APPENDIX-III GOLOGICAL DATA

APPENDIX - III GEOLOGICAL DATA

III-1 Drillhole

- (1) List of Drillhole
 - (2) Classification of Drilled Core
 - (3) Geologic Log of Drillhole
 - (4) Method of Water Pressure Test
 - (5) Result of Water Pressure Test

III-2 Trench and Pit

- (1) List of Trenche
- (2) List of Pit
- (3) Geologic Log of Trenche and Pit

III-3 Geophisical Prospecting

- (1) Result of Seismic Prospecting
- (2) Result of Vertical Electrical Sounding

III-4 Result of Microscopic Observation

III-5 Construction Materials

- (1) Result of X-ray Diffraction Analysis and Polarized Microsopic Observation for Quarry Site
- (2) List of Pit for Concreate Aggregate
- (3) List of Trench for Earth Material
- (4) Gradation of Concrete Aggregate
- (5) Result of Soil Test

III-6 Locality of Sampling

III-l Drillhole

- (1) List of Drillhole
- (2) Classification of Drilled Core
- (3) Geologic Log of Drillhole
- (4) Method of Water Pressure Test
- (5) Result of Water Pressure Test

III-1 (1) List of Drillhole

· · · · · · ·			ı — — — — — — — — — — — — — — — — — — —			Water	
Hole name	Location	Elevation (m)	Coordinate	Direction of hole	Length (m)	Pressure Test	Remarks
AD-1	El Siete No.l Dam, Right Bank	1476.68	1,139.433N 1,098.128E	Vertical	30.00	0	*2
AD-2	u Line in the second	1465.27	1,139.375N 1,098.113E	Vertical	50.00	0	*2
AD-3	H .	1438.33	1,139.356N 1,098.203E	Vertical	30.00	0	*1 *2
AD-4	El Siete No.l Dam, River bed	1423.98	1,139.317N 1,098.200E	S10°W, 46°	30.00	o	*1
AD-5	El Siete No.l Dam, Left Bank	1478.79	1,139.221N 1,098.086E	Vertical	30.00	0	*1 *2
AD-6	El Siete No.l Dam, Right Bank	1461.85	1,139.394N 1,098.166E	Vertical	30.00	0	*1 *2
AD-7	El Siete No.l Dam, River bed	1426.09	1,139.265N 1,098.246E	N10°E, 48°	30.00	0	:
AD-8	El Siete No.l Dam, Left Bank	1480.67	1,139.151N 1,098.175E	Vertical	30.39	0	*2
AD-9	t t	1481.28	1,139.171N 1,098.222E	Vertical	50.00	0	*1 *2
	Total: 9 holes	310.39 m					
BD-1	El Siete No.2 Near Head race tunnel	1109.32	1,137.872N 1.094.033E	Vertical	69.90	-	*1 *2
BD-2	El Siete No.2 Intake dam	1074.34	1,137.658N 1,094.235E	Vertical	9.50	-	
	Total: 2 holes	79.40 m					
CD-1	El Siete No.2 Powerhouse	694.50	1,129.603N 1,092.979E	Vertical	22.30	0	*1 *2
CD-2	El Siete No.2 Penstock	815.43	1,129.786N 1,091.776E	Vertical	46.38	0	*1 *2
	Total: 2 holes	68.68 п					:

Remarks: O Hole with water pressure test.

^{*1} Hole with piezometer. *2 Hole with standard penetration test.

III-1 (2) Classification of Drilled Core

The geological profile and the logs of drillholes in Appendix 10-1 (3) attached to the ATRATO HIDRO-ELECTRIC POWER PROJECT REPORT give classifications of drilled cores. The classifications comprise three elements - degree of weathering, hardness and core cutting (crack spacing).

Each element is further classified according to five grade based on the criteria given below.

Classification of Drilled Core

Grade	Weathering	Hardness	Core Cutting
1	Very fresh. No weathering of mineral component.	Very hard. Broken to knife- edged pieces by strong ham- mer blow.	Over 30cm
2	Fresh. Some minerals are weathered slightly. Usually no brown crack.	Hard. Broken to pieces by strong hammer blow.	10 - 30cm
3	Fairly fresh. Some mine- rals are weathered. Cracks are stained and with weathered material.	Brittle. Broken to pieces by medium hammer blow.	3 - 10cm
4	Weathered. Fresh portions still remain partially.	Very brittle. Easy broken to pieces by medium hammer blow.	1 - 3cm
5	Strongly weathered. Most minerals are weathered and altered to secondary minerals.	Soft. Able to dig with hammer.	Under lcm

III-1 (3) Geologic Log of Drillhole

AD-1	(Drilled	length:	30.00m)	Page	(1	to	2)
AD-2	(Drilled	length:	50.00m)		(3	to	5)
AD-3	(Drilled	length:	30.00m)		(6	to	7)
AD-4	(Drilled	length:	30.00m)		(8	to	9)
AD-5	(Drilled	length:	30.00m)		(10	to	11)
AD-6	(Drilled	length:	30.00m)		(12	to	13)
AD-7	(Drilled	length:	30.00m)	•	(14	to	15)
AD-8	(Drilled	length:	30.39m)		(16	to	17)
AD-9	(Drilled	length:	50.00m)		(18	to	20)
BD-1	(Drilled	length:	69.90m)		(21	to	24)
BD-2	(Drilled	length:	9.50m)		(25)
CD-1	(Drilled	length:	22.30m)		(26	to	27)
CD-2	(Drilled	length:	46.38m)		(28	to	30)

EL SIETE	No.l	PROJ	ECT		HOL PTH OF HOLE	E N	10. AD-1 (SHEET OF 2) 0 m COMMENCED Aug 8 1984
ELEVATION	1476. 6	8	m	DE	PTH OF OVERBURDEN	9.	
COORDINATE 1139). 433N,	1098.1	28E	LE	NGTH OF ROCK DRILLING	<u>20.</u>	
ANGLE FROM HOR		90		то			m LOGGED BY ISHII
BEARING OF ANGL	E HOLE					50	.3%
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DEPTH NOCK NAME LOG CORE	CEMENTA TION XIND OF BIT CASING	COLOR	S . S	25.0	DESCRIPTION		WATER TABLE
	8 520	COLOR	HARD.	CORE	DESCAN HON		9 3
Om 0 → 100	 	1 1	 	<u> </u>			LUGEON Om m
	Į į				Core loss		12
	Percussion	brown			Core loss		49
	i stol	مُ			Core loss Frogment and silt.		336'
- g ∆	Per	l ≀⊨		-	Cove loss		
	<u>[5</u>	#			Core loss 20		
S Topewash		black			2.4		
MIII 4 ご Fo	ž				Block of basalt	1.0	
					3.8		
	8	ΙF	- -		Core loss 1	4.0	4
	Percussion		ĺ		subrounded		S PT
0-3	<u> </u>	-			gravels. 5.0 ≥	=	
	g				Core loss	basalt	
deposit	1				6,2	of.	
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7 % X N N		로			Core loss	pebbles	
4 \(\vec{\pi}{2}\) F-3WW		*		-	7.5	4	
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Mudflow deposit					Core loss	Some	
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が マンス トート アンス コード コード アンス	-	-	3-4	4	Fragment of basalt		
	ā				Core loss		
WAIIXI 🖡 I	اع				Leakage of water		
	amond	-2	3~4	- <u>a</u> -	Frogment of bosult 6		
	. <u>5</u>	brown	×		11.2		
2-		امّا			Core loss Leakage of water	χ.	
1	×	1 1	_		12.5	76	
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3 4 13 / 120/15/15	∯ iİ	redd			8 8		
BAS	1 1	=			Core loss	core]
	1				Core loss 14.4	Poor	1
M See - o					[COIN 1020	g	02 5
Decomposed		3	4	4	15.25 Fragment core dominant,		
			4 ~ 3	~ 5			
	1		+	-	Core 1055		
Decomit		성	3		Piece cores, cracks		
		black	1	3	stained.		
	1 1	1 L	4		Calcite vein network.		
	}				Core loss		ا أن ا ا ا ا
		5 € 3	4 4	4			
	}	reddish hovd 4			Core loss		
20 V		20 4	4	4	Seam, brittle.		20
1 1	1	1	1	1	▶ driller's note 4		
M KM 1 1					tick). 2 (aubatick). 3 (piece). 4 (fragment). 5	grain.	
·				· \$ (soit) scamposed)			
	RQD 1 (fresh)				, , , , , , , , , , , , , , , , ,		

° §	CEMENTA. CEMENTA. TION KIND OF BIT CASING COLOR	WEATHER WEATHER WEATHER WEATHER WEATHER CORE CORE CORE CORE CORE CORE CORTING	DESCRIPTION Seam at 20.2~20.4m, brittle.	WATER TABLE	20m	ELEVATION
25m	brown	3 4 2 4 34 3		LUGEON	2 0m	
ndamlandandandandandandandandandandandandanda	Nx Diamond bit purplish grey	2 3 3 3 3 3 3 2 2 2 2 1 3 3 1	Core loss 20.7 21.45 Core loss 21.1 Core loss 22.3 Fragment cores, rust-stained 22.6 Cracky at 22.3 ~ 22.6m. Hair cracks. 24.0 Generally good. Fresh, substick cores, some hair cracks, rust-stained. 26.5 Somewhat surffered thermal alteration. Crack stained. Calcite vein network.	Uniaxial compressive strength 426.2 kg/cm²	2.8.1 1.3.5	**************************************
20 1 20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			End of hole 30.0m p driller's note 4 lick). 2 (substick). 3 (piece). 4 (fragment). 5 grain		udundandandandandandandandandandandandandan	1446.7▼

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										PTH OF OVERBURDEN NGTH OF ROCK DRILLING _										27
										TAL LENGTH OF CORE										
										RE RECOVERY						. si si	• • •			-
	¥		>	—	Т				OBSE	RVATION OF CORE						4.4			. <u>Z</u>	\Box
ОЕРТЖ	ROCK NAME	100	CORE	CEMENT TION KIND OF	CASING	COLOR	WEATHER -ING	HARD.	CORE	DESCRIPTION			- 2	BLE ESSUR				0€PT#	ELEVATION	
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	:			u.		reddish brn.				Topsoil with plant root. Breccia of black shale							20 20 21	1		
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3 4 4					_	khaki				4.7 Soil with subrounded			-			E G	18 47			
ֆուսիս				××	Diamond	no ki				pebble of chert, shale and basalt.			-				/ 3 0/1	. դուսարու		
9 17 17 17	- :*			ercussion		x G				Slime 6.0 6.5								ر د السالسل		
8 kurlania	-	\bigvee		Perc		rk brown				Slime								գուսիսան 8		
9-						dark				9.0		.						9		
10-111-111-111-111-111-111-111-111-111-	deposit	0								Coarse graind sand, slime?, with pebble of bosalt and chert.								րուրարուր Ծ		
2,	Mudflow	X		‡iq		grey				Slime								ակադրույր «		
3 4	Muc	כו		Diamond		dark				Pobble of Basalt and chert.						-		ակասհայհա		
2	٠			ž	- 11	- - -				Slime					W			արարուր		
9 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						Khaki				10.7	ļ				-			6 		
8						grey				Block of baselic tapilli tuff, hard.								8		
a dundun		a				dark												20		
(= <u>2</u> = 3	20 3			10		kard) -	b driller's note 4 tich) 2 (substich) 3 (piece) 4 (fragment) 5 g 5 (solt) ccomposed)	rafa			eterrorito	•								

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											TAL LENGTH OF CO									
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			·	13 V	- core loss				1		5 (soft)	and a distance								
		-		L	- RQD			1 (rash) -	- 5 (de	composed)									

ELEVATION COORDINAT ANGLE FRO	<u>Dam</u> E <u>1139.</u> M HORIZ	, right 1465. 375N, 10 ONTAL	bai 27 98.	ik n 113E	1	DE DE LE TO	PTH OF HOLE PTH OF OVERBURDEN NGTH OF ROCK DRILLING TAL LENGTH OF CORE	50 34 15	.0 m .8 m .2 m	CO CO DRI	MMI MPL LLE	ETE DB	ED D	Jun Aug	29 <u>1984</u> 3 -1984
DEPTH ROCK NAME	1	CEMENTA. TION KIND OF BIT CASING	COLOR	WEATHER ING	MARD. NESS	CORE CUTTING	RVATION OF CORE DESCRIPTION			R TABL	URE 1	res?	\- <u></u>	ОЕРТИ	ELEVATION
40m		Nx Diamond bit	dark grey ~ purplish grey	1 } 3	2	3	Good core recovery. Basaltic lapilli tuff, subanguler pebble of basalt in tuffaceous matrix. 43,0 Fresh, hard, stick cores, a few cracks stained. Generally good. Max. core length over 70 cm. Basalt, coarse grained. Few cracks stained. End of hole 50.0 m				GEON			Of # d Of	o 1415.3 v
		core loss		1 ((bard)	itick) ?(asbelick) 3(piece) 4(fragment) 5 g - 5(solt) ecomposed)	Y ZiM					. :		

				PRO)JE(OT.		HOLE N	Vo:	AD-3 (SHEET OF 2)
								PTH OF OVERBURDEN _3.		
COORD	NATI	F 1139	.356N, IO	98.	203	Ξ.	LE	NGTH OF ROCK DRILLING 26.	.75	m DRILLED BY
ANGLE	FROI	M HORE	ZONTAL	9	0_	•	то	TAL LENGTH OF CORE		m LOGGED BY TSHII
BEARIN	G OF	ANGL	E HOLE	_		<u>.</u> :	CO	RE RECOVERY 6	<u>7. 8</u>	3 %
			,				OBSE	RVATION OF CORE	i i	
DEPTH ROCK NAM	100	CORE	CEMENTA TION KIND OF BIT CASING	80,00	WEATHER -ING	HARD.	CORE	DESCRIPTION	1	WATER TABLE
Om	1	0 - 100							\perp	LUGEON Om m
Top-	Δ			bra.		-		Breccio of chert in silt. Topsoil. 0.7		9 6
1-1-3	_		Percussion					Angular pebble of shale		25 '
Siopewash	$ \Delta $		SS	e ×				and basalt in silt matrix.		36
2 Dewo			일	0						22 2
d 0	Δ		a	\vdash		ļ		Breccia of shale and	1	3 41 E 3 1435.1 w
3 4 30			+				A	Basait, # 2~5mm, 3.25	┨	
4.					5	5	4.3 5	Slime, coarse sand like.		
4-4-1	V		1.		2	3	4	Similar Carra		45 -4
SALT				 	2	3	4	<u> </u>	1	Las Table
ABA BA	V	75			5	5	5	Slime, medium graind.		1 1 5
Muchinduding Decomposed	V		1		3	3	4	Fragment core of basalt.		
7 2 2	v		}		5	5	5 4.3	S)ime Hard fragment.	Ì	
1 3 8	'		} _		-	<u>ٽ</u>	~ 3	Core loss. 7.3		
8 2 2	٧		<u>+</u>		-			Leakage of drilling water, 8.5		20 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
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4 è	 ,							Core loss		
64 6	V.	川柳				<u> </u>		Core loss 16.2		
l He			1	dark	2	3	3	Brown cracks		
] 7] ≥	٧	ИШ	1	윤		<u> </u>	4			
		NIIIII			<u> </u>	<u> </u>		COT 8 1033 17.3		
8	۷				2	3	3	Crack stained Core loss 18.8		
n										
9-4	Y			•				No return of drilling water. 19.4		
20 :			1 1		2	2	3			20
LEU J	<u>اا</u> ا	N N Controvi		å	1		لىسىا 	▶ driller's note ◀		
						1 (5	tick) 2 (substick) 3 (piece), 4 (fragment), 5 grain	ň		
	RIV core loss				1			5 (sofi)		•
		<u> </u>	- AQO		1 (1	iresh)	~ 5 (de	composed)		

LOCATI ELEVAT COORDI ANGLE		, right b 1438.3 356N,109 ZONTAL	ank 3 6.20 90	m SE	DE DE LE TO CO	PTH OF HOLE PTH OF OVERBURDEN NGTH OF ROCK DRILLING 2 TAL LENGTH OF CORE RE RECOVERY	30.0 3.25 6.75	m COMM m COMP m DRILLI m LOGG	ENCED S LETED S D BY	Oct 2 Oct 13	1984 1984
DEPTH ROCK NAME	LOG CORE RECOVERY	CEMENTA. THON KIND OF BIT CASING	COLOR		CORE	RVATION OF CORE DESCRIPTION		ATER TABLE ATER PRESSURE		ОЕРТН	ELEVATION
20m	>		s	2 3	3	Core loss		Lugeo		20m	
20 20 20 20 20 20 20 20 20 20 20 20 20 2	> > > >	Nx Diamond bit	dark grey		2	Good core recovery. Substick - stick core, fresh, hard. Few cracks stained. 26.4 Fresh, few cracks. A few white velns.			= 0 [u=1.5 [u=0	2 3 4 5 8 9 5 8 9 9 5 8 9 9 5 8 9 9 5 8 9 9 5 8 9 9 9 9	! 408.3 ₩
onder of the standard of the s										mlnuburhurhurhurhurhurhurhurhurhurhurhurhurhu	
		cere lass RQO			(hard) ·	p driller's note 4 tick) 2 (substick) 3 (piece) 4 (tragment) 5 g 5 (soft) composed)	gráin				

EL SIETE No.1 PROJECT HOLE No. AD-4 (SHEET 1 OF 2)										
LOCATION Dam rive	LOCATION Dam, Flyer bed DEPTH OF HOLE 30.0 m COMMENCED Sep. 12 1984									
	98 m DEPTH OF OVERBURDEN 22.									
	198.200E LENGTH OF ROCK DRILLING 7.1									
ANGLE FROM HORIZONTAL	46 TOTAL LENGTH OF CORE	m LOGGED BY ISHII								
BEARING OF ANGLE HOLI	SIO°W CORE RECOVERY 52	7.84								
\$ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	OBSERVATION OF CORE	WATER TABLE N- I S								
DEPTH CCC NAME COG COGE COGE RECOVERY CEMENTA. KIND OF SIT	MEATHER ALL DESCRIPTION DESCRIPTION	WATER TABLE TEST TO THE TABLE T								
	MEATHER OCIOR STATES OCIORE STATES OCIORE STATES OCIORE STATES OCIORES									
Om 0 + 100		Out &								
	Subrounded to subangular									
d ss +										
ξā.	pebbles of basalts and cherts. Matrix is brown									
Slopewash Slopewash Subsequently of the position of the posi	silt.									
Stopewash Stopewash Stopewash Secussion	2.45	E 2 E 2 E 2 E 2 E 2 E 2 E 2 E 2 E 2 E 2								
3- j.										
	Almost slime.									
4- 0	A few pabbles.									
	ا ج									
5-1 0 1111	greyish									
	6									
6 0	5.9									
7 1 7 1										
bit										
o lamond	River bed deposits.									
10 0 mg	Subrounded to Subangular									
ă li li li li li li li li li li li li li	pebbles and cobbles of									
deposit o o o o o o o o o o o o o o o o o o o	basalt, and time to	▎▕▕▕▕▕▍▍ ▋▍								
oda × N	coarse grained sand									
2-3 0.										
	matrix.									
Ver L	Maximum diameter of									
i a o	cobble is assumed to									
4	HI5 cm long.									
	Core recovery is poor.									
	[5									
0,0										
20 3 0 1		<u> </u>								
8 , 8	b driffer's note 4 I (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain									
Core loss	1 (hard) ~ 5 (solt)									
E RQO	1 (Iresh) ~ 5 (decomposed)									

					PRO	JE	CT		HOLE N	10.	1D	- 4						
									PTH OF HOLE 30									
									PTH OF OVERBURDEN 22.									6 - 1984
COC	RDI	NATI	1139.	. 317N, 109	8.2	OOF	•	LE	NGTH OF ROCK DRILLING _7.	15	m	Df	RILLE	DB	Υ		T C 1 1	* *
				ZONTAL E HOLE					TAL LENGTH OF CORE	اــــا	m	LC	GG	D E	ΙΥ		12H	11
05A		J Ur	ANGL	E HOLE	<u> </u>	<u> </u>			RE RECOVERY 52		<u> </u>		<u> </u>			- 1	1	
x .	ROCK NAME	U		NO ON		(32	6		RVATION OF CORE		ATER	R TAB	LE	1	۸		Œ	ELEVATION
ЭЕРТН	Z:	٥	CORE	CEMENTA TION KIND OF BIT CASING	80,00	WEATHER	HARD.	COTTING	DESCRIPTION	W	ATER	PRE	SSURE	TEST			ОЕРТН	\$
	Ş.		1.0	2 × a0	ŏ	3	ì.	80		L.	<u> </u>		UGEO					iii
20m			0 → 100					ļ		ļ,			UGEO	N	1		20m	- _
4	4-	o `		1	grey		3.		Medium to fine grained sands or stime.				.				_	.
1	deposit	-0			X.				4.3				1				-1	
. Inchair	q				dark				Pebble and cobble of basalt					1			-	
2-	ē				2	<u> </u>		_	22.0 and pebble of chert.								2	
	River	0			duck	•			Pebble of basalt and shale. 22.85								-	1407.5
3.4		Γ				2	3	3	Some cracks are stained.]							-3	
- dia		V		Di.	purplish grey	-	-	 	23.6 Basaltic tuff, contains				. .				-	
4-				۵	<u>u. </u>	1		_	breccia, #1~3 cm.						1	П	-4	
1		٧	<i>}</i> }	ğ		1	2	2	Some cracks are					.			<u> </u>	
2		.,		٥					coated by milky clay.						ω	4	-5	
		٧	WW	Diamond					25.5 Cracky,					:	11 23	N.	- 6	
6-7	 -	, ,	WIII			1	3	3	cracks stained.				.		_			
,]	AL	۷		ž	_				26,8								- 7	
'	S	V		1	grey				Good core recovery						1			
8 113	A				Ĭ		1,		as stick. Hard and fresh								8	
	00	V			يد	1	2	1	basalt.]	1.	1	9	8.4		1
9-3		'	11111		함		:		Some calcite veins.	i I					2	اۃ	9	
] -		V	WW.						00000 000000						ı			
30-	 -		иии	!	ļ								\dashv		1	\vdash	- 30	1402.4 ₩
4									End of hole 30.0 cm								-	
1-3															į .		1	İ
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3.4							1										3	
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9				1													-9	
	l																Ė,] • [
1.0.5	l	i	N N	1	<u> </u>	L	4	 	▶ dreller's note €	<u></u>	L				<u></u>	اا	<u> </u>	
				: [ĺ		1 + 6	itick), 2 (substick), 3 (plecs), 4 (fragment), 5 grain	,								
			. u , l',	- cure loss		Į			- 5 (soft)				-					•
			L	- #Q0		1 (fresh)	~ 5(8	ecomposed)									

