OF QUARTZ AND MICA SCHIST WITH GARNET

39.84 to 41.10m
QTZ. BANDING

45.26 to 46.56m
BANDING (QTZ. FELSPAR)

47.44 to 48.81m
QTZ. BANDS

49.57 to 51.07m
THOUGHOUT

56.94 to 58.36m
NO. OF PIECES

58.38 to 59.38m
CLOSELY JOIT SPACING

59.38 to 60.71m
3 PIECES
NO. OF PIECES
ROCK IS SLIGHTLY IN WEATHERED CONDITION

184.79 54.28
180.69 58.38
179.69 59.38
174.07 65.00

A
B
C
B

29.00 0 32.00 0.1 35.00 0 38.00 0 41.00 0.1 44.00 0 47.00 0 50.00 0.1 53.00 0.1 56.00 0.1 59.00 0 62.00 0.1 65.00

31.33 .06 31.51
39.21 .13 39.34
45.69 .162 45.06
56.36 1.332 56.69