EL	SIE		10.1													
LOCAT	· · · · · · · · · · · · · · · · · · ·		n, left			-		A Company of the Comp	.O_ m						25 _19	
			1478.79					PTH OF OVERBURDEN 4						Sep	9 - 19	184
COORD	INATI	E 1139.	22IN, 104	18.0	86E	2		NGTH OF ROCK DRILLING 25		(PRILLE	D 87	1			
ANGLE	FROI	M HORE	ZONTAL	9	0	-	ŢΟ	TAL LENGTH OF CORE	m	l	OGGE	D B,	1	<u>IS</u>	HII	
BEARI	NG OF	ANGL	E HOLE			<u>.</u>	:co	RE RECOVERY 6	L. <u>5</u> %						· · · · .	
	Т	Ι .		T			OBSI	RVATION OF CORE	T						22	
1 2 3	U	3 3	Z Z Z Z	~	8	8	ý	•			BLE	. , F	·	_ <u>r</u>	1	
DEPTH OCK NAME	2	CORE	CEMENTA TION KIND OF BIT CASING	COLOR	WEATHER	HARD. NESS	CUTTING	DESCRIPTION	WATE	R PF	ESSURE	TEST		96	PLEVATION	
8		1.0	Ö 1	٥	3	ì	08							_	- 4	
Om		0 → 100								····	LUGEON		3.,		Om	, m
	T	MMN	1					Topsoli, slit with fragmento.5					1	Ē	İ	ļ
1 1		$\mu \mu \mu \mu$	'											┋.		
1-1-3	$ \Delta $		5					Silt ~ Sand with					[9	1	-
	1:		Si										ı	12		-
2 5	Δ		3	c		\	[granule of basalt.		1	\ \		ŀ	9 5	1	- {
2 Tanka			Percussion	- 3€				Fragment of decomposed	l. l	1	1 1			E		l
dunium a			41	0		'							ļ	21 3		.
			:: <u> </u>	۵.				basalt at 3.2 ^m .		1			-	18		- [
1 30	17								.	ļ			Ì	- E-4		- 1
4-4	ΙX	MMM	X							f				Ē		
=	+	$\mathcal{H}\mathcal{H}\mathcal{H}$	4	<u> </u>				4.7					ł	_	1474	▼
5-3	V		ᅋ					5.0 ~ 5.3 Decomposed		1			1	40 - 5		1
611	∇		×			1		6.2 ~ 6.4 Decomposed			1 1		Ш	Ē		
6-3			40	×	_	_	ايرا	J. J. J. J. J. J. J. J. J. J. J. J. J. J		l				XX 8		- 1
1 .3.	lv.		<u> </u>	d.h	5	5	5	Poor core recovery				1	H	⋍ ⋡	ļ.	- 1
7.1A		THTH!		¥]]	1				E,		
l (∃\d														E		
milimitumi BASALT	V		}					7, 0		1	1 .		Value	E 8	ı	
Decomposed BASI	`			<u></u>				Intensity weathered basait.	-				케	- 6		
-	V			kohki						ŀ			z	F	ĺ	ĺ
9-3 0	•	14140			5	5	5	Slime with fragment cores.					ال	- 9	ŀ	
1 3 8				10					ļ	ĺ			١	=	ļ	
₁₀] Ē	X			Ė				10.3					<u>ا</u> ا	Ē- 1	0	-
minuluniuniun Decomposed				مَ	4	4	5	1010			F		Ч	46	-	- 1
ة ا	lv		l	ark	^ 5	~5	~4	11.0					- 1	===		
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"			<u>+</u>	ŀ	3	3	3	Place ~ fragment core.						<u> </u>	j	
2-5	V	ии	bit	×	~ 4	~ 4	~4	Brown crocks.						F~		
1	.		ond	black	2	2	2	Course grained basait.	İ					E		
3-3	V	WHINI		<u></u>	4	4	4			ŀ						1
4		KKIIK			<u> </u>								8	S.E.		- 1
4.4	V		Diam	Diack	2	2	2	Substick ~ piece cores.		İ			n	n = 4		- 1
	17					Ī .		14:2		_			اد	a.E.		.]
2 Ludwill 7 L A 3	IX		ž	١:			.	Core loss		rength				₽.5		
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	<u> </u>			مَ	H	┝		15.7		33			ł	E 6		l
1 1 7	١V	144441	1	١.			;							į °		1
- 4	. 1 / 1	卷套		1		[Core loss		Si <]	ŀ	E		
7-3 °C	' 			c	<u> </u>	-	7	17.1		compressive	N .			F 7		- 1
-				brown	3	3	3-4	Moderately weathered basalt, brittle		gu	kg/cm²		71	<u>_</u>		-
8	W			ã			•	Total Deline		ő	ĝ		'	_ E		
]]	V			ج		3	3	Cracky, brown crack.		ł	4		2	9.		
[]	V.	ШШ		grey	2	L	4			Įχ	88		n	ı E_g	. .	
9-3	V			ark	[*	2	j	Stick to substick core.	222	Uniaxial	"		3	م إ		
20		KKKKA		qai		1	2	Fresh, but cracks are brown.		د		$\lfloor \rfloor$	Ш	_ [1	20	
	·	N N	·		<u> </u>	1	•	p driller's note €								
					1		1 (5	tick) 2(substick) 3(piece) 4(fragment) 5 grain								
		NV VIA	- core loss			110	hard) -	5 (soft)								
		Ł	~ RQG		1 (iresh)	~ 5 (de	composed)								

F	i .	SIF	TF	No I					HOL					rsi	IEE1	r: 2	C)F	 2 .,	e Life to	
									PTH OF HOLE												
ELE	VAT	ION	1 1 1 -	1478.7	9		1	DE	PTH OF OVERBURDEN	4	.7	m i	.C							-1984	
COO	RDII	NATE	1139	22IN, 104	<u> 48.0</u>	86E	<u>.</u>	LE	NGTH OF ROCK DRILLING	25	3	m .	D								
													L	ogo	ΈC) B	Y		SH	<u> </u>	
BEA	RING	G OF	ANGL	E HOLE					RE RECOVERY		. 5	*		i		1				afiyat, sa	
	¥		3	2 . 4					RVATION OF CORE	513	w	ATER	TAF	BLE		-1/	نندا			₫	
OEPTH	CHAM	0 0	CORE	CEMENTA TION KIND OF BIT CASING	COLOR	ΞŽ	- SS	3,5	DESCRIPTION					SSUF			·		DEPTH	ELFVATION	
ا ة	Š		SEC .	8 5 20	ខិ	WEATHER	HARD.	CORE		- f.	l i.	٠,		·		. I 				<u>.</u>	
20m			0 → 100											LUGE	ON-		1		2 0m	m T	
		V		4	>		2	2	Substick ~ piece core,									E			
1.3		٧	MW.		gre)	2	3	3	crasks are stained. Cavity in Qt. vein (3cm) at 20,9m					- 1				E	1		
		abla			- 5		3	3	Core loss 21.3									E	-		l
2		7			25				21.7									E	-2		
1000100010001000100010		· V	ШШ		Gen Gray		2	2	22.5	•							H	[-		
3		X		_					Core loss 23.3	•				1	١	:		E	-3	* * * * * * * * * * * * * * * * * * *	
		۷۷		P ! 1	<u> </u>	2	2	2	23.3 ^m to 30.0 ^m conta	ins		İ						E	- 1		١
4-4		٧	1444 1	77	brn.	3	3~4	4	anguler pebbls of Basa	it .	. 1					.]	-		~4		1
1 = 1				Diamond											.		2	5.5	-		1
5-	Į	٧	}}}	È		١.			Tuff breccia or lapilli									F	-5		
=	. د		nan	۵		' .	2	١,	tuff.								킈			4	
6-3	SA	٧	kWf	×		,	2	'	• • • • • • • • • • • • • • • • • • •									Ē	-6		l
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7	ω	V			grey		į.							- }				1	~7		
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87		V	aaaa		×												φ	3			l
E,		V	HHH		g		2	١,	Fresh, hard and stick								9	3	-9	3 1 1 1 5 4	
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30-3			11111	<u> †</u>		ļ								_					- 30	1448.8 ,	1
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E o l		L{	ШШ	L	<u></u>	<u> </u>	-	<u> </u>	> driller's note €		.	لــا	لــا				لبنا	L	0		J
						Ī	Ī	1,6	tich) 2 (substick) 3 (piece), 4 (fragment), 5	5 grain											
		ľ	1 N 25	- core loss		1	1,0	(hard) -	\$ (soft)											*	
			<u> </u>	- RQO		1 (fresh)	~ \$ (di	composed)			,							٠		

		C IE	TE N	ا ما					IIC LOG OF DRILL I			1 05	ງ ,	
									HOLE NOTH OF HOLE 30	LO M		CED AL	ر <u>ح</u> او 24	1984
							-		TH OF OVERBURDEN 15			ED Se	p 7	- 1984
									NGTH OF ROCK DRILLING 14		DRILLED I	вү	·	<u> </u>
									TAL LENGTH OF CORE		LOGGED	ay	<u>ISH</u>	<u> </u>
BEA	RIN	3 OF	ANGL	E HOLE			<u> </u>		RE RECOVERY 5	0.8 %				
	W.E	IJ	E	A X G G		r &			RVATION OF CORE	WATER	RTABLE ——	v	r	Š
ОЕРТН	ROCK NAME	r o	CORE	CASING	COLOR	WEATHER	HARD. NESS	3.5	DESCRIPTION	WATER	R PRESSURE TES	T	ОЕРТН	ELEVATION
	Q.			R ×∞0	8	₹.	¥	មីភូ						<u> </u>
Om			0 → 100 D D D D S	7. s	ļ			ļ		1	LUGEON -	7	Om -	<u> </u>
1 4		Δ	1		Ę.				O ~ 0.3 Topsoli with plant root.			20 15		
1-					brown							22	1	
=		Δ	1111	'					Soll with breccias of shale.			19	عطن	}
2				اچا	dark	. !				\		15	2	l l
-	ash	Δ		sic	-		·					28		}
3	Slopewash	_		Percussion					Talus deposit, silty and/or			26	i Luul	.
	101	Δ		je	۳		- 14		clayay matrix with breccios			24	4	
']	(S)	Δ			cher				of black shale (#5~10mm).			29 46	Ę	
			[]]] :	٥							Z 46	5	
=		Δ		· · · · · · · · · · · · · · · · · · ·			<u> </u>		5.6]		HF	Ē.	
6-3		X		1 1	*				Slime and pebble			d sovis	6	
					black				of basait.				Ē	
7-1				'									7	
		ш			•				Few pebble of chert				Ē.	
8-1				bit					at 8.5m.				- 8 -	
			HITT.										وط	
9-1	siŧ	\Box	MW.	Diamond	khaki				•				Ē	
10-	ode		WW	Ě	ž								- 10	
	ď	M		ä									<u> </u>	
1-	3.	XI		×					•				1	
1 4	£ 10	V V] Z]	 -			-	Core loss 11.5				-	
2 1	Mudflow			} , [;				-	CO16 1033 12.0				2	
3-1		니니			L MO								E 3	
3-1					brov				All and an area					
		13							Slime and rounded pebble of basait.				4	
				L	dark				pappie of pason.				<u></u>	
5					ס				15.2				5	1446.7
-	1		W		충				Slime 15.75]			<u> </u>	
6-1		V.			black				•	}		1	6	
=	ASA	•	193	1	2				Slime					
7 -	ВА	V		1	grey				17.3				7	
		٧			ρĭŧ				Slime 16.2 Slime 17.3 Fragment of basalt. 17.8 Core loss 18.8			80 4	8	
8-7	30	۷.							Core loss			9 "	Ľ.	,
9-1	Decom posed	V				<u> </u>	-	├─┤	18.8 E 4			13/0	-9	
1	8				grey				Silme , slity				<u> </u>	1442.1
20 =			THIN!		<u> </u>	Ļ	1		▶ driller's note ◀	1		111-	20	
						Ī		1 (1	lick), 2 (substick), 3 (piece), 4 (fragment), 5 grain					
		,	v vij	- core loss		1			5 (sait)					
			-	- BOD		1 (1	iresh) ·	~ 5 (de	composed)					

-			lo. I		_									
			<u>m , right</u> 1461.85			-	DE		<u>S</u> m				Aug 24 Sep 7	
								NGTH OF ROCK DRILLING 14				D BY		
			ZONTAL									Y8 O	ISH	ÍÏ
BEARIN	G O	ANGL	E HOLE				со		.8%					
ME	U	È	F X G					ERVATION OF CORE	WATE	R TABI	E -	1/		Ž .
DEPTH POCK NAME	07	CORE	CEMENTA. TION KIND OF BIT CASING	COLOR	WEATHER -ING	HARD.	CORE	DESCRIPTION			SURE T	EST	M. M.	ELEVATION
l Š		L	n × mo	8	3	₹	៥ភូ							
20m	ļ	0 ≈ 100 MINION				<u> </u>				L 1	UGEON		20m	
	V		1 1	->-	2	3	4~5							
14		4		grey				Fairly fresh, substick					l l	
	V.	KKKA				3	2	~ piece core, but rother						
2-3		Wiff.		purplish		,	,	brittle					4 5	
3 - 1	V	и		₹ 2	2	\$	5					2	9 3	
1 1	$ _{V}$		<u></u>	black		4	3	Cracky at 22.0 ~ 22.7	1			E	م	
4	'		p E	2				24.5					4	
1 1	V	ИIN	Diamond		2		3	Poor core recovery.						
5 = 1		4 \}	ă		~ 4	~ 5	~ 5	Leakage of drilling water.					<u> </u>	
A S	1 7		×	>				Fairly fresh, cracky.						
6-7 A	١.	[2	g re	2	3	3							
m	V							Many brown cracks.					E,	
S A S A L T	V	MIIII			 			27.3				<u> </u>		
8-3	•	<i>[]</i>		ج.		2		Fresh, hard and substick core. Some crocks are				"	3 8	
9-4 1-4 1-4 1-4 1-4 1-4 1-4 1-4 1-4 1-4 1	Y			grey		ş	2	stained.				"		
9				Ä	1	(3)	-	Cracks are filled with	.				E 9	
4	٧	WWW		dark		(3)		white calcite vein .						1431.9
30	-	41111			\vdash	ļ		End of hole 30.0 m		\Box			30	1
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9]														
ة و		ЩЩЩ		<u></u>	<u>L</u>	Ļ				Ш	Т_		<u> </u>	<u></u>
					1	1	1,,	 b drifter a note 4 stick) 2 (substick) 3 (piece), 4 (fragment), 5 grain 						
		M EÑ	- care lass		1	1		~ 5 (soft)			٠.			
		<u> </u>	- AQO		1 (fresh)	~ 5(d	ecomposed)						

GEOLOGIC LOG OF DRILL HOLE HOLE No. AD - 7 cs

F		SIE	TE	No. I	PRC	JE	CT :	٠.	HOLE N	10.AD-7 (SHEET OF 2)
-				, river		-				O m COMMENCED Jul. 6 1984
				1426.0						4 m COMPLETED Jul 21 - 1984
				265N, 10					NGTH OF ROCK DRILLING 19	
				ZONTAL		18			•	m LOGGED BY ISHII
				E HOLE			_			0.3%
				1	Γ				RVATION OF CORE	
E	ROCK NAME	ق	CORE	CEMENTA THON KIND OF BIT CASING	~	Ē.,				WATER TABLE WATER PRESSURE TEST
ОЕРТН	ŏ	٥	CORE	KIND KIND CASI	COLOR	WEATHER	MARD. NESS	CORE	DESCRIPTION	WATER PRESSURE TEST
	¥.				ļ	₹_	T.	ីក		Luceus
Om	_		0 → 100	-		ļ	ļ			COGEON
	_								Mainly fragments of basalt	
1 1	lopewash				 			:	set in a khaki colored silt	
	ě.	$ \Delta $			20				or clay matrix.	
2-	ᅙ			<u> </u>	×					
	S	Δ		1					2.6	
3		0							ė	
		0.			grey				Core loss	
A.		9			ŏ	<u> </u>	<u> </u>		4.0 6 8	
]	1	.			g K	ļ	L_			
		٥٠.			8				Core loss	
	+	۱٠.			₽	<u> </u>	<u>. </u>			
1	35			1 1	Ì	<u> </u>	-		Core loss so	
ا "	ode	0			e y				6.5	
7-	ΰ				5				Core loss	
'		- *	ЩЩ		H	 =	F			
]	<u></u>	0 -	XIIIII				ļ.,		Basaltic core, hard. Piece ~ substick core.	
8	iver				e y				Core loss 8.0	
	Œ	[.']		'	D.				No return of 3 drilling water ◆ 2	
9-3		.		'	×	<u> </u>	 			
		. 0			90	ļ	_		Piece cores	
10			1	± a	Ľ	L		_	Core loss 10.4	10 1418.4 •
			1						.10.4 ~ 30.0 [™]	
1-3	l	٧	焩川	ğ			3	2	Good core recovery.	
			伽川	Diamond				-		
2-		V	111111II);c		2	 	1	!	
"						"	2	3	Some cracks are stained.	
3-3		V	4H111	ž					Sollia Crocks are station.	
-			WIII							
4-	⊢	Y	22411		rey				14.2	
			144		12	5		2		
5-	٥	V	ш			2	-			
	S								Max. core length 40 cm	
6-	BA	٧						١	INSA, COIS ISINGIII TO	
=	1		W		o X	٠	-			
7-		۷	WHI!		20			3	Piece cores.	
1			₩III			1	2		17.2	
8-		٧	XXIIII					2	Fresh, hard substick core. Good.	
1									Few cracks are stained.	
9-		٧	1111H					 	0.01	0 = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
4							1	1	Coarse dark green crystal.	3 4 20
20	<u></u>	<u> </u>		<u> </u>	! _	1	1	-	▶ driller's note ◀	L L L L L L L L E ZVL
			8			Ī	Ī	1,0	nck), 2(substick), 3(piece), 4(fragment), 5 grain	
		Í	M KĀ	core loss			1		- 5 (aoit)	•
			L	agr –	-	1 ((dearl	~ 5 (de	composed)	

LOCATION ELEVATION COORDIN	N <u>Dam</u> DN ATE <u>1139</u> .	, river 1426.09 265N, 109	bed))8.24	.m 46E		DEI DEI LEI	HOLE NOTH OF HOLE 30 PTH OF OVERBURDEN 10 NGTH OF ROCK DRILLING 19	.O m .4 m .6 m	00 00 80	MME MPL	NC ETE D B	ED D	Jul Jul	6 <u>1984</u> 21 -1984
							TAL LENGTH OF CORE RE RECOVERY 80		LO	GGE				HII
				<u> </u>	(OBSE	RVATION OF CORE	<u> </u>	٠				\overline{T}	2
DEPTH ROCK NAME	L O G CORE RECOVERY	CEMENTA. TION KING OF BIT CASING	COLOR	WEATHER	HARD.	CORE	DESCRIPTION	WATE	R PRES	SURE T	ÉST		DEPT	ELEVATION
20m	0 ÷ 100								ւ 1 1	UGEON			20	m
14	V		rey			1	Max. core length 40 cm 20.7					#	ահումուն	
2-1	v		dark gr	2	2	2	Somewhat cracky.					8 : 1	= 10 1111111111111111	
4-3	v	pi pi	2	1		•	Basalt, hard. Few						. d 	
5-1-1	\ \	Diamond	greenish g		2	2 1	fracturés.					- O=n	ուրադուրը Մարդույր	
9 A B	>	×N	gre		3	ı	One core, 70cm long.) — — ['(1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
8-1	>		٧,	- 1	2	2	27.3 Cracks dipping at 40° to 60°.					[u=16 —	թ. 5.3 րուրուրուր	
30 -1 30 -1	v		purplish		3		Suffered some hydrothermal alteration.					ļ		0 403.8 ₩
ulmul							End of hole 30.0m.						ւևամասե	
31							,						3	
الساساس													4	
Lundani Lundani													5	
2-1-1 2-1-1 1-1-1-1 8-1-1													E-8 E-7	
8					·								1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
o o nuluuluu														0
		core loss RGO		1 (1/		hard)	b drifter's note 4 tick), 2 (substick), 3 (piece), 4 (frequent), 5 grain 5 (soft) icomposed)							

E	:L	SIE	TE N	lo . J	PRC	JE(CT.		HOLE N	0. AD - 8 (SHEET OF 2)
		ON		, left t						39 m COMMENCED Jul. 28 1984
ELE	VAT	ION	·	1480.67	<u>, </u>	n	1	DE	PTH OF OVERBURDEN 4.	85 m COMPLETED Sep 15 - 1984
									NGTH OF ROCK DRILLING 25.	
ANG	LE	FROI	√ HORI	ZONTAL	- :	90	-	то	TAL LENGTH OF CORE	
BEA	RIN	G OF	ANGL	E HOLE				co	RE RECOVERY 6	1.8%
	<u> </u>		à	٠., ١		•			RVATION OF CORE	WATER TABLE
ОЕРТН	MAN	0	CORE	CEMENTA THON KIND OF BIT CASING	ŏ	ΞŞ	38	75. 25.	DESCRIPTION	WATER TABLE WATER PRESSURE TEST
B	ğ	با	REC	KING	COLOR	WEATHER -ING	HARD. NESS	CORE	DESCRIP FROM	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
Om	-	177	0 → 100	1 1 1 1		-		Ť		LUGEON Om T
		_	TINNI	Ę					O ~ O. I ^m Topsoil with	
1		$ \Delta $		Percussion	w.c				roots.	
1		١. ا		ä	bro					2 2
1	ید	Δ		ä	drk.					
2-1	Slopewash		1111	Ţ	q				2.3	
1	è	Δ		Nx Diamond	*			.	2.3 ~ 2.9 Black of Basalt	
3-	Ö	١.		¥ E	black				-	3
- thu	S	Δ		السلسا			-	-	3.6	
4-3				ercussion	brown				Poor core recovery.	
		$ \Delta $		รัก	å			-	4.85	
5-3				S		 				12 5
1 1		V	1711		·				Decomposed basaltic	
8-3		•	MM						tuff breccia?	V Oile
1	Ø	٧			30	_	_	_		
7	ΔS				>	5	5	5	Rounded to subsounded	
	В	٧			Δ.	}			pebble ~ granule of basalt.	14 S
8-			MM)						Silme dominent.	
111	چ ا	V						ļ		
9-3	Decomposed								Slime	
1	ă	V	100] 'L	×				3111114	
10-	ő	١.	IMM		a c	5	5	5	10.3	
4	ě	V		i i	مَ				Soft core, Easy to broken	
1-3		·	$\mathcal{H}\mathcal{H}\mathcal{H}$			L	<u> </u>	ļ	to grains with fingers.	
1 4		V	WW	Diamond	brn	3	3	4	Basalt, fine grained.	│
2-				Ě			3		Dasarry viva granita	2
		V		ă	ack	2		2		88 ei m
3		Ì	7)	×	مَ		(4)			
1 4		l v l		Ž		L				
4-3				}	khaki	2	3	3	Basalt, coarse grained.	
		ΙvΙ			호	3	4	4		
8-3		'			×				Cores are stained along	
1	5	v	1		black	2.	3	3	cracks at 5mm width.	
8-	₫		ДЦ		Δ					
4	S	v	###						Basalt, fresh but	
7	⋖		XHIIII						somewhat brittle.	0
	20	$ _{V} $			rey	1	2			
8-3			∤}}}↓		g	,	5	2	Some calcite veins.	┆ ┆ ┆
		v			2				dipping 30° ~ 40°.	▎▕▎▕▎▎▎ <mark></mark> ┃╏ [┸] ┋╴┃
9 -		٧.	/		×	2	3			-
		V	$\mu\mu$		죠					
20	<u> </u>		иЩШ	<u> </u>	<u> </u>	<u> </u>	<u> </u>	لبا		20
			$\mathbb{K}_{+} \otimes$			1	1	†	p driller's note 4	
			图图	~ core loss			١.,		tick), 2 (aubatick), 3 (piece), 4 (fragment), 5 grain - 5 (soft)	
			<u> </u>	- RQO		1 (composed)	
				*~				• • •	- ·	

EL.			Vo. l					HOLE N)
	ION _	٠.	480.67	1	n	1	DE	PTH OF OVERBURDEN 4.	.85	m (ОМР	LÉT	ΕD	Sep !	5 - 1984
								NGTH OF ROCK DRILLING 25			RILL	ED 8	Ý		
								TAL LENGTH OF CORE			.ogg	ED 8	Ϋ́	<u> 15</u> +	111
BEARIN	G OF A	IGLI	HOLE						<u>8.8</u>	%					,
1 1 %	ען ט	È	E Zo o		i œ			RVATION OF CORE	¦ ˈw	ATER TA	BL E	4	۸		ě
DEPTH ROCK NAME	LOG	RECOVERY	CEMENTA TION KIND OF BIT CASING	Š	WEATHER -ING	HARD.	CORE	DESCRIPTION	W	ATER PR	ESSURE	TEST		96.94	ELEVATI
8			5 × mO	ŭ	¥.	ř	ŏg				LUGEC	W			
20m	10 -	100			_		<u> </u>		 		LUGEC	,	1	200	-
1 4	V A					2	3	20.5			1				
14		ШЩ			5	3	4	Cracky , a few cracks filled with clay.						_[1	
4					-	3-2	 - -	Rust - stained.			.		0	ωĘ	
2-	1 14			×			2	Core loss					3	σ <u>ξ.</u> 5	
-	V 14			ğ	.2	2	3	: *					Į.	<u> </u>	
3	I., III	M		9			<u> </u>	Core loss						-[3	
1 SASALT SALT	V	M		:	2	3~2	3	Leakage of drilling						Ē.,	
4-3	I _V III	W	ا ق	į				water.						E'	1 . 1
] -	\ \mathred{y}	W	ا ت		2	2	5	Basalt , substick to						Ē,	
A L		M	- 6				3	piece core.	\				м	2€	
6-1 S		M	Diamond					· · · · · · · · · · · · · · · · · · ·					"	1 E 8	
∢		$\{\}\}$						Basalt, fresh and hard.					3	٦	
7 4 00	1 14	Ш	ž	rey										E 7	
-	v }	Ш	1	C)	t ·	2	ļ ·	Some cracks filled with catality.						E	
8-				ж.	3	3	2	*						T = 8	
1 4	V			dark	2	1		No brown cracks.							
9				U									ō	9 9	
1 3	V	ИN							1				٦	J	
30-3		M									1			LE"	450.3 ₩
1 Juni	1 1111			:				End of hole 30.39m						Ŀ,	
1 4				:											
2				:				•			-			2	
4															1
3_						<u> </u>								E-3	.
-								*						-	
4 - 1								•						4	
السا													-	[-	
5-3			1	ļ				• •			1	-		[-5	{
6-7		!]					
] ,]														Į Ę,	
''														L	
8-3					'									8	
4									1.						
9 -						İ			1	-			7.	-9	1
														<u> </u>	
0 3	1T 1T	Ш		L	4	4	 	▶ driller's note 4	ــــــــــــــــــــــــــــــــــــــ		<u> </u>		<u></u>	<u>E</u>	
	Ø	3					1,6	rtick), 2 (substick), 3 (piece), 4 (fragment), 5 grain	n						
	177	۸ <u>۲</u>	. core loss		1			- \$ (noft)					. ,		
	L		ROO		1 (iresh)	- 5 (d	ecomposed)							

EL SI	ETE N	0. 1	PRO	JEC	<u>. T.</u>			AD-9 (SHEET 1 OF	
							-	m COMMENCED Sep.	
ELEVATIO							PTH OF OVERBURDEN 6 NGTH OF ROCK DRILLING 43		
							TAL LENGTH OF CORE		
							RE RECOVERY 64		JILL
		E HOLL			~		RVATION OF CORE	· ′o	
DEPTH CCK NAME	L O G CORE RECOVERY	A SO SA	ά	<u>ي</u> ي				WATER TABLE	DEPTH
DEPTH XX NAJ	CORE	CEMENTA TION KIND OF BIT CASING	o,	WEATHER-ING	HARD.	CORE	DESCRIPTION	WATER PRESSURE TEST	DEPT
 - - - - - - - - - -	0 → 100	0	Ľ.	3	r	98			Om m
Om	10000	1						7	
- 4	△						Topsoil 0.8		-
1-			,	5	5	5			1
	V								`. -
2-3	·					·	N	7	2
ASALT	/						Decomposed basalt.	7	
3 d S	• [[[[[[]]]]	Ę.	- 1	4	' '	4	Soft. Easy to break	7	3
Decomposed B	V []]]]]]	Percussion	O W/1			٠.	into silt.		.4
1 4 3 5 1 3	: [[[]]	20	o	3	5	5	A*		.
Decomposed	V	اق	מ	5		5			.5
j š	·			٥		ŭ			.
S E	<u> </u>								-е
\ \alpha \ \ \	v						- -		1 1
7		1					6.8	_	
			n o		:		Slime		7
8 ulumbuulu ul					4	4	7.85		-8
				3	5	4	Fragment ~ piece core.		.
	, IIIII ;				3	3			-9
	~~~~						Slime		
10-3									- 10
1 4 1				5	5	5	Leakage of drilling		-   1
14							water at 11.3 ^m		-1
			>				<b>[</b>		-
2-1		ا مه	ρ. 9.	3	4	4	Fragment of Basalt.		-2
	<b>∨</b>	bit					Slime		
3 July 7 J	·	ا ہ		5	5	5	Leakage of drilling		-3
1 4 8 V	<b>V          </b>	ő					water at 14 m		·
BAS	·	Diamond							-4
\	<b>√         </b>	ة		2	2	2			-5
5 = 1							Very poor core recovery.		
\ \d	<b>V</b>	ž	يخ				, , , , , , , , , , , , , , , , , , ,		-6
l se l	, IMM		grey	4	4	4	Some substick ~ piece		.
] <b>#</b>   \	<b>V</b> [1]		1 1	'	S	5	cores, hard.		-7   .
Weather ed			drk.	(2)	5	5	Leakage of drilling		_
8 1	<b>, 111</b>		>	(2)	3 (2)	1	water at 15 ~ 16 ^m ,		-8
] =			ς γ		. <b>-</b> ,	`-'	16.65~18.4m, 19~19.7m		-
"			5				Total to my for 1001 m		-9
									-
20	- billilli	1 1	لـــا	لبا	<u> </u>	لبا	≯ driffer's note ◀		20
				i	1	1,6	e armer's note 4 tick), 2 (substick), 3 (piece), 4 (freqment), 5 grein		
	क्षा हि	- core loss			110		5 (soft)		
	Ł	- AQO		1 (1	resh)	- 5 (đe	composed)		

					PRO	JE	CT	2, ž	HOL	E N	o AD	- 9 (SHEET			
									PTH OF HOLE						
									PTH OF OVERBURDEN						
									NGTH OF ROCK DRILLING						
DEA	ALC.	יי אטו ה אטו	MUNICI	EUNIAL		_	•	10	TAL LENGTH OF CORE	64	m .	LOGGED	D1		
C. SEM		0.00	I	r noce	<del></del>		****		RE RECOVERY ERVATION OF CORE		22%		<del></del>		
, F	NAME	U	, <b>3</b>	و هڅځ	-	165			ERVATION OF CORE		WATE	R TABLE	₩	Į į	ELEVATION
06РТН	X	١٥	CORE	CEMENTA TION KIND OF BIT CASING	COLOR	WEATHER	HARD.	CORE CUTTING	DESCRIPTION	7	WATE	R PRESSURE TES	SΤ	DEPTH	3
	8		0 ≈ 100	0 100	l°	¥	Ĭ.	၀ဥ				LUGEON -			
20m			11111121 10 = 100	<del> </del>	O PROVI		_	2	Rust - stained			1 1 1	1	20m	- ₽
		V			Qrey	-	2	-	nusi - siulileu	ı		ولما	0.85	ահոսնույնո	
1-4								٠.	Poor core recovery.	•		╽┼╱╟	707	듣1	
1		V.		]					*						
2-	1	١,			0 88.0	_		_						E 2	
	SA	٧			1 -	5	3	9	Slime		-			ılı.	
3-3	⋖	-		1	P					i				E-3	
	മ	٧							<i>:</i> .					ı dı	1
4-		٠.		1	- :		3	5	Lappilli tuff	İ				4	
1 5	ed	V-						1						سبلة	
5-	Wheathere	•				45			Slime	ļ				5	l
1	<b>(</b> ₽	V	ИШ			3	2 3~4	2.							
8-	Ъe	•				3	314	-						E-6	
	*	٧		1		5	5	5	Slime		.			-	
7-3		•		].	ν V			-		7.4	'			7	1453.9₩
1					_									_	
8-1		٧		1	۵.	2	2	3				}	1	E-8 · ·	1
1			7 m	ا •-	1	3		Ĭ,						Ē	! · · · · · · · · · · · · · · · · · · ·
9~		٧		ă		2	1	2	· <del></del>					9	
1		١.،		יס		~ 3	~ 2	~4	Cracky, cracks strained .				5	E- 30	
30-		۷	XXIII	Diamond	>				No core 30.0				Mi.	<b>3</b> 0	
				ā	grey	5	,	2	Basait, coarse grained.				, 00 , 00 , 00	E :	
1		V	KKIIII	۵	drk.	ĺ	-	_	Daggiii totica graine.				니귀으	Ē.	
2-3		v	<b>XXIII</b>	ž	2	<u> </u>			·					-2	
•		Y		ī				_	Generally good,						]
3-		v i					1						ν @	_	
, ,	1	١,	WIII			2	1	3	but cracks stained.				0 "		
4-3	۵	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		1	1		3	3			<b>\</b>	}	3 4	4	1
'	S	٧ :	YX		rey									Ĕ.	
5-4	٥	\/ ·		1	9	<u> </u>							11	Ē. 5 .	.
1	മ	Y			sh								8 0	E	
6-		V			purplish			1	Basait, fresh, hard.				80 3	E-0.	
4					a	•	[		Substick core.				آاءًا	E.	
7-3		V			1	2	2	2	Some cracks stained.				1-11	-7	
1		'		]		~	-	-						<u> </u>	
8.3		V.			a la								ις ( ^α	8	
4		'			D D D									Ē-	
9-3		٧		j									٥ اتا	9	
1	l		<b>}</b>			2	2	3	Cracks stained.		'			Ē	
40 =	L	L	N N	<u> </u>	<u> </u>	<u></u>	<u> ~3</u>	1	⇒ driller's note 4		<u> </u>	<u> </u>		± 30	لـــــــــــــــــــــــــــــــــــــ
						Ī	Ī	1,0	itick) 2 (substick) 3 (piece) 4 (fragment) 5	5 grain					
			N KÜ	- core loss			٠,	(Nard)	- 5 (soft)						
				- RQO		1 (	lcesh)	~ 5 (d	ecomposed)						

EL SIETE No.1  LOCATION Dam, left  ELEVATION 1481.  COORDINATE 1139.171N,1	PROJECT bank 28 m 098.222E	DEPTH OF HOLE 50.0 m DEPTH OF OVERBURDEN 6.8 m LENGTH OF ROCK DRILLING 43.2 m	O - 9 (SHEET 3 OF 3 )  COMMENCED Sep. 20 1984  COMPLETED Oct 9 - 1984  DRILLED BY
ANGLE FROM HORIZONTAL BEARING OF ANGLE HOLI		TOTAL LENGTH OF CORE  CORE RECOVERY  64.4%	LOGGED BY ISHII
DEPTH ROCK NAME LOG CORE RECOVERY CEMENTATON KIND OF	ام الغالي	DBSERVATION OF CORE  WAT  DESCRIPTION  WAT	TER TABLE VOLUME TEST
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1/1 Cora foss	•	nard) ~ 5 (soft) - 5 (décomposed)	

				lo. 2												<del></del>	
	LOCATION Intake tunnel DEPTH OF HOLE 69.9 m COMMENCED Oct. ELEVATION 1109.32 m DEPTH OF OVERBURDEN 42.1 m COMPLETED Nov  COORDINATE 1137.872N, 1094.033E LENGTH OF ROCK DRILLING 27.8 m DRILLED BY																
ANG	LE I	FROM	I HORIZ	ZONTAL	9	0	-	то	TAL LENGTH OF CORE	m	L	ogg	ΕĎΙ	¥Υ			
BEA	RING	G OF	ANGL	E HOLE	<u> </u>				RE RECOVERY 10	). <u>9 %</u> T		. 94 . 1	194 s	·	γ	· · · · · · · · · · · · · · · · · · ·	
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ОЕРТН	POCK NAME	7	CORE	CEMENTA TION KIND OF BIT CASING	COLOR	FATH	HARD. NESS	CUTTING	DESCRIPTION	WA	TER PR	ESSUR	E TES	Ţ		DEPT	ELF.
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	op s	Δ		issi					Clay, gravelly						4		
2-4				Percussion					2.1					e P	4	- 2	
				۱ - ۲					Consist of rounded or subrounded gravel set					Λαί	4		
3-1									in siltor sand matrix.					ż		-3	
4-									Very poor core recovery.					ļ-		4	
-				'					Slime and Subrounded				ļ	SP		-	
6-	·		$\mathcal{W}$						pebbles of Basalt.					-		5	1
[				+												- 6	1 .
4		ט		bit					Slime, coare grained.								
7-				8			<u>-</u>		_							- 7	
-				iamond					Slime, fine grained							-	•
8-7			$\mathcal{W}$	Dia			`		with subangular pebbles.				۱ ۸	8.4		-8	
9-1			MM								-	$\prod'$	Ŋ	1		. g	
1			$\mathcal{W}$	××					Silme, course grained,		On	( <b>u</b> r	11   2	26 m	ľ	_	
الم السان	*								angular shaped.		13m	(un	til 7	am'	•	10	
	deposit								Partly containing silt.								
1 1	o o								9.0 ~ 9.4m			di				- 1	
2-									14.0 ~ 14.4 14.8 ~ 15.0		"	] ]				-2	
1									•							_	
3-									Very poor core recovery.							<u>-</u> 3	
	<b>≩</b>															- - -	
4~	4-	u														<u> </u>	
5	Mudflow															-5	
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8-3			HAR.													- 6	
7-3																,	
Lun													Ì				
8-											.					8	
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9-4	Subrounded cabble or																
20			WW				Ļ	<u> </u>	gravel of baselt with slime.	Ш					Ц	20	
		ļ					1	<b>†</b> ,,,	» driller's note 4 lick) 2 (substick) 3 (piece) 4 (fragment) 5 grain								
		ł	N 69	- core loss			1		5 (salt)	•				1			
			<u> </u>	- AQO		F (	ireah)	- 5 (di	composed)								

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									NGTH OF ROCK DRILLING 2								
									TAL LENGTH OF CORE		m						<u>I</u>
BEA	RIN	OF	ANGL	E HOLE	<u> </u>				RE RECOVERY	10	.9%		:		-т		
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DEPTH	OCK NAME	۲٥	CORE	CEMENTA TION KIND OF BIT CASING	070	WEATHER -ING	HARD. NESS	CORE	DESCRIPTION		WATE	R PRES	SURE T	EST		8	E.C.F.v.
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2-					rey				Almost slime.	Į					E	2	
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9-1	:		HW		1 3 O L				39.75 ~ 40.0 m						[	. 9	
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40 3			N N AIMMI	<u> </u>	<u></u>	H	1	$\vdash$	> driller's note €				اللل		L E	-01	لـــــــا
			图图						ick) 2 (substick) 3 (piece), 4 (fragment), 5 grain	int							
				- core loss - RQD		1 (1			5 (soft) composed)								
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ANG	LE I	FROI	M HORI	ZONTAL		90	•	TO	TAL LENGTH OF CORE	m	ι	.OG	GΕ	D B	Υ	15	H	<u> </u>
BEA	RIN	G OF	ANGL	E HOLE	_			CO	RE RECOVERY	2.9%						٠		stinger.
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DEPTH	ROCK NAME	Ľ	CORE	CEMENT, TION KIND OF BIT CASING	COLOR	WEATHER	HARD. NESS	CORE	DESCRIPTION	WATE	R PR	ESSI	)RE	FEST		2	5	ELEVATI
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			MAH	1	ark brown				Very poor core recovery.		Ì					<u> </u>		
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	Mudflow		MMM		<u> </u>	-									14	E		1 .
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9	ofi			}	5	j	,	5	Slime or decomposed					:			9	
"	Alternation			1	dark	5	5		sand stone or cement.			1					-	
60	ā			1 1	bik	2	3-4	-43				L					60	
1			N N	<del></del>	الملتجمية	1	1	1	→ driller's note 4									
								10	lick) 2 (substick) 3 (piece), 4 (fragment), 5 grain									
			[,	- core foss		1	11	hard)	5 (soft)									
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LOCATION Int	o, 2 PROJE ake tunnel	T HOLE No. B  DEPTH OF HOLE 69.9 m  DEPTH OF OVERBURDEN 42.1 m	D-1 (SHEET 4 of 4 )  COMMENCED 061 - 23 - 1984
ANGLE FROM HORI	ZONTAL 90	LENGTH OF ROCK DRILLING 27.8 m  TOTAL LENGTH OF CORE	LOGGED BY ISHII
ROCK NAME LOG CORE	CEMENTA. TION KIND OF BIT CASING COLOR WEATHER	X  ¥	TER TABLE
sandstone and shale	mond bit grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey of grey	5 5 Slime Fragment of black	60m *
Alternation of	X	5 5 Slime  3 4 Black shale  5 5 Slime, origin is sandstone?	1039.4 ▼
8 8 2 2 2 2 2 2 4 2 9 4 2 4 2 2 2 2 2 2 2 2		End of hole 69.9 m	illudadadadadadadadadadadadadadadadadadad
	- core fors	> driller's note 4 1 (stich), 2 (substick), 3 (piece), 4 (fragment), 5 grain 1 (hard) - 5 (soft) resh) - 5 (decomposed)	

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ОЕРТН	ROCK NAME	106	CORE	CEMENTA. TION KIND OF BIT CASING	COLOR	WEATHER	HARD. NESS		RVATION OF CORE	1			BLE ESSU	- 1.	V	ν <u> </u>	-	рертн	ELFVATION	
3	Top soil	000000		Nx Diamond bit	to dark grey drey 공유				Topsoil  Slime  2.5  dark green purplish grey basalt cobbles.  Terrace deposit?  Slime, nudium to coarse grained.  Portly containing pebble of sandstone and basalt.				<b>\</b>		0. 6			0m 2 4	m	
8	Teri	ပ (			black				9.0 ~ 9.5 m Subrounded pabble of basalt.									8	1064.8•	
10							1		End of hole 9.5 ^m of this hole was suspe	İ		l	h.					10		
				– cerë lass ÷ RQO		1(		(hard)	p driller's note 4 tick) 2 (substick) 3 (piece) 4 (fragment) 5 grain - 5 (soff) ccomposed)	•						-	1			

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				vernous					PTH OF HOLE		2.3 m					9 <u>1984</u>
				6943					PTH OF OVERBURDE		0 m					3 - 1984
									NGTH OF ROCK DRI				RILLED E			
				ZONTAL					TAL LENGTH OF CO				OGGED E	,	131	111
BEA	RIN	3 OF	ANGL	E HOLE					RE RECOVERY		3.9%				····	
	ME		. ≿	4 ≥ 5 5 ≥ 5	.	та:-			RVATION OF CORE		- WAT	TER TAB	LE1	۸	,	ğ
ОЕРТН	NAME	0	CORE	CEMENTA TION KIND OF	ž   8	Ψg	ESS.	يا ≩يوا	DESCRIPTION		!		SSURE TEST		DEPTH	ELEVATION
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EL SIETE No. 2 PROJECT HOLE No. CD -1 (SHEET 2 OF 2 )  LOCATION Powerhouse DEPTH OF HOLE 22.3 m COMMENCED Nov 29 - 1964  ELEVATION 694.50 m DEPTH OF OVERBURDEN 0 m COMPLETED Dic 6 - 1984																				
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Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  A 4 4 4 4 Fragmant, easy to broken.  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime  Slime	3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	E Residual	+ + +		Percussion	grey ~ greyish white brow	ş	\$	,	O.65 Decomposed diorito. Fragment ~ grain core. Easy broken to silt.  Poor core recovery. Fragment ~ grain core.			8.7	2 3 4 4 3 4 6 7 30 54	7 8 9	814.8 w
15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6   15.0 ~ 15.6	1000	- 80 - 80 - 80	+			reyish									-1	
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core foss 1 (hard) ~ 5(soft)	4 5 minutunian	Decomposed	+ + + + + + + + + + + + + + + + + + + +		Percussion Diamond bit	g grey ~ greyish		5		Coarse grained Others; fine grained Fragment, easy to broken. Stime					4 5 7	
					- core loss				hard) -	5 (soli)						

LOCATION P	No.2 P	ROJE	C <u>T</u>	DE	HOLE N PTH OF HOLE 46	lo (	D m	- <u>2</u> c	ОММ	ENG	CED	Oc1.	25	<u> </u>
					PTH OF OVERBURDEN 0.1 NGTH OF ROCK DRILLING 45									1984
ANGLE FROM HOR	ZONTAL _	90	•	то	TAL LENGTH OF CORE		m	Ļ	OGGE	D E	ЗҮ	<u>I</u>	SH.	I I
					RE RECOVERY 66 ERVATION OF CORE	T						-	7	<u>,</u>
ROCK NAME LOG CORE RECOVERY	CEMENTA TION KIND OF BIT CASING	COLOR WEATHER	HARD.	CUTTING	DESCRIPTION			PRE	BLE SSURE	TEST			ЭЕРТН	ELEYATION
20m 0 = 100						ļ			LUGEOI	1	•		20m	4
Solution +		4 A	4	5	Silme.							nda ndami	,	
2-DiO DiO O		5 - Kaub			22. 7								2	792. <b>7 y</b>
3 trialing + 4		3	3	2	Core surface is rough and somewhat discolored.							ահումումուն	3	
th should		4		3							1	nunlanaha:	5	
4 5 6 1 7 7 4 + + + + + + + + + + + + + + + + +		ght gre	2 5 3	2	Substick core, fresh but cracks stained						0.4		-6 - -7	
		2	3	3							3	a.E	- ₈	
other hands		2	2 5 3	ŀ	Stick core, cracks stained							11.11	- - - - 30	
1,1					Stick core dominent, good core recovery.							n de continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la continuent de la c	 1	
D10R1 TE		kish white	2	ļ	Fresh, with few limonite stained cracks.						0 = 0	P = 10	-2 - -3 -	
4-1		→ pinkis		·								o piempionipro	4 5	
6-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1		light grey	2 (3)	2 5	Cracks, clay filled.  36.4 ~ 36.9m  Cracks at 10° to 35°,  grnx, grey clay film						0.1	01	- -8 - -7	
8 +		2	2	2	filled.						Lu # 0.	P +	-8	
9 1	1	х е 2	3	3	39.6~ 39.75 Slime.							1	-9  40	
	core loss			hard)	b driffer's note 4 stick) 2 (substick) 3 (piece), 4 (frequent), 5 grain - 5 (soft) ecomposed)	1								

# GEOLOGIC LOG OF DRILL HOLE

				10.2	PRO	DJE				ΕN	o. CD-	2 (SHEE			
				nstock	7				PTH OF HOLE		3 <u>8</u> m	COMPL			<u> 1984</u>
			: : 1120	815.4 ,786N,109			-		PTH OF OVERBURDEN		55 m			<u> </u>	1304
				ZONTAL					NGTH OF ROCK DRILLING TAL LENGTH OF CORE				BY _	ISH	11
				E HOLE					RE RECOVERY		m <u>. 4</u> %	LOGGE.			
							<u> </u>		RVATION OF CORE	$\equiv$		·			z
1 2	ROCK NAME	ڻ	E A	A NO D	<b>C</b> C	ŭ.,						TABLE	•	DEPTH	ELEVATION
DEPTH	ž	٥	CORE	CEMENTA TON KIND OF BIT CASING	COLOR	WEATHER ING	HARD.	CUTTING	DESCRIPTION		WATER	PRESSURE T	EST	Ğ	SLEV
	×	_	0 = 100	ļ ·		13	r	\ <u>0</u>				LUGEON		40m	
40m			un cerui			<del> </del>					Т	$\neg \neg \neg$	╌╂┰╌	400	
1		1	222	<b>!</b>					Diorite, substick ~					ш	
1.14	1.	+							stick core.				1	Ē١	
			KKKI				2	г							
2-3	-					2	١ ،	1	Whit vein dipping		.			2	
4	'n		XIIII		hite		3	1	20° at intervals of					E .	:
3-3	<u>-</u>	+			3	1			20 ~ 40 cm				00	-3	
	œ	' ,		j j										Ē.	
4	0				æ								3 6	-4	
4	۵		<u> </u>		eyish	2	3	3	Cracky, black cracks.						
1 -1		+			<u> </u>		L							E 5	
200			XXX		Ō	2			Eresh, stick core.					Ē.	
84						\$	·2	l	Good.					-6	
1			14			1		ļ	-					<u>E</u> .	769.1 ₩
7-				·					End of hole 46.38m	•				7	
'												-			
														8	
8-7												]		E	
														E 9	
9-3														£ "	
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5 Juni						ŀ				ı				•	
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1 4										1				E	
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1 4				l						- 1				F	
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6-														-5	
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6-														-8	
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4				:										£-	
[ ]														Ę.,	
1	l													<u> </u>	
0 1				<u> </u>	زرم ومرد									<u> 0</u>	
		Ì	A. N			1	1	<b>†</b>	⇒ driller's note 4						
		j	四四	- core loss			١.,		lick), 2 (nubstick), 3 (piece), 4 (fragment), 5	grain					
			Ł						. 5 (sali) composed)						
			•	- RÇO		. (	, esal ,	J (U)	composto;						

III-1 (4) Method of Water Pressure Test

The tests were conducted under the following conditions.

	Method of	Diameter	Test	Test	Testing	
Hole	Water	of	Section	Section	Time	Remarks
Name	Pressure Test	Drillhole	Length(m)	(Times)	(Minutes)	
			_		• ^	
AD-1	*	NX	5	4	10	
AD-2	*	s <del>1</del>	5	4	<b>u</b>	cles table
AD-3	*	<b>\$</b> }	3	8		Cycles ow tabl
AD-4	**	11	3	2	•	
AD-5	*	ıı	5 and/or 3	4	11	ire bel
AD-6	*	u u	5	3	••	ed ed
AD-7	**	"	3	6	••	Injection Pressure are mentioned bel
AD-8	*	à	5	5.	84	on
AD-9	**	11	3	7	••	i <del>S</del> ii
CD-1	*	n	5	3	•	Inje
CD-2	*	11	5	4	••	
			[	1		
			<del>                                     </del>	<del>  · · · · · · · · · · · · · · · · · · ·</del>		
Total:	11 holes 50 t	imes				•

^{*} Single packer method

Injection Pressure at hole head

Depth from Rock Surface	Injection Pressure
to Packer	Cycle kg/cm ²
Less than 5m	1-2-3-2-1
5 to 10m	1-3-5-3-1
More than 10m	1-5-1-5-1

^{**} Double packer method

III-1 (5) Result of Water Pressure Test

<u> </u>		<del></del>	I mee		<del> </del>
			Effective	Y	
Hole	Test	Water	Maximum	Lugeon Value	
Name	Section(m)	Table(m)	Pressure	(1/min/m/10kg/	Remarks
<u> </u>			(kg/cm ² )	cm ² )	
_				`.	
AD-1	12.55 - 17.55	14.00	4.5	20	*
	17.55 - 22.55	14.60	6.6	13	*
	22.55 - 27.55	16.00	11.7	9	1
1	27.00 - 30.00	17.00	11.8	13.5	
AD 9	38.10 - 41.00	15.55	11.7	9	
AD-2	l .			· ·	
	41.00 - 44.00	15.55	11.7	18.5	
	44.00 - 47.00	15.55	11.7	11.5	
: :	47.00 - 50.00	15.55	11.7	13	
AD 3	7 20 10 20	6 15	20	3.5	*
AD-3	7.20 - 10.20	6.45	3.8		*
	9.00 - 12.00	6,45	3.8	3.5	1
	12.00 - 15.00	6.45	5.8	3	*
	15.00 - 18.00	6.45	5.8	3	*
	18.00 - 21.00	6.45	8.8	1	*
	21.00 - 24.00	6.45	8.8	0.5	*
	24.00 - 27.00	6.45	8.8	1.5	*
	27.00 - 30.00	6.45	9.8	0	
AD-4	24.00 - 27.00	4.00	9.4	8	Inclined * drillhole
	27.00 - 30.00	4.50	8.4	6	*
AD-5	12.33 - 15.33	14.90	5,•5	25	*
	17.50 - 22.50	_	4.6	17	.*
	22.50 - 27.50	24.00	5.5	12	*
	27.00 - 30.00	24.77	6.6	10	*
AD. 6	15 70 20 70	19 40	6 /	10	4
AD-6	15.70 - 20.70	12.40	6.4	18	*
	20.70 - 25.70	12.40	6.4	12	, x
	25.00 - 30.00	12.40	11.4	7	
AD-7	12.00 - 15.00	1.92	10.3	5	Inclined drillhole
	15.00 - 18.00	2 5	10.3	10	0111111016
	1	2.5		1	
	18.00 - 21.00	2.5	10.3	10.5	
	21.00 - 24.00	2.5	10.3	8	
	24.00 - 27.00	2.5	10.3	0	
	27.00 - 30.00	2.5	5.3	16	*

Hole	Test	Water	Effective Maximum	Lugeon Value	
Name '	Section(m)	Table(m)	Pressure	(1/min/m/10kg/	Remarks
			(kg/cm ² )	cm ² )	
AD-8	11.69 - 14.69 15.23 - 18.23	8.25 10.55	4.9 5.1	38 13	*
1	18.00 - 23.00	10.55	8.1	10	*
·  -  -	23.00 - 28.34 28.00 - 30.39	10.87 11.12	11.2 11.2	6	
AD-9	28.98 - 31.98	27.00	8.8	3.5	*
ND 9	31.98 - 34.98	27.00	8.8	0.5	*
	33.98 - 36.98	27.00	8.8	0.1	*
	36.98 - 39.98	27.00	8.8	5	*
	39.98 - 42.98	27.00	10.3	5	
•	42.98 - 46.98	29.10	11.1	5	
	46.58 - 50.00	19.11	10.1	13	
CD-1	10.00 - 15.00	4.20	10.6	8	r Program
	15.00 - 19.80	4.95	10.6	0.4	
	19.30 - 22.30	4.68	10.6	0.4	
<u> </u>			11.0		
CD-2	24.40 - 29.90	8.93	11.0	0.4	
	29.90 - 35.28 35.28 - 41.00	9.15 9.20	11.1 11.1	0 0.1	
	41.00 - 46.38	8.89	10.0	0	

* Lugeon value is calculated at maximum pressure.

Lugeon value =  $\frac{10 \times Q}{PL}$ 

Q : Quantity of water injected (1/min)

P: Effective injection pressure (kg/cm²)

L: Length of test section (m)

## III-2 Trench and Pit

- (1) List of Trench
- (2) List of Pit
- (3) Geologic Log of Trench and Pit

Trench Name	Location	Elevation (m)	Coordinate	Direction	Length (m)
AT-101	El Siete No.l Damsite, left bank	1501.98	1139.211N 1098.030E	NS	6.16
AT-102	Ditto	1498.95	1139.208N 1098.017E	N35°W	4.95
AT-103	Ditto	1487.48	1139.245N 1097.985E	EW	8.50
AT-104	Ditto	1480.61	1139.266N 1097.967E	N70°E	7.90
AT-105	Ditto	1491.75	1139.187N 1098.098E	EW	10.45
AT-106	Ditto	1465.89	1139.216N 1098.187E	NS	11.50
AT-110	El Siete No.l Damsite, right bank	1476.64	1139.499N 1097.961E	N75°W	13.10
AT-111	Ditto	1476.20	1139.480N 1097.996E	N15°E	14.40
AT-112	Ditto	1482.65	1139.458N 1098.110E	N35°E	8.76
AT-113	Ditto	1473.14	1139.417N 1098.177E	N20°E	9.30
BT-201	No.l Auxiliary Dam left bank	1500.00	1139.017N 1098.017E	NS	9.90
BT-202	Ditto	1478.35	1139.031N 1098.818E	NS	18.60
вт-203	No.l Auxiliary Dam, right bank	1528.58	1139.243N 1099.047E	n65°E	8.65
AT-1	El Siete No.l Penstock Alternative Plan	1202.02	1137.466N 1094.779E	N70°W	8.95
AT-2	Ditto	1200.40	1137.418N 1094.761E	N50°W	9.85
AT-3	Ditto	1177.03	1137.320N 1094.651E	N78°W	20.27
	ļ <del></del>				

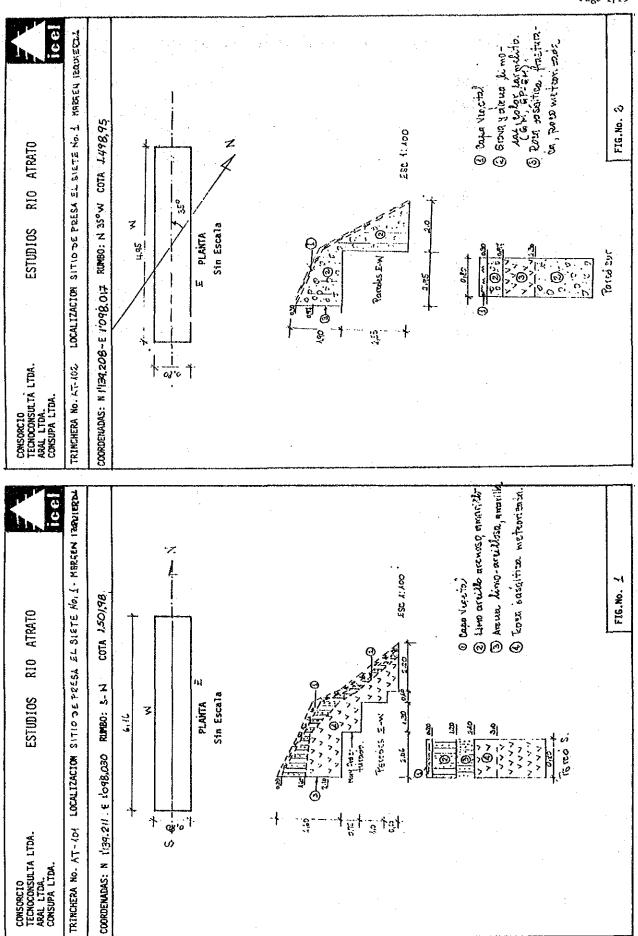
Trench Name	Location	Elevation (m)	Coordinate	Direction	Length (m)
AT-4	El State No.l Penstock Alterna- tive Plan	1163.20	1137.274N 1094.607E	N20°W	6.00
AT-5	Ditto	1154.99	1137.227N 1094.525E	w°08и	9.01
AT-6	Ditto	1113.36	1137.162N 1094.413E	N70°W	11.30
AT-9	Ditto	1193.35	1137.699N 1094.754E	N81°E	11.80
AT-10	Ditto	1169.00	1137.758N 1094.531E	N34°E	18.60
AT-11A	Ditto	1226.65	1137.770N 1094.788E	S50°W	11.90
AT-11	El Siete No.1 Penstock	1226.65	1137.509N 1094.725E	N60°W, N28°W	13.60
AT-12	Ditto	1201.17	1137.481N 1094.627E	N45°W	10.80
AT-13	Ditto	1120.00	1137.378N 1094.399E	N64°W	17.15
AT-14	El Siete No.1 Powerhouse	1122.50	1137.652N 1094.399E	N69°E	10.50
AT-15	El Siete No.l Penstock	1166.00	1137.451N 1094.607E	N57°E	13.70
BT-10	El Siete No.2 Penstock	882.50	1129.844N 1091.481E	N7°W	9.60
BT-11	Ditto	873.00	1129.841N 1091.518E	N30°E	10.10
BT-12	Ditto	853.72	1129.803N 1091.606E	N45°E	10.00
BT-13	Ditto	826.31	1129.812N 1091.760E	N10°W, N65°E	18.35
BT-14	El Siete No.2	706.50	1129.621N 1091.972E	N32°W	22.90

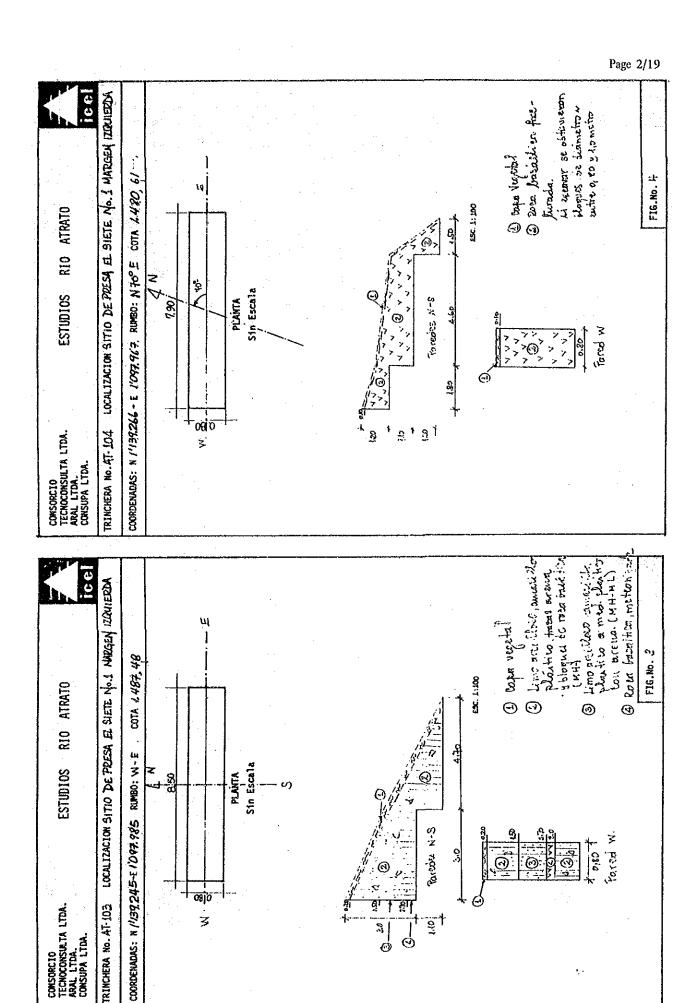
III-2 (2) List of Pit

Pit Name	Location	Elevation (m)	Coordinate	Depth (m)
ATA-107	E1 Siete No.1 Damsite, left bank	1431.51	1139.214N 1098.279E	1.50
ATA-108	Ditto	1431.64	1139.212N 1098.298E	1.00
ATA-109	Ditto	1423.98	1139.279N 1098.325E	1.00
ATA-7	El Siete No.1 Powerhouse Alternative	1033.01	1136.779N 1094.185E	1.85
ATA-8	Ditto	1034.83	1136.804N 1094.163E	1.80
	Total: 5 pits 7.1	5 m	·	

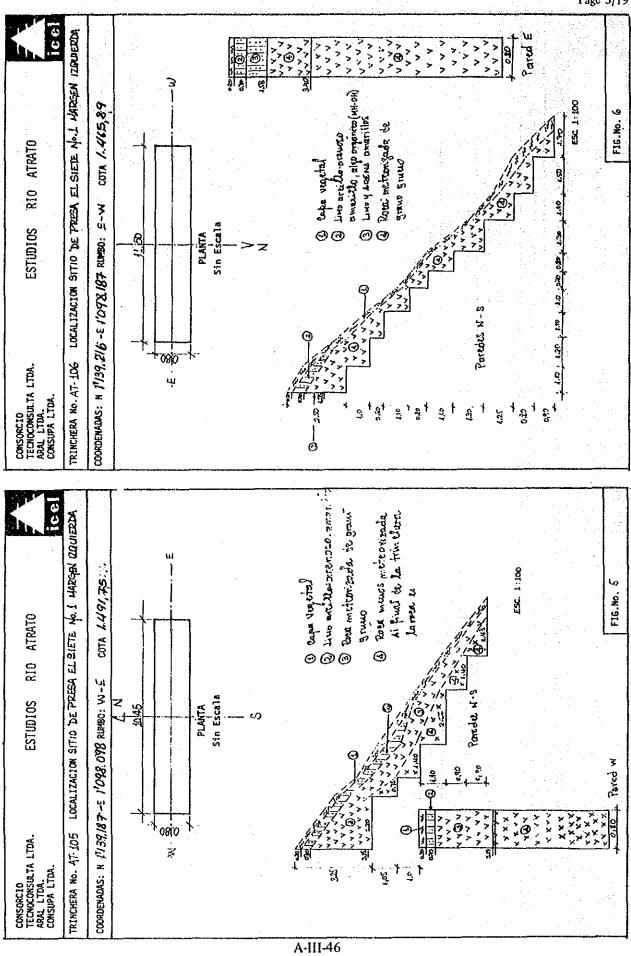
TTT-2	(3)	Geologic	Log	of	Trench	and	Pit	
TTT_C	(3)	CECTORIC	HUK	VΙ	TICHCH	CITIC		

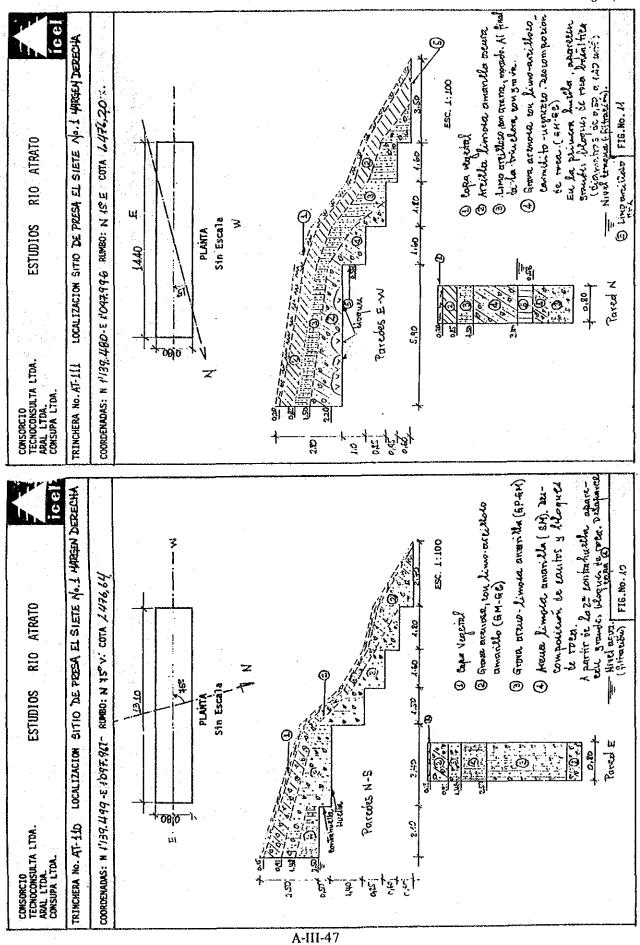
AT-101	Page 1
102	
103	2
104	
105	3
106	
110	4
111	_
112	5
113	_
BT-201	6
202	_
203	7
AT- 1	
2	8
3	•
4	9
<b>5</b> °	10
6	10
9	11
10	11
11 11A	12
12	12
13	13
14	
15	14
BT- 10	
11	15
12	
13.	16
14	
ATA-107	17
108	·
109	18
7	
8	19

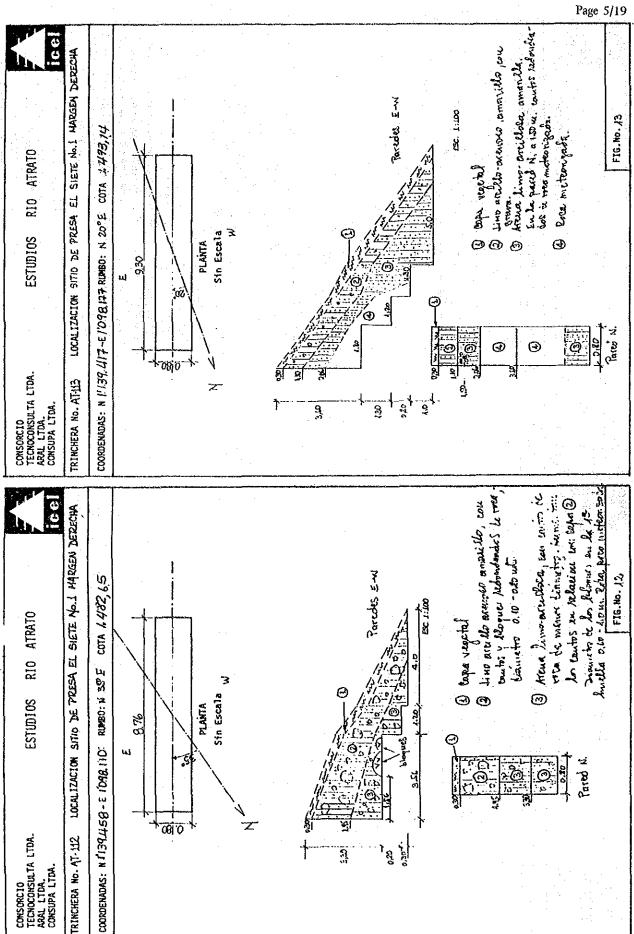




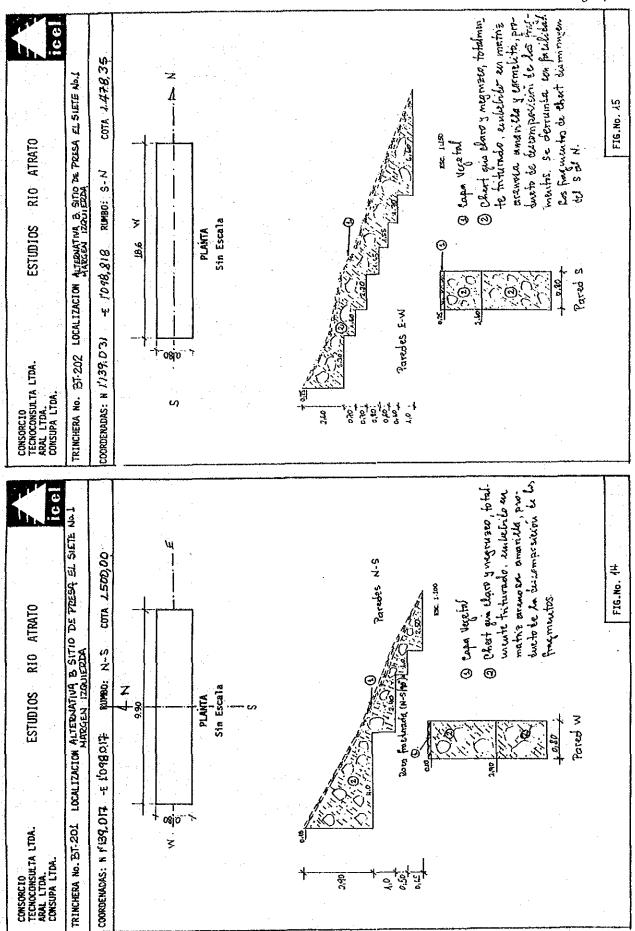
A-III-45



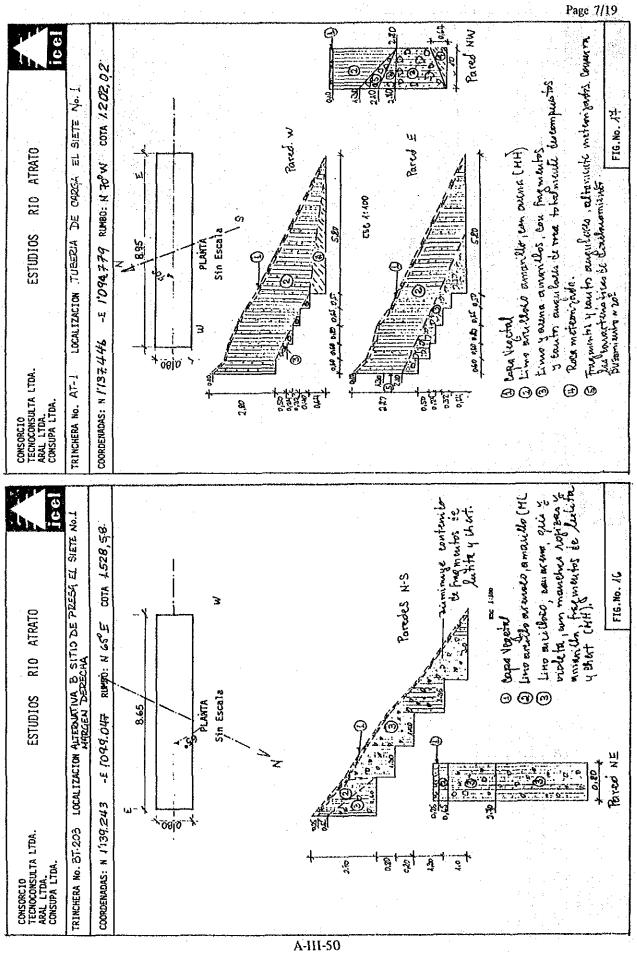


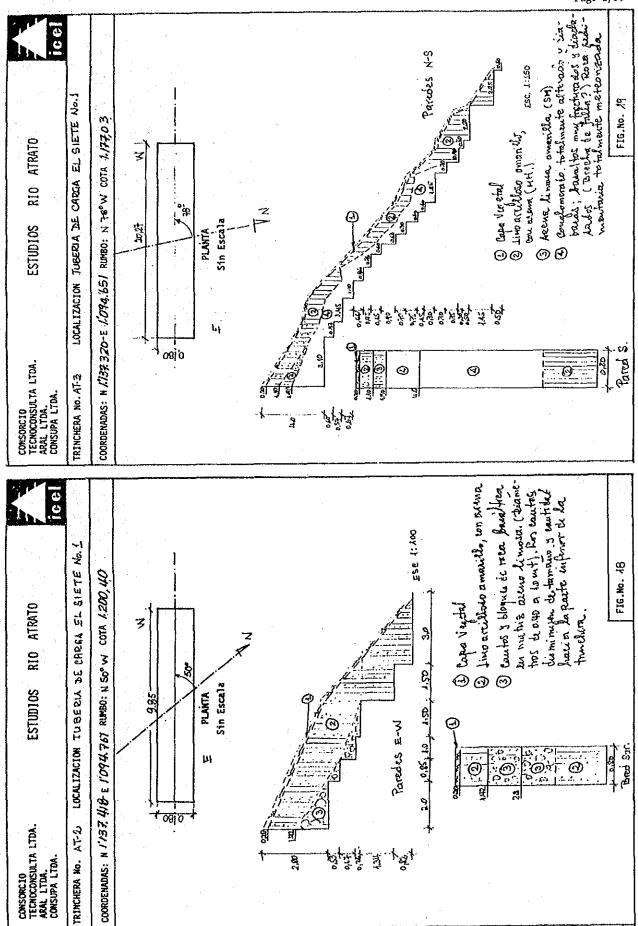


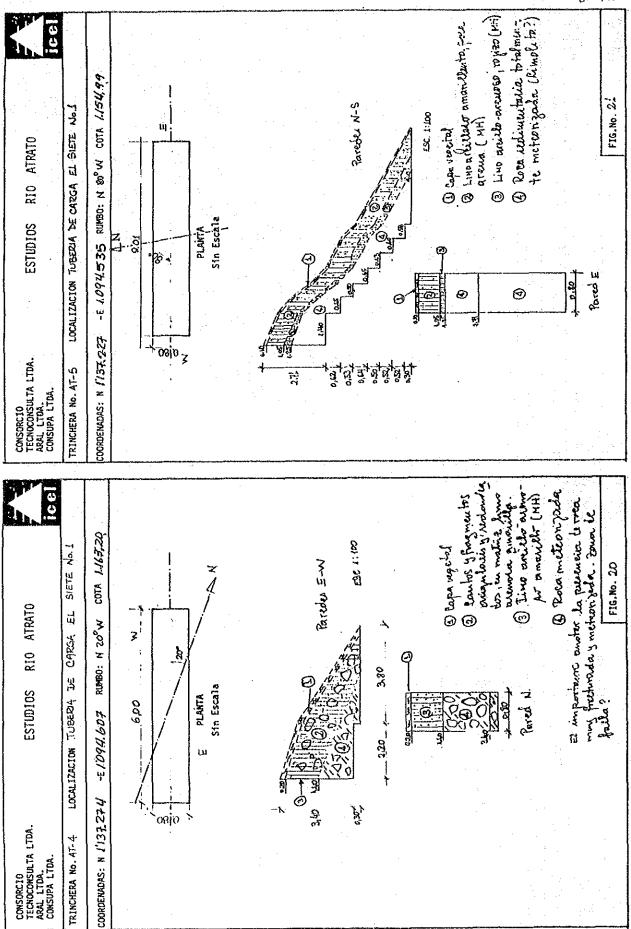
A-111-48



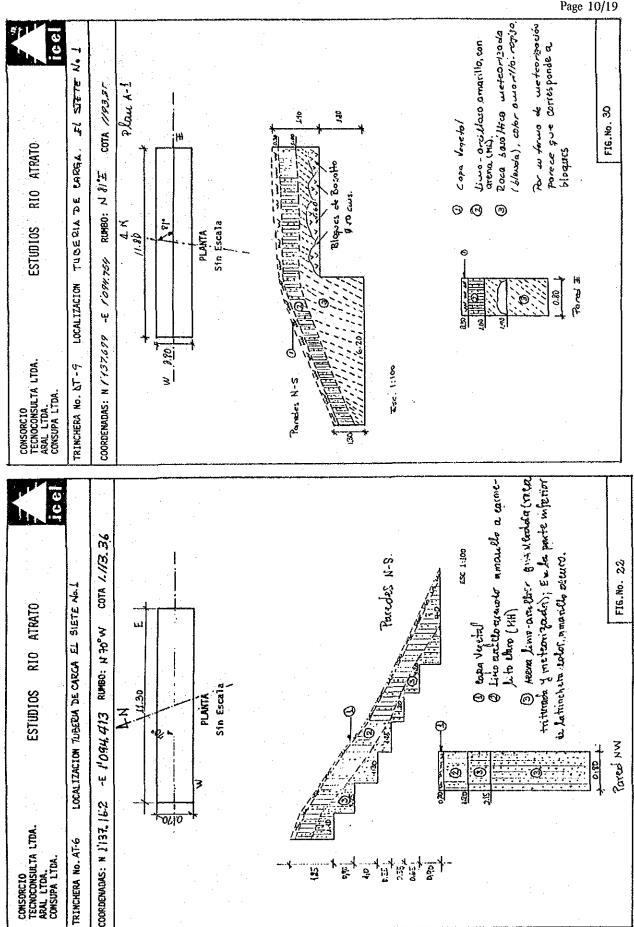
A-111-49

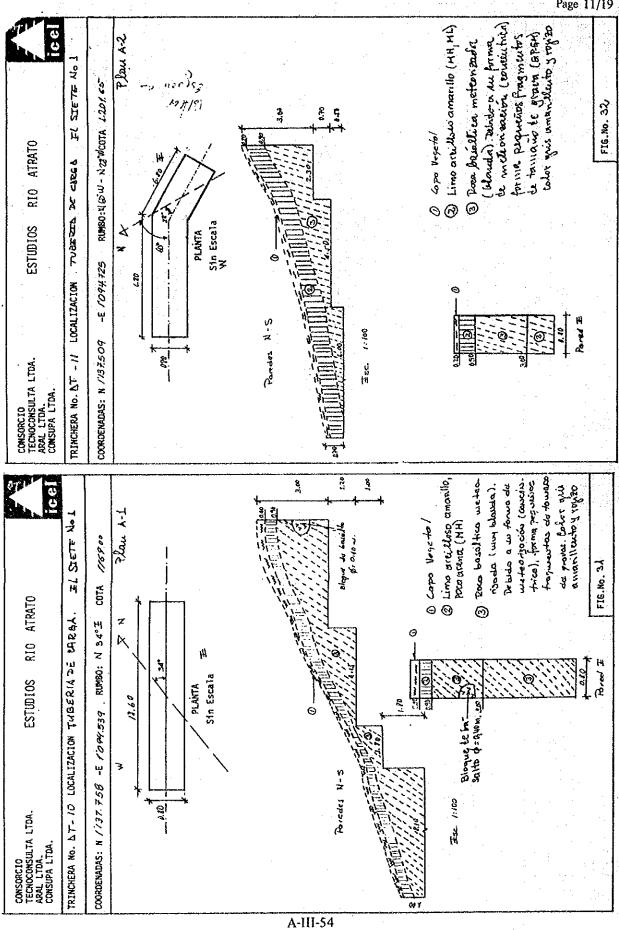


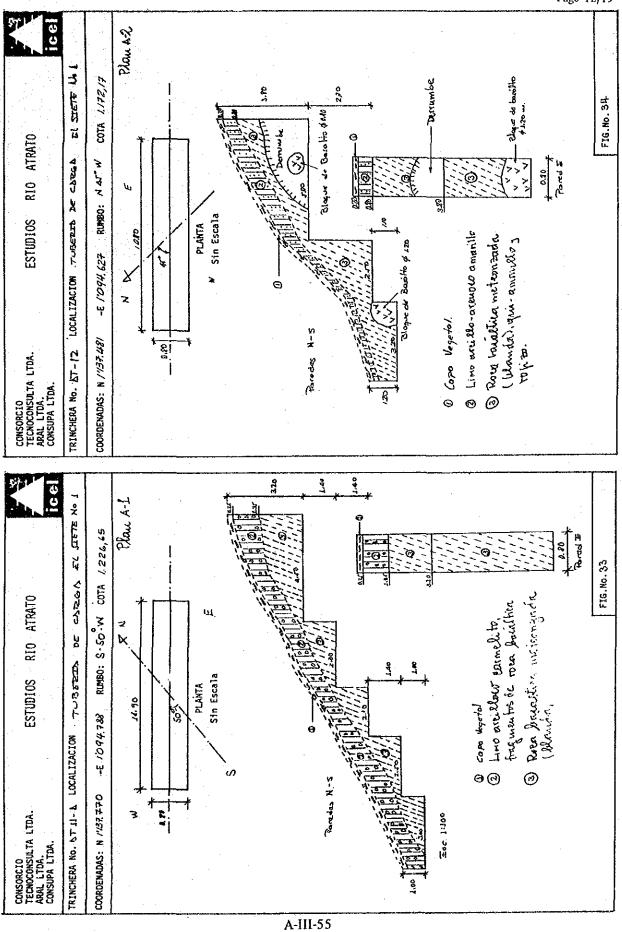


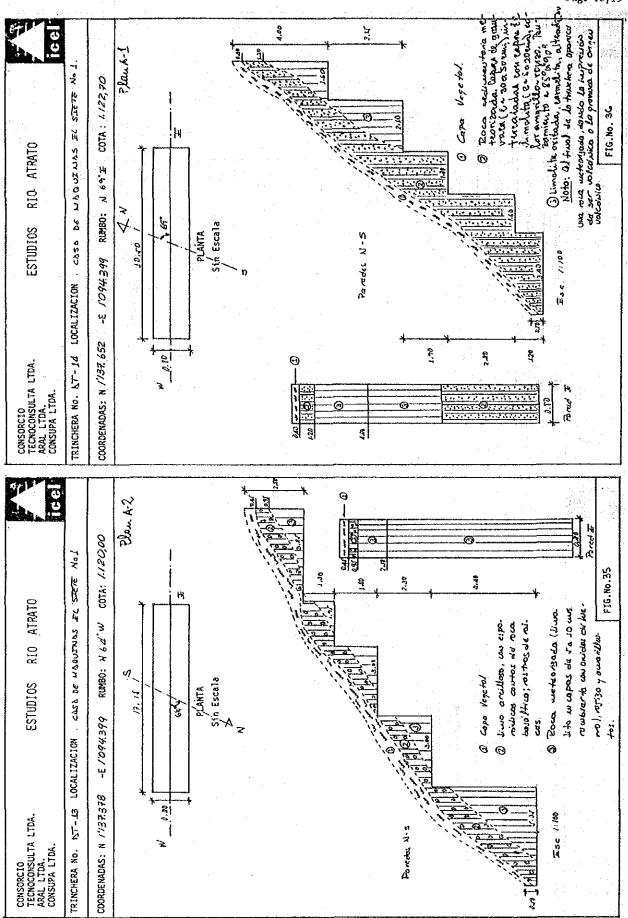


A-III-52

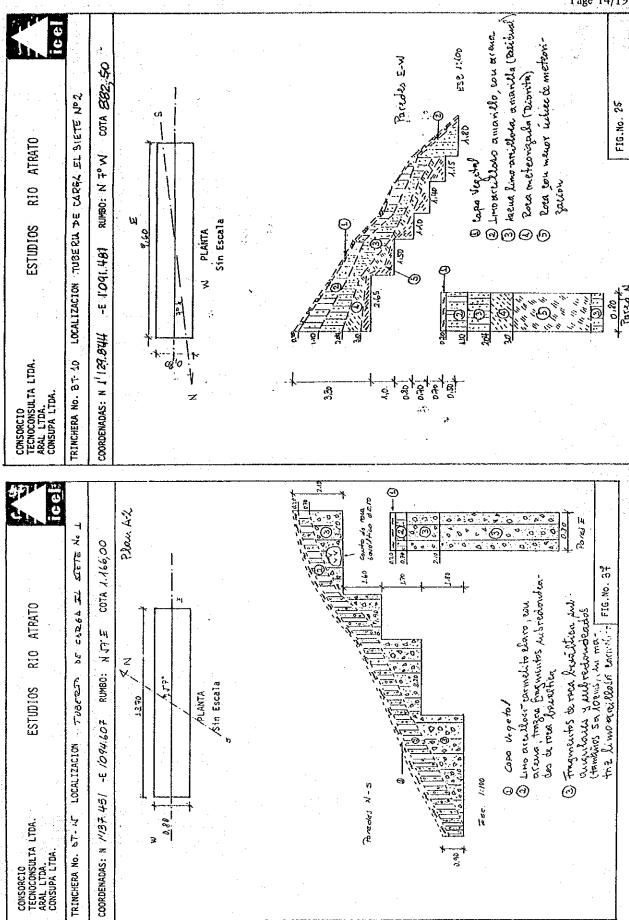




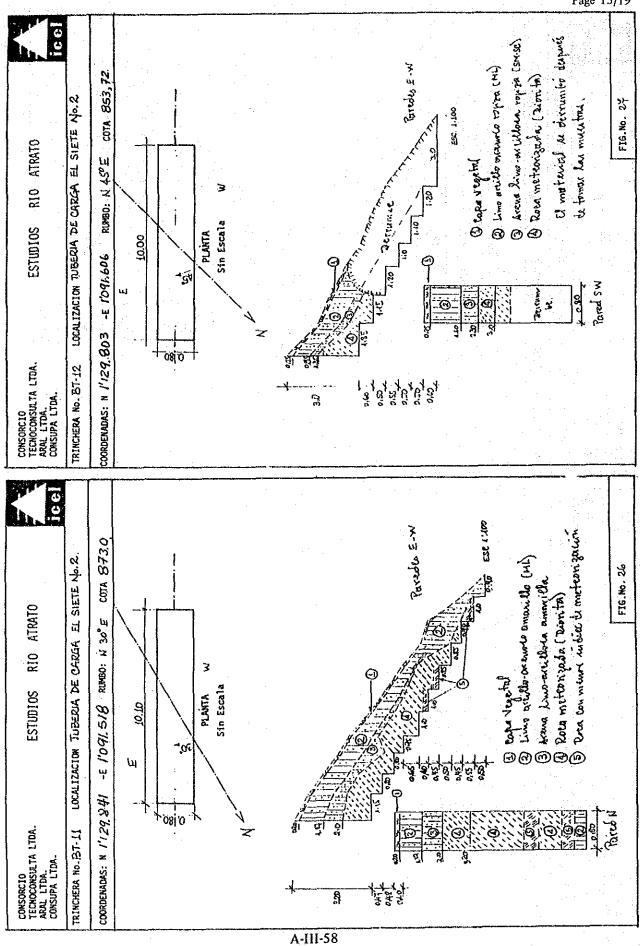


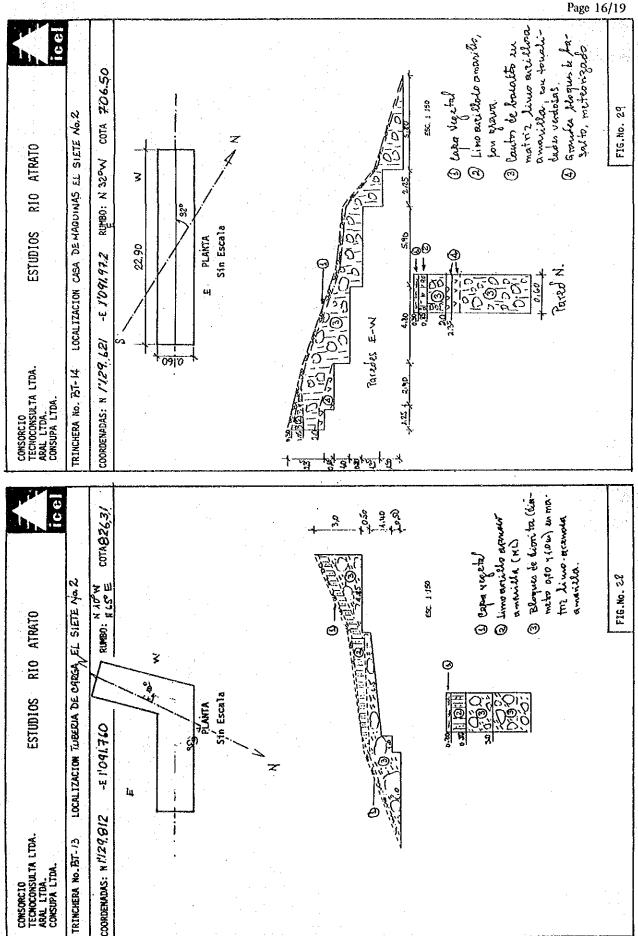


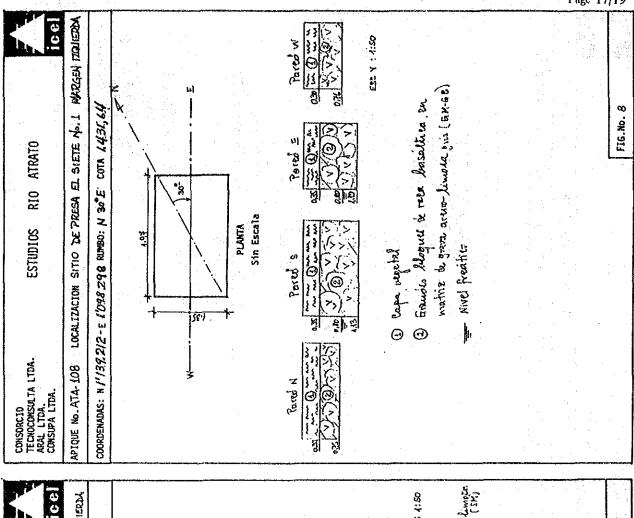
A-III-56

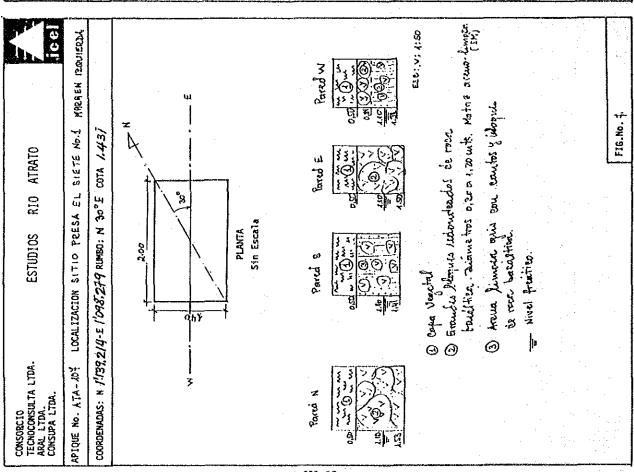


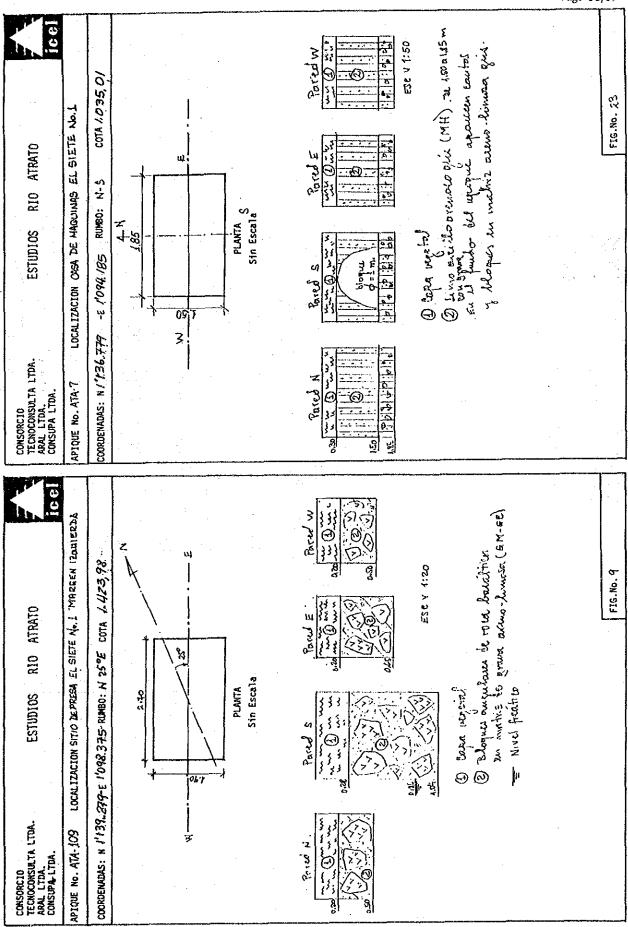
A-III-57





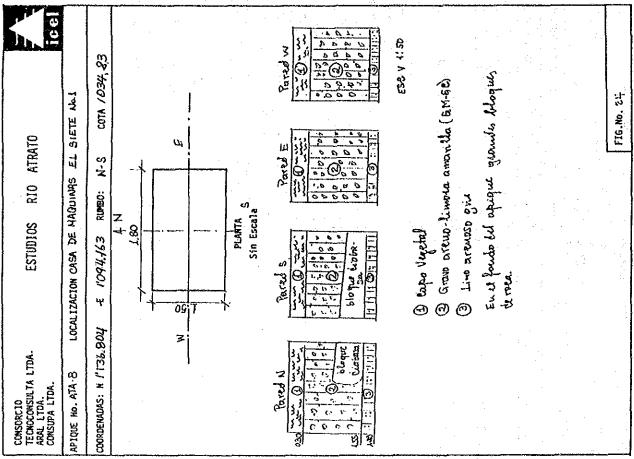






A-III-61





#### III-3 (1) Result of Seismic Prospecting

#### Seismic Refraction Method

Conditions of seismic meserments performed in this project site are mentioned as follows:

Recording device;

12 channels type

Model; Nimbus Oyo ES-1200

Generation of seismic energy; Blows with a hammer of 5-1b.

Intervals between geophones; 10 meters

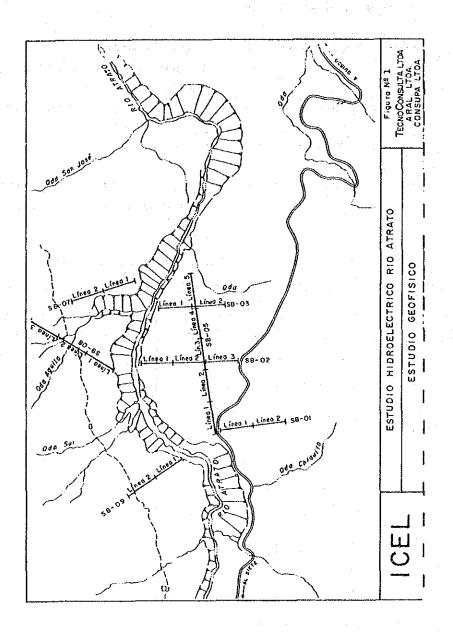
Intervals between shots;

Approximately 50 meters and

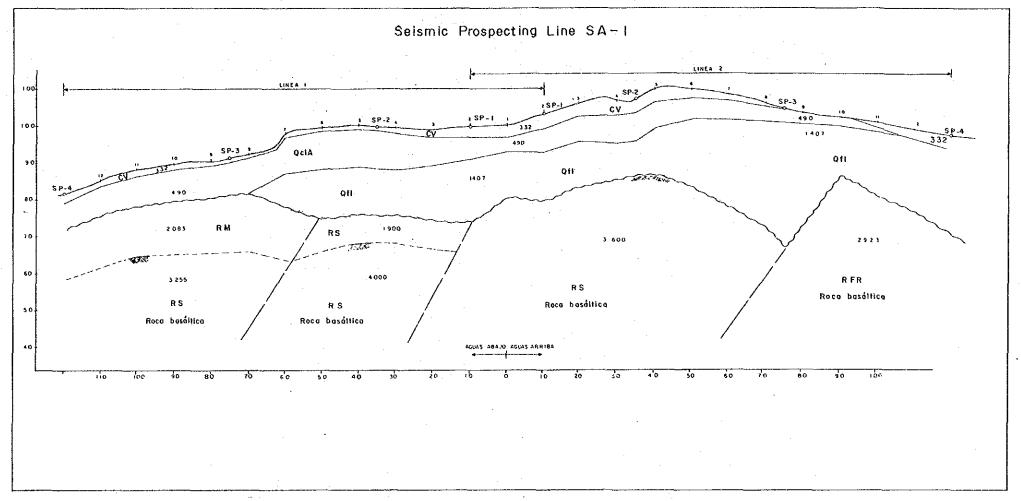
4 shot points in 1 spread.

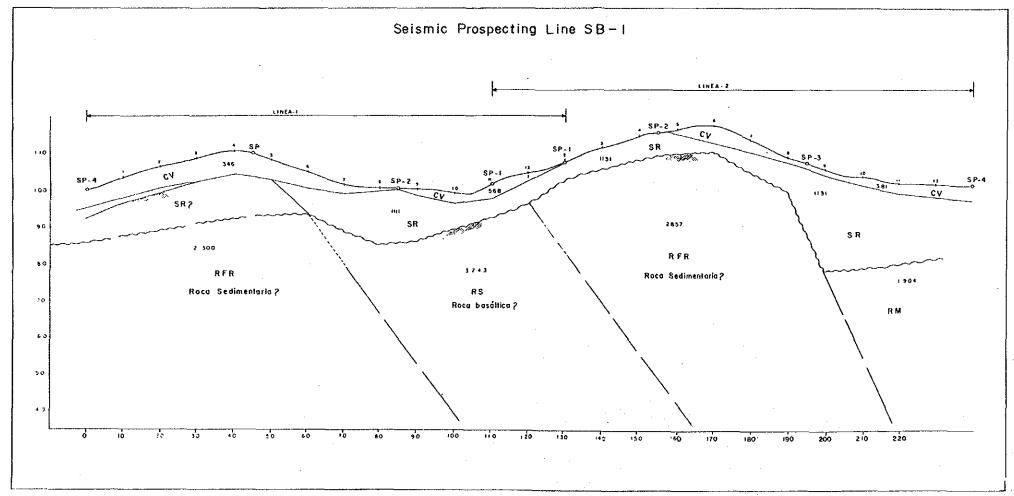
## Quantitive Features of the Seismic Prospecting

Location		Mesuring	Length	Spread	Geophone	Shot	Remarks	
			(m)	ļ	Stations	Points		
1.2	Damsite	SA-1	220	2	24	8	Dwg-08 show location of Mesuring li	Ē
TE NO.2		SB-7	220	2	24	8		
EL SIETE	Penstock and	SB-8	330	3	36	12		
Ξ	Powerhouse Sites	SB~9	220	2	24	.8		
1		SB-1	220	2	24	8		
E NO.1	Intake Damsite	SB-2	320	3	36	12		
SIETE	and Sedimen- tation Baisn	SB-3	220	2	24	. 8		İ
EL	Site	SB~5	550	5	60	20		
<del></del>	Total: 8 Lines 2,300 m							



Location of Seismic Prospecting Lines at El Siete No.1 Penstock and Powerhouse Sites, and El Siete No.2 Intake Damsite and Sedimentation Basin Site.

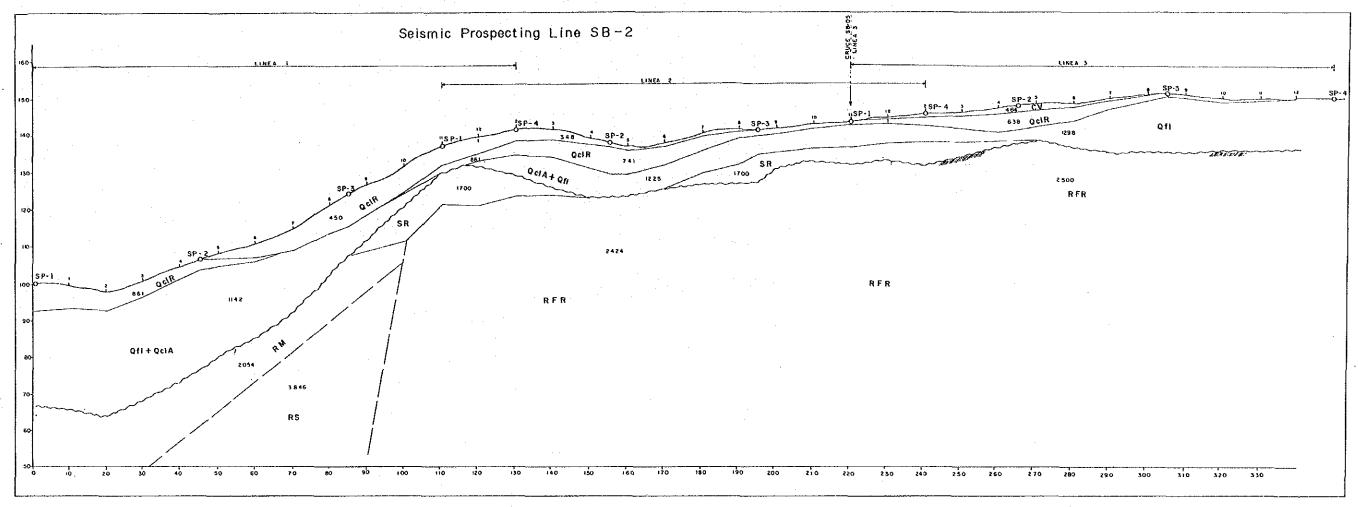


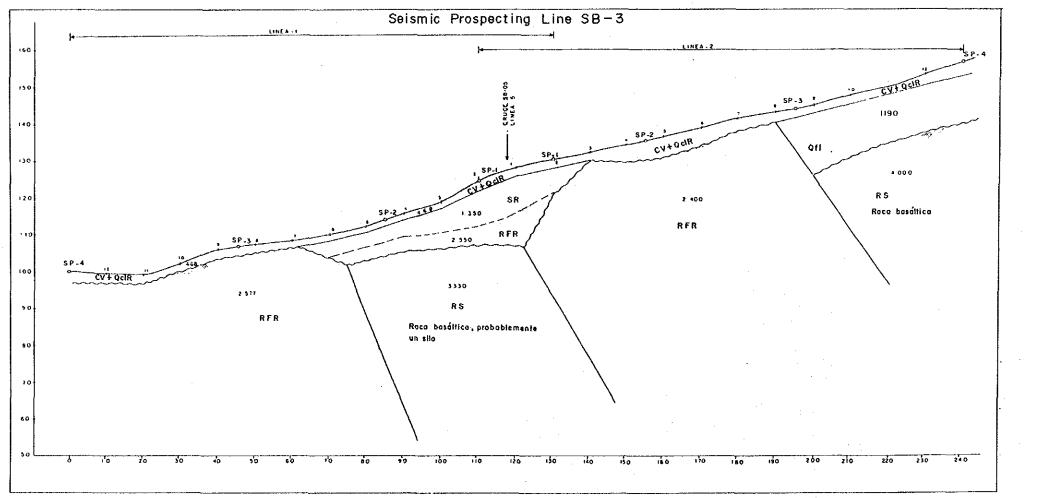


### LEYENDA

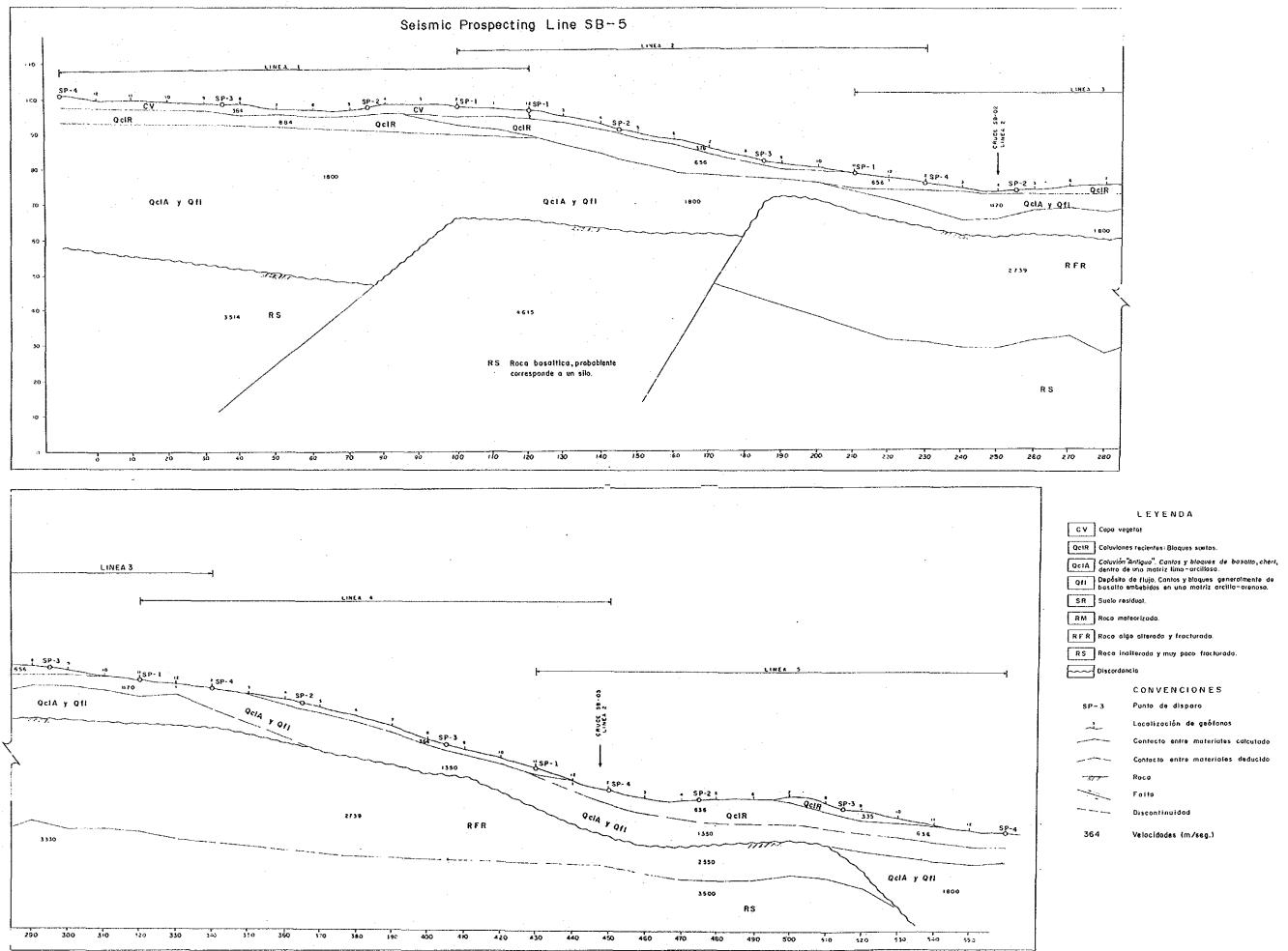
	LEYENDA				
C V Copa ve	Capa vegetal				
QcIR Coluvian	ės recientės: Bloques suetos.				
OctA Coluvión dentro d	n"Antiquo". Cantos y bloques de basalto, cher de una matriz limo-arcillosa.				
	de flujo. Cantos y bloques generalmente de embebidos en una matriz arcillo-arenosa.				
SR Suelo re	sidual,				
RM Roca mateorizada.					
RFR Roca al	go otterado y fracturada.				
RS   Roca inellerada y muy poco fracturada.					
Discordo	nela				
	CONVENCIONES				
SP-3	Punto de dispero				
	Localización de geófonos				
	Contacto entre moteriales calcutado				
	Contacto entre moteriales deducido				
200.0	Roca				
	Falla				
	Discontinuidad				

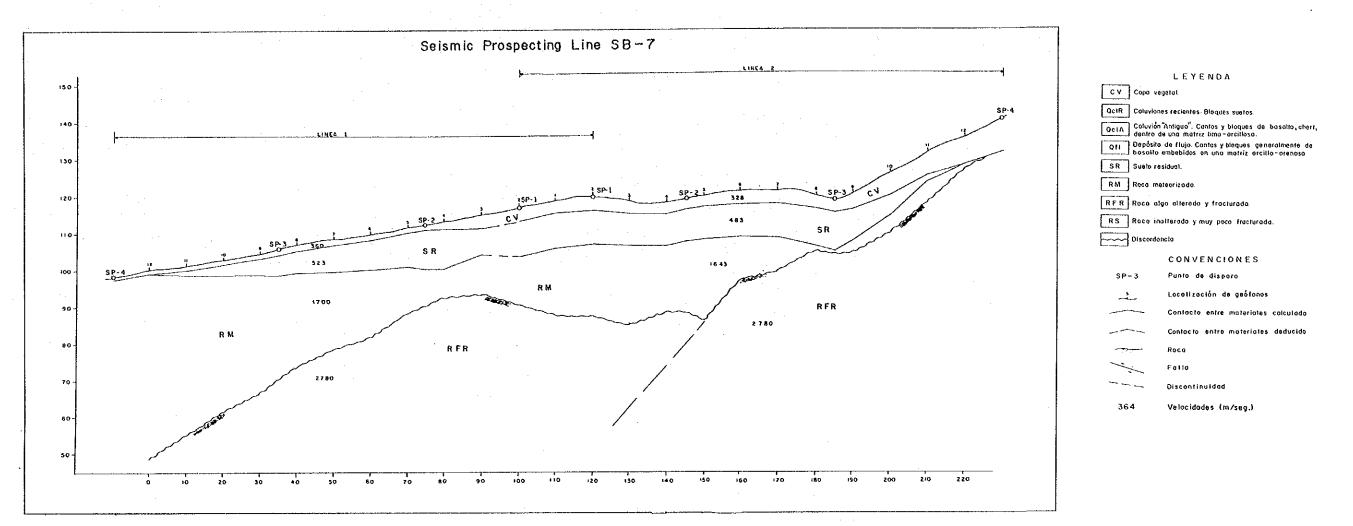
Velocidades (m/seg.)

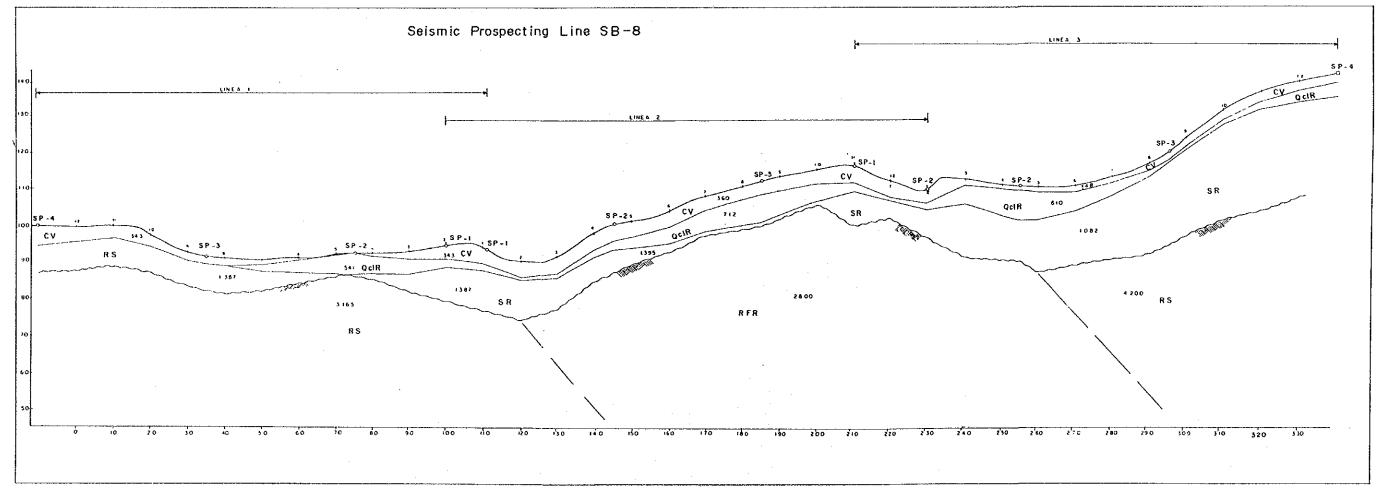


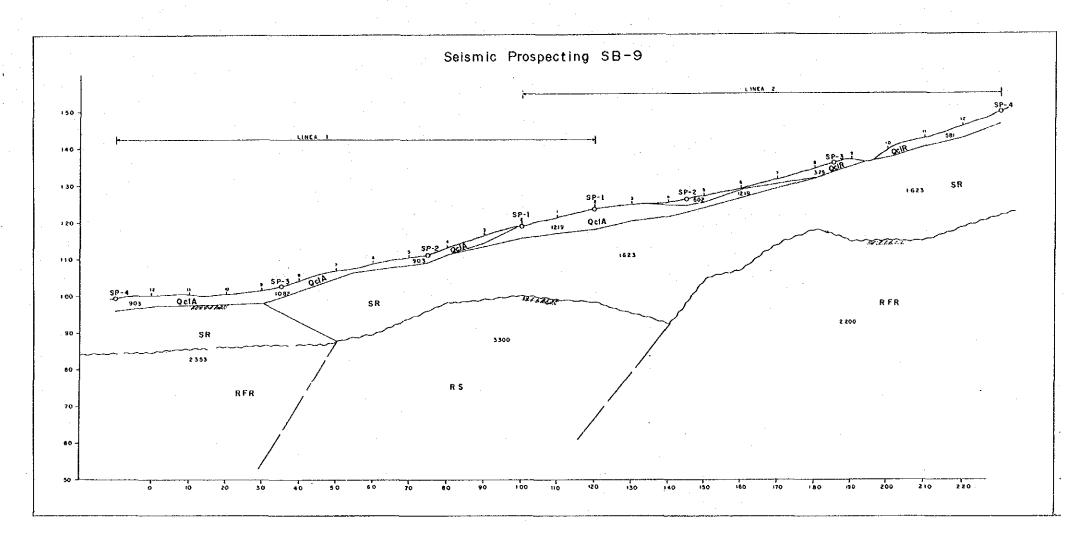












## LEYENDA

C II C II O X
atal
s recientos: Bioques suetos
intiguo". Cantos y bloques de bosallo,chert. una matriz limo-arcillosa.
in flujo. Cantos y bloques generalmente de mbeblidos en una matriz arcillo-arenosa.
dual.
eorizado.
o alterada y fracturado.
lterada y muy poco-frocturoda.
cia
CONVENCIONES
Punto de disporo
Localización de geótonos
Contacto entre materiales calcutada
Contacto entre materiales deducida
Roco
Follo
Discontinuidad
Velocidades (m/seg.)

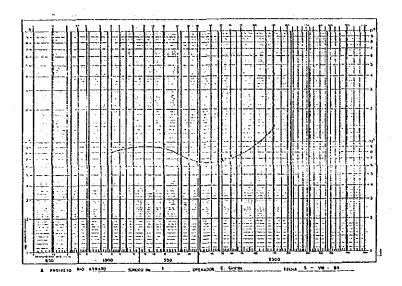
## III-3 (2) Result of Vertical Electrical Sounding

- ° Resistivity Layers in Project Area
- ° Sounding curves (S-1 8)

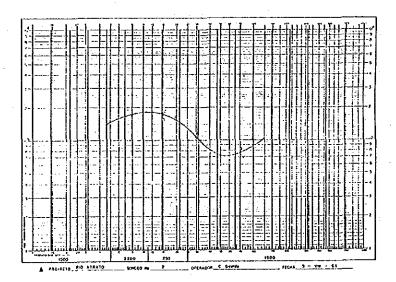
Resistivity Layers in Project Area (Vertical Electrical Sounding)

		ng-points 06.					
	Kemarks	Location of mesuring-points are shown in Dwg06.					
	4th layer	3,000	200 (62)	(30)	(30)	1,500	3,000
vity (ohm'm)		15) 19.5	(30) 22 (6	24 (3)	350 (6)	250 (2	185 (2,7,5)
Resistivity	2nd layer	860	200	600	1,300	3,200	1,400
	1st layer	110	52 70 (5) (15)	240	920	1,500	970 (4
Mesuring-	Point	S-4	8-5	S-6	S-1	S-2	S-3
	Location	El Siete No.1	Penstock Site			El Siete No.2 Penstock Site	

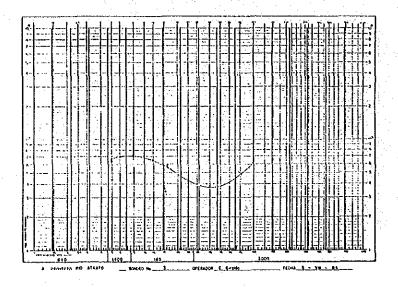
NOTE : ( ) shows depth of resistivity boundary in meter.



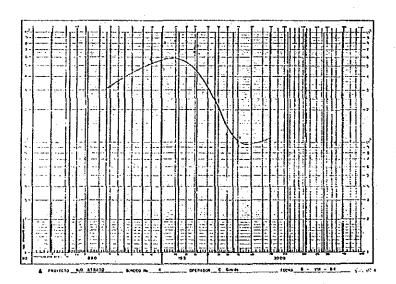
Sounding Curve S-1



Sounding Curve S-2

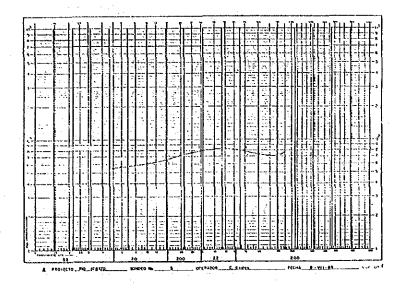


Sounding Curve S-3

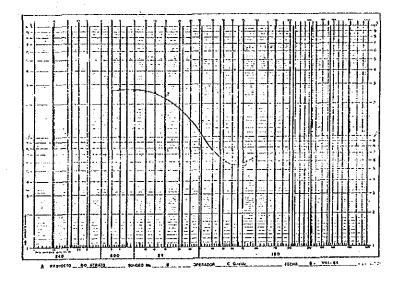


Sounding Curve S

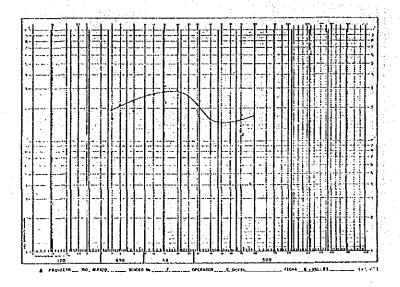
S---4



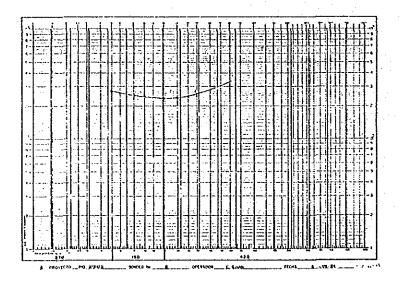
Sounding Curve S-5



Sounding Curve S-6



Sounding Curve S



Sounding Curve S-

## III-4 Result of Microscopic Observation

(Sample No. S-1 - S-5)

Project;	Atrato, Colombia	`	 
Locality;	El Siete No.l Penstock Route		
Sample No	.; <u>s-1</u>		
Rock name	; Altered, augite basalt		
Texture;	Volcanic rocks Holocrystalline, granophyric structure. Porphyritic texture, Intersertal texture	•	

	Name	Characteristcs
neral	Porphyritic phenocrysts: Plagioclase:	Commonly, euhedral, 0.3 - 2.0 mm., in size; Labradorite in components.
in gi	Augite:	Few, 0.1 - 1.0 mm
forming mineral	In groundmass: Plagioclase microlites:	Intersertal texture. Very aboundant, lath-crystals, 0.14 - 0.3 mm
Rock	Augite microlite- granules:	Commonly, 0.02 - 0.08 mm, interstitual.
	2nd chlorite:	Few, interstituals, 0.06 - 0.16 mm
Description	This rock was determined grain size, as the augit	by the texture, composited constituents and e basalt.
•	gree of Chloritization teration Pyritization	weakly weakly

This rock is the greenish grey lighten colored, and altered basalt, with dark green pyroxene phenocrysts.

Project;	Atrato, Colombia	
Locality;	El Siete No.2 Waterway Route (Drilled core of BD-1, 54.3 π	1
Sample No.;	<u>S-2</u>	
Rock name;	Altered diabase	
Γexture;	Volcanic rocks. granular Holocrystalline, structure. Intersertal texture.	

	Name	Characteristcs
	In groundmass:	Intersertal texture
mineral	Plagioclase:	Very aboundant, euhedral, twinning, 0.4 - 1.4 mm, in size, medium grained.
forming	Augite:	Commonly, 0.2 - 0.6 mm, altered partially with chlorite.
	2nd Chlorite:	Commonly, interstitual.
Rock	Zeolite:	Commonly to few, sector-forming.
Description	This rock was determined (medium grained), as the	by the texture, constituents, and grain-size altered diabase.
	gree of teration Chloritization Zeolitization Garbonatization Pyritization	strongly Montmorillonitization weakly strongly strongly

This rock is the bleaching whitish greenish grey colored, and altered diabase with dark green pyroxene phenocrysts.

Project;	Atrato, Colombia	
Locality;	El Siete No.2 Waterway Route	
Sample No.;	<u>S-3</u>	
Rock name; _	Altered basalt or dolerite	
Texture;	Volcanic rocks. Holocrystalline, Granular stru Subophitic texture.	ucture.

	N	аше	Ch	aracteristcs
mineral	In grou Constitu Plagioc	ents:	Subophitic texture  Aboundant, euhedra in components 0.14	1, twinnings, An ₅₄ labradorite - 0.4 mm, in size.
Rock forming		ite - tremolite: aque granules:	Z A C in extinction	itual, pale greenish, n is 14°, rming by uralitization from
Description	This roc	k was determined		mposed constituents and lerite.
	gree of teration	Albitization Uralitization	Few Very strongly	

This rock is the dark greenish grey colored and altered basalt, as showing in the hand specimen.

Project;	Atrato, Colombia
Locality; _	El Siete No.2 Powerhouse Site (Drilled core of CD-1, 11.7 m)
Sample No.;	<u>S-4</u>
Rock name;	Hornblende - plagioclase mylonite
Texture;	Dynamic metamorphosed rocks.  Holocrystalline, crystallobalstic fabric, Cataclasitic fabric.  Granulated texture, and Laminated texture.

	N	lame	Characteristcs
	Chief co	enstituents:	
mineral	Plagioc	lase:	Very aboundant, 0.04 - 0.6 mm, in most, to 1.6 mm, in size, oriented to parallel in lamination, and affected strongly by granulation.
forming	Hornble	nde:	Very aboundant, 0.04 - 0.4 mm, in most, to 0.8 mm, in size, orientated to parallel in lamination.
			In taminacion.
Rock			
Description		k was determined de - plagioclase	by the fabric, texture and constituents, as the mylonite.
	gree of teration	Albitization Chloritization Carbonatizatio	

This rock is the bleaching pale grey colored and altered and clastic rocks.

Project;	Atrato, Colombia	
Locality;	El Siete No.2 Penstock Site	
Sample No.;	S-5	
Rock name; _	Altered, hornblende - biotite granodiorite	
Texture;	Plutonic rocks.	
	Holocrystalline, equigranular structure.  Medium grained, hypidiomorphic-granular texture.	

	Na Na	ime	Cha	racteristes	)		
	Constitue	ents:					
mineral	Quartz: Orthocla		Few, anhedral, 0.1 - Few, anhedral, 0.1 - kaolinitization.		n size	, alter	ed by
forming	Plagioc	ase:	Aboundant, anhedral Ang, andesine in co		al, 0.3	3 - 2.0	mm,
Rock	Hornble	nde:	Commonly, green type	e, subhedra	1, 0.8	- 2.4	om.
Ro	Biotite		Commonly to Few, grepleochloism remarkate with chlorite, 0.8	bly, altere	d and i	eplaci	
Description			by the plagioclase of iotite, as the hornb				
1 2							
Ωe							

This rock is the hornblende - biotite granodiorite, that consists of chiefly whitish grey colored plagioclase and mafic minerals of hornblende and biotite.

## III-5 Construction Material

- (1) Result of X-ray Diffraction Analysis and Polarized Microscopic Observation for Quarry Site.
- (2) List of Pit for Concreate Aggregate
- (3) List of Trench for Earth Material
- (4) Gradation of Concrete Aggregate
- (5) Result of Soil Test

# III-5 (1) Result of X-ray Diffraction Analysis and Polarized Microscopic Observation for Quarry Site

#### Numbers and localities of specimens

#### Q-1, Q-2, Q-3

Quarry site on opposite bank of Quebrada Dos Quebrodas (Appendix-10.6). Above noted three specimens were examined by thin section and polarized microscope method and X-ray diffraction method, with the following results.

## (1) Q-1: Dark green coarse-grained augite meta-basalt

This rocks was originally coarse-grained augite basalt or augite dolerite chiefly composed of plagioclase (0.4 x 0.8 mm in average size), augite (0.3 - 3.0 mm in diameter) and magnetite. Plagioclase crystals were completely replaced by albite with minor amounts of epidote and chlorite. Augite crystals are generally very fresh but partly are replaced by chlorite and epidote. No expandable clay but only pale green chlorite is found.

#### (2) Q-2: Dark green fine grained augite meta-basalt

Original rock was a typical augite basalt mainly composed of augite phenocrysts (0.2 - 0.9 mm in diameter), plagioclase phenocrysts (size range of 0.3 x 1.0 - 0.7 x 1.4 mm), fine-grained groundmass of augite, plagioclase and magnetite with many gas pores or druses. By diagenetic hydrothermal alteration, however, plagioclases forming phenocrysts and groundmass have been completely replaced by albite, prehnite and minor amounts of sericite and all druses have been perfectly filled by prehnite, chlorite and pumpellyite. Augite phenocrysts are relatively fresh and well preserved. X-ray diffraction data obtained from clay minerals forming this rock specimen indicate that no expandable clay was formed.

#### (3) Q-3: Dark green medium-grained augite meta-basalt

Phenocrysts are augite of  $0.7 \times 1.2$  mm in average diameter and plagioclase of  $0.5 \times 1.7$  mm in average diameter. The groundmass was mainly composed of plagioclase ( $0.2 \times 0.4$  mm), augite ( $0.2 \times 0.3$  mm) and magnetite. Augite forming phenocrysts as well as groundmass are

not altered. Phenocryst and groundmass plagioclases, however, have been completely altered into albite with minor amounts of sericitic mineral. The volcanic glass of groundmass was also completely replaced by chlorite. Although most of irregular shaped or round shaped gas pores and druses in original basalt have been filled by secondary minerals such as chlorite and calcite, relatively large round shaped gas pores of 0.2 - 2.0 mm in diameter are still well observed. These pores are not believed to be connected with each other.

III-5 (2) List of Pit for Concreate Aggregate

Pit Name	Location	Elevation (m)	Coordinate	Depth (m)	Gradation analysis
AFb-1	Quebrada la Borrasca	<b>-</b>	-	1.5	, i r o r
AFb-1A	Ditto			1.5	
AFb-2	Ditto	$\frac{1}{2} \int_{0}^{\infty} dx dx = \frac{1}{2}$	-	0.55	t tell <del>=</del>  width
AFb-2A	Ditto		-	0.55	_
AFb-2B	Ditto	act.		0.55	o
AFb-2C	Ditto	<b></b> .	-	1.70	
AFb-3	Ditto		-	0.60	<b>-</b>
AFb-5	Ditto		· <u></u> -	2.30	0
AFb-6	Ditto		-	2.20	0
AFb-7	Ditto	, <del>-</del>	-	0.60	o
TFb-4*	Ditto			6.20**	
	Total: 10 pits 12	.05 m, 1 tr	ench 6.20 m		
AFs-12	Puente de Sanchez Right Bank	_	<u></u>	2.00	<del>-</del>
AFs-13	Ditto	<b>-</b> -	· _	2.00	0
AFs-14	Ditto	-		2.00	0
AFs-15	Ditto	-	-	2.00	0
	Total: 4 pits 8.	00 m			<del></del>

^{*} Trench ** Length in meter

III-5 (3) List of Trench for Earth Materials

				-				1	
Trench	Location	Elevation	Coordinate	Direction	Length	Gradation	Test		
Name		(m)			(n)	analysis	Moisture-Density Relation	Liquid Limit	Plastic Limit
TFs-1	Terraza de Sanchez			N85°E	17.08	0	0	0	0
TFS-2	Ditto	ı	1	N65°E	7.3	0	1	0	0
TFs-3	Ditto	ı		N80°W	20.7	0	0	0	0
TFS-4	Ditto	1	1	N65°E	4.4	0	0	0	0
TFs-5	Ditto	I	ŀ	NS5°E	7.8	0	0	0	0
TFs-6	Ditto	ı	1	W85°W	15.32	0	0	0	0
TFs-7	Ditto	I	1	N75°E	18.20	0	0	0	0
TFs-8	Ditto	ı		N45°E	16.80	0	0	0	0
TFs-9	Ditto	l	ı	N85°W	17.30	0	0	0	0
TFs-10	Ditto	1	l	N25°E	3.40	0	l	0	0
TFs-11	Ditto	ı	1	N55°E	16.95	0	0	0	0
	Total: 11 trenches	hes			145.25 m				

III-5 (4) Gradation of Concrete Aggregate

76.2 - 38.1 - 19.0 - 9.51 - 4.76 - 2.38 - 1.19 - 0.595 - 0.297 - 0.149 - 38.1 mm         19.0 - 9.51 mm         4.76 mm         2.38 mm         1.19 mm         0.595 mm         0.149 mm         0.074 mm           21         19         32         27         34         18         11         16         11         5           23         25         26         26         31         15         10         13         15         5           25         31         26         18         20         20         13         13         10         5           25         29         24         22         20         20         14         12         8         6           33         26         21         20         20         14         12         8         6           24         34         28         14         19         19         19         19         19         20         2           25         21         28         14         23         18         6         3           24         34         28         24         28         14         7         2         2	Sampling	Sampling Trench or	. ვ	Coarse Aggregae (%)	regae (%)			Fine Ag	Fine Aggregate	(%)				Gradation	(%) u
21         19         32         27         34         18         11         16         11         5           23         25         26         26         31         15         10         13         15         5           25         31         26         18         20         20         13         13         10         5           25         29         24         22         20         20         14         12         8         6           33         26         21         20         53         26         5         5         0         0         0           24         34         28         14         19         19         19         19         19         19         2         2           8         31         29         31         24         23         18         16         6         3           12         21         33         33         40         28         14         7         2         2         2	Spor	Pit Name	76.2 - 38.1mm	38.1 - 19.0mm	19.0 - 9.51mm	[2]	4.76 - 2.38mm	2.38 - 1.19mm	1.19 - 0.595mm	0.595 - 0.297mm		0.149 - 0.074mm	<0.074	76.2 - 4.76mm	<4.76
23         25         26         26         31         15         10         13         15         5           25         31         26         18         20         20         13         13         10         5           25         29         24         22         20         20         14         12         8         6           33         26         21         20         53         26         5         5         0         0           24         34         28         14         19         19         19         19         12         2           8         31         29         31         24         23         18         16         6         3           12         21         33         33         40         28         14         7         2         2	no de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la constanta de la const	AF8-13	23	19	32	27	34	18		16	11	5	Ŋ	62	38
25         31         26         18         20         20         13         13         10         5           25         29         24         22         20         20         14         12         8         6           33         26         21         20         53         26         5         5         0         0           24         34         28         14         19         19         19         19         12         2           8         31         29         31         24         23         18         16         6         3           12         21         33         40         28         14         7         2         2		APs-14	23	25	26	56	31	15	10	13	15	Ŋ	9	19	39
25         29         24         22         20         20         14         12         8         6           1         33         26         21         20         53         26         5         5         0         0           24         34         28         14         19         19         19         19         12         2           8         31         29         31         24         23         18         16         6         3           12         21         33         33         40         28         14         7         2         2		AF8-15	25	æ	56	81	50	50	E	£ .	o ₁	S	81	19	36
33         26         21         20         53         26         5         5         0         0           24         34         28         14         19         19         19         19         12         2           8         31         29         31         24         23         18         16         6         3           12         21         33         33         40         28         14         7         2         2		AFb-1	25	29	24	22	20	20	14	12	8	9	18	51	67
24         34         28         14         19         19         19         19         12         2           8         31         29         31         24         23         18         16         6         3           12         21         33         33         40         28         14         7         2         2		AFb-2B	33	26	21	20	53	26	۱'n	Ŋ	0	0	Ξ	18	19
8         31         29         31         24         23         18         16         6         3           12         21         33         33         40         28         14         7         2         2		AFb-5	24	34	28	14	19	61	61	61	12	2	10	58	77
12 21 33 33 40 28 14 7 2 2		AFb-6	œ	31	53	31	24	23	81	16	9	e .	10	38	62
		AFb-7	2	21	33	33	07	88	14	_	~	8	^	57	<b>6</b> 3

III-5 (5) Results of Soil Tests

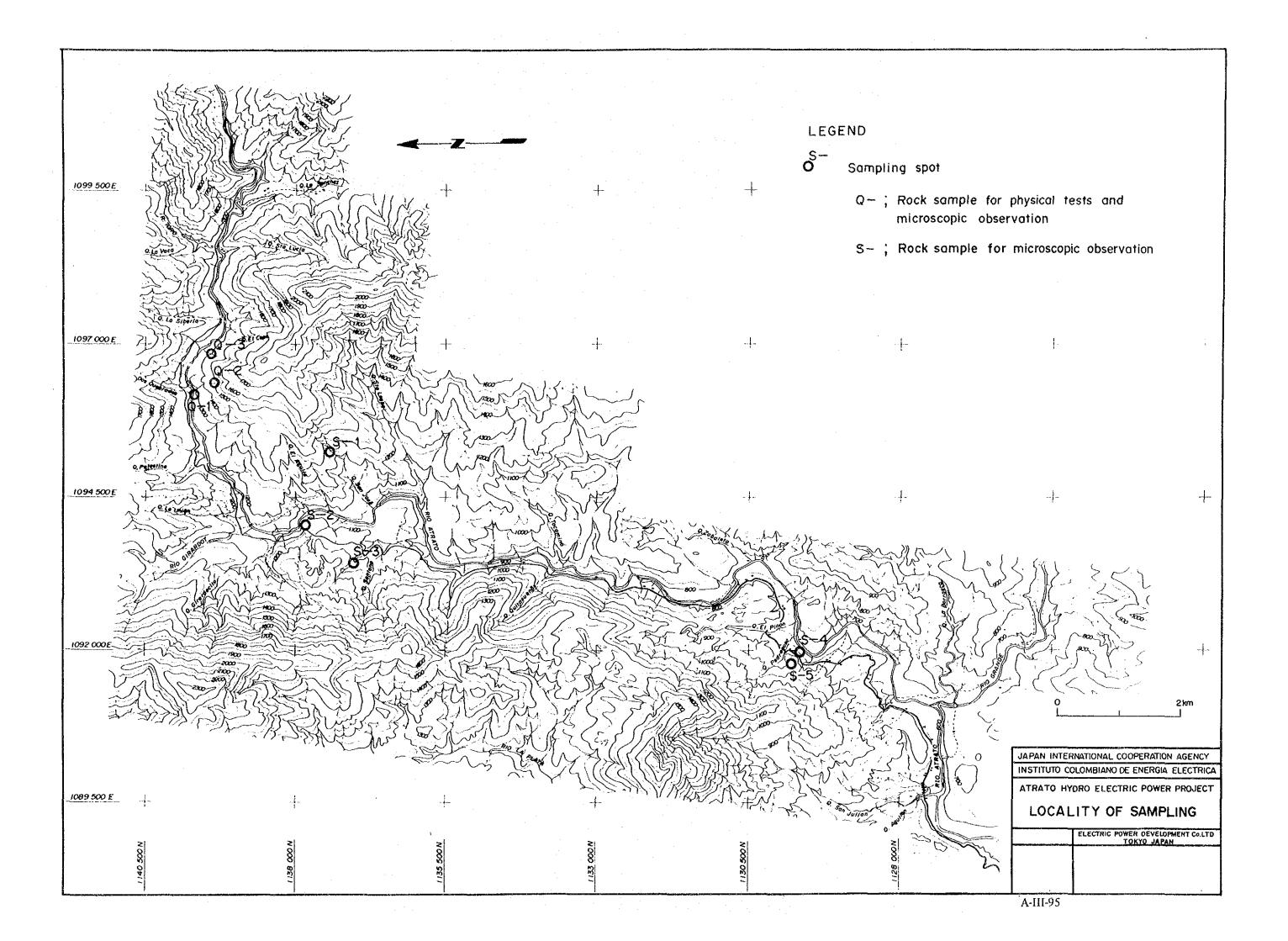
		<u> </u>												
	Re-	*2	*	*2	*	*2	*	*	*2	*3	*	*	4	*
ion	Maximum Dry Density	2.03	1.72	2.04	1.59	1.68	1.53	1.55	1.60	1.67	1.85	1.92	1.78	1.81
Compaction	Optimum Water Content	15.8	20.2	13.3	23.5	0.61	26.7	25.4	25.0	20.0	15.2	14.3	15.3	14.8
	-0.075mm (No.200)	18	25	22	19	30	25	25	36	36	17	17	35	35
	-0.595mm (No.30)	32	38	33	32	07	36	36	52	52	25	25	74	77
	-2.38mm (No.8)	77	67	4.5	777	67	#	77	09	09	37	37	53	53
	-4.75mm (No.4)	75	2,	53	53	57	20	20	63	67	87	87	09	9
(Passing)	-19.0ma (3/4")	78	75	76	7.2	92	65	. 65	83	83	18	81	82	82
Gradation (	-38	88	85	76	88	87	18	8	92	92	96	96	87	87
Ğ	(2")	93	85	100	91	100	85	85	100	100	100	100	86	89
	(2-1/2")	100	100		100		88	88					100	100
	(3")	3					100	100						
Limits	Id	6	11	2	ı	91	71	71	00	∞	20	2	^	7
berg I	. T.	23	គ	54	ŧ	35	36	36	29	59	54	54	23	23
Atter	17	32	84	3,4	1	51	20	õ	37	37	29	53	30	30
*	Specific Gravity	2.76	2.67	2.73	. 1	2.76	2.74	2.74	2.72	2.72	2.70	2.70	2.70	2.70
Water	ပ္သံုး	3	ı	ı	32	23	30.2	29.7	26.7	26.1	15.2	15.3	16.1	16.3
Soil	Classi- fication Unified System	၁ဗ	ž	29	æ	ž	E	Æ	ě	E S	OM-GC	39-W5	29-KG	CM-GC
	Trench or Pit Name	TFs-1	TFs-3	TFs-4	TFS-5	TFs-6	TFs-7	TFs-7	1Fs-8	TFs-8	TFs-9	TFs-9	TFs-11	TFs-11
	Borrow Area							•						

*1 Specific Gravity of Soil passing No.4 sieve.

^{*2} The Moisture-Density Relations of Soils using a 5.5-1b Rammer and a 12-in. Drop (& 10.1 cm mold: soil material passing No.4 Sieve).

^{*3} The Moisture-Density Relations of Soils using a 10-1b Rammer and a 18-in. Drop (A 15.2 cm mold: soil material passing No.4 sieve).

## III-6 Locality of Sampling



# APPENDIX-IV STUDY OF DEVELOPMENT PLAN

IV-1	KW and KWh Value to be Applied to Atrato Hydro Power Project
IV-2	Monthly Inflow at El Siete No. 1 Dam
IV-3	Monthly Available Discharge for Power at El Siete No.l Power Station
IV-4	Monthly Firm Discharge for Power at El Siete No. 1 Power Station
IV-5	Monthly Inflow at El Siete No. 2 Intake Dam
1V-6	Monthly Available Discharge for Power at El Siete No. 2 Power Station
IV-7	Monthly Firm Discharge for Power at El Siete No. 2 Power Station
IV-8	Mass Curve of El Siete No. 1 Dam
IV-9	Monthly Average Discharge at El Siete No. I Dam
TV~10	Monthly Average Discharge at El Siste No.

Intake Dam

#### IV-1 KW and KWh Value to be Applied to Atrato Hydro Power Project

- 1. Alternative Standard Thermal Power Plant
  - (1) Termocartagena 300 MW x 1 Unit (except for 230 KV transmission lines and transforming facilities)
  - (2) Construction cost (Prices in 1981)

 Power plant
 249,000,000 US\$

 Coal conveyer
 9,800,000 US\$

 Land reclamation
 1,050,000 US\$

 Total
 259,850,000 US\$

(3) Revised construction cost due to the price escalation Foreign currency:

 $259,850,000 \times 0.8 \times 3.77/3.47 = 225,852,000 \text{ Us}$  Local currency:

 $259,850,000 \times 0.2 \times 21.51/13.33 \times 59.07/114.17$ = 43,389,000 US\$

Total 269,241,000 US\$ at the end of 1984

Therefore, the unit construction cost in KW: 897.5 US\$/KW

2. kW Value

kW Value = Fixed cost of standard thermal Power Plant

(Installed capacity of S.T.P.P.)x(1-Station service ratio)

$$\frac{x(1-\text{Outage ratio})x(1-\text{Scheduled outage ratio})}{x(1-\text{Transmission line loss factor})} + \text{Power transmission cost per kW}$$

$$= \frac{(33,385+1,615)x10^3}{(300,000)x(1-0.04)x(1-0.05)x(1-0.10)x(1-0.04)} + 6.6$$

Where:

Discount rate(s) : 12% per year

Serviceable life

30 years

Outage ratio

Scheduled outage ratio: 10%

: 3% (without fuel costs)

Power transmission cost per kW

(220 kV, 2 cct, 86.4 km from Cartagena to Sabanalargu

via ternera):

 $160 \times 103 \text{ US}/\text{km} \times 86.4 \text{ km} \times 0.144 \times 1/300,000 \text{ kW}$ 

= 6.6 US\$/kW

#### 3. kWh

Variable cost of standard thermal power plant kWh Value ≖ (Annual energy production of S.T.P.P.)

x(1-Sation service ratio)x(1-Transmission line loss factor)

 $(30,873+6,462)\times10$  $(1.840 \times 10^6) \times (1-0.06) \times 1-0.03)$ 

= 22.3 US mils/kWh (18.4 US mils/kWh in case of exception to 0 & M cost of 6,462,000 US\$)

Where:

Coal price at Termocartagena: 47.0 US\$/ton (Cerrejon mine mouth's price: 30.0 US\$/ton

Calorific value of coal : 6,900 kca1/kg

Thermal efficiency of the power plants qt: 35%

Heat rate

0.357 kg/kWh

Plant factor

70%

Annual energy production

: 1,840 GWh.

IV-2 Monthly Inflow at El Siete No. 1 Dam (CA * 256.3 km²)

Year																	
Month	1969	1970	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Total	Average
, an	594.87	819.78	733.18	415.27	724.53	583.33	665.07	390.26	442.38	391.00	535.76	410.72	592.27	315.64	674.67	8288.73	552.58
Feb	454.00	412.41	629.98	462.70	780.58	675.64	462.64	308.91	326.75	262.28	436.88	332.16	558.38	270.58	543.69	6917.58	461-17
Mar	759.66	634 -69	552,70	723.15	694.12	627.48	523.19	314.96	413.79	388 .84	367.89	467.29	512.06	454.96	547.64	7982.42	532.16
Apr	920-32	904.98	935.79	927.48	702.47	790.58	616.93	350.06	1264.71	568.26	451.26	554.60	679.65	745-61	497.72	10910,42	727.36
Мау	736.94	1147.05	1163.20	788.46	635.67	746.39	643.03	657.65	1044.40	732.12	778.30	603.86	708.20	738.13	598.88	11722.28	781.48
da C	786.68	960.65	1135.38	695.65	715.67	817.09	862.88	649.02	655.72	956.10	821.18	78-898	672.24	663.83	826.81	12087.74	805.84
Tar.	433.08	857.72	806.58	671.68	908.32	1028.58	604.29	615.38	542.68	750.26	575.94	572.89	614.89	840.73	910.31	10733.33	715.55
gny .	700.97	957.88	76*676	760.92	927.02	1003.98	371.65	742.06	390.15	642.52	636.52	200.67	541.27	911.94	701-27	10738.76	715.91
Sep	81.746	1156.04	1032.92	94-676	786.90	815.99	313.26	46.34	536.49	730.34	396.67	509.74	523.78	829.45	874.98	10899 54	726.63
Oct	1274.53	999.85	1274.06	843.29	766.67	850.73	606.35	879.08	750.79	915.81	574.64	597.33	554.38	831.94	1007.56	12727 -01	97-878
Nov	682.33	1126.07	1185.34	830.23	714.00	776.88	758.68	846.70	868.18	901.02	573.44	868.67	508.29	733.73	1338,63	12712.19	847.47
Dec	601.83	899.45	553.68	818.27	531.81	1041.97	539.98	623.55	690.92	691.17	90.765	755.58	407.21	693.17	736.55	10179.20	19-879
Total	8892.39	75.97801	10952.75	8886.56	8887.76	9758.64	6967.95	6873.97	7926.96	7929.72	6742.54	7042.35	6872.62	8029.71	9258.71	125899.20	8393.28
Average	741.03	906-38	912.73	740.55	740.65	813.22	580.66	572.83	85-099	660.81	161.88	586.86	572.72	669.14	771.56	10491.60	77 669

IV-3 Monthly Available Discharge for Power at El Siete No. 1 Power Station

1972         1974         1975         1976         1979         1980         1981         1982         1982         1982         1984         705-06           674,07         414,92         632.03         542.18         1973         440.24         390.74         334.65         410.34         562.86         115.36         642.88         7750.09         516.67           591,72         444.92         623.05         540.35         340.35         346.27         334.65         410.34         562.86         115.36         642.88         7750.09         516.75           591,72         447.89         623.26         599.42         400.35         346.17         334.95         367.0         466.58         511.17         473.98         529.05         516.28         517.0         50.34         517.0         517.0         466.38         511.17         473.0         659.38         517.0         517.0         466.38         511.17         473.0         659.38         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0         517.0 <td< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>_</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></td<>									_									
441,492         622.65         582.05         542.30         601,43         390.07         441.94         390.74         534.65         410.34         562.86         315.35         642.88         7750.09           447.89         625.25         599.92         420.33         308.81         326.61         262.23         436.27         331.95         540.34         270.53         514.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         6531.36         653	1969 1970 197		197	2	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Total	Average
437.89         625.26         599.26         430.35         308.81         326.61         262.23         436.27         331.95         540.34         270.53         14.36         6551.36           654.81         642.64         598.76         522.05         314.87         397.27         388.55         367.70         466.58         511.17         453.98         522.05         7522.05           702.90         623.98         672.63         561.63         397.27         388.55         367.70         466.58         611.67         478.16         8653.36           702.90         623.98         672.63         591.67         797.21         690.36         642.23         570.50         692.76         478.16         8653.36         778.20         867.63         877.20         877.20         877.20         877.20         877.20         877.30         877.30         877.20         877.20         877.20         877.20         877.20         877.30         877.30         877.30         877.30         877.30         877.30         877.31         877.31         877.31         877.31         877.41         877.31         877.41         877.41         877.41         877.41         877.41         877.32         877.32         877.32	530.76 665.56 674		7.29	2.07	414.92	632.05	542.30	601.43	390.03	76-177	390.74	534.65	410.34	562.86	315.56	642,88	7750.09	516.67
654.81         642.64         598.76         348.87         347.70         466.58         511.17         453.98         529.02         7532.05           702.90         622.98         672.63         361.33         349.82         390.57         491.49         425.52         507.87         608.58         659.45         478.16         8653.36           702.90         622.98         612.63         561.33         349.82         590.57         491.49         425.52         507.87         608.58         659.45         478.16         8653.36           701.98         621.63         608.43         709.68         675.63         672.01         611.95         606.86         691.62         577.92         9756.36           623.66         652.11         674.03         666.11         601.83         608.43         709.68         677.63         570.50         662.78         691.62         577.29         744.02         978.43           660.24         671.79         702.44         671.79         703.46         577.28         750.80         389.87         593.65         621.75         499.74         519.98         682.75         974.12           702.51         671.79         703.44         703.13         766.83 <td>453.17 411.95 59</td> <td></td> <td>59</td> <td>1.72</td> <td>447.89</td> <td>625.26</td> <td></td> <td>430.35</td> <td>308.81</td> <td>326.61</td> <td>262.23</td> <td>436.27</td> <td>331.95</td> <td>540.34</td> <td>270.53</td> <td>514.36</td> <td>6551.36</td> <td>436.76</td>	453.17 411.95 59		59	1.72	447.89	625.26		430.35	308.81	326.61	262.23	436.27	331.95	540.34	270.53	514.36	6551.36	436.76
702.90         623.98         672.63         561.33         349.82         580.57         491.49         425.52         507.87         668.78         659.45         478.16         8653.36           701.98         621.85         693.81         589.44         607.77         737.21         650.36         642.23         570.50         662.78         691.62         567.92         9798.48           629.66         652.11         674.03         666.11         601.83         608.43         709.68         675.63         622.01         611.95         606.86         691.28         9756.36           623.49         674.17         704.45         570.80         595.67         529.67         667.65         552.64         559.61         610.95         444.02         9756.36           660.24         673.14         677.79         702.81         667.47         593.65         525.64         559.67         499.74         449.74         444.02         9756.36           660.24         673.18         656.85         389.87         593.65         525.64         559.08         662.76         661.27         444.02         9756.36           702.51         677.79         773.64         589.25         492.54         487.98<	565.07 573.46 55		55	1.12	18.459	642.64		522.05	314.87	397.27	388.55	367.70	466.58	511.17	453.98	529.02	7532.05	502.14
701.98         621.85         693.81         589.44         607.77         737.21         650.36         642.23         570.50         662.78         691.62         567.92         9798.48           629.66         652.11         674.03         666.11         601.83         608.43         709.68         675.63         622.01         611.95         606.86         691.28         9756.36           631.49         674.17         704.45         570.80         595.67         529.87         667.65         525.64         559.61         600.64         680.55         744.02         9756.36           660.24         651.16         724.70         371.38         652.68         399.87         593.65         621.75         499.74         519.98         686.39         744.02         9107.05           702.51         651.16         724.70         371.38         652.68         399.87         593.65         621.75         499.74         519.98         688.23         774.02         9107.05           702.51         651.16         703.36         656.85         396.36         621.75         499.74         519.98         688.27         667.67         910.76           702.51         651.84         691.36         656.85 </td <td>680.37 642.50 66</td> <td></td> <td>9</td> <td>8.19</td> <td>702.90</td> <td>623.98</td> <td></td> <td>561.33</td> <td>349.82</td> <td>580.57</td> <td>491.49</td> <td>425.52</td> <td>507.87</td> <td>608.58</td> <td>659.45</td> <td>478.16</td> <td>8653.36</td> <td>576.89</td>	680.37 642.50 66		9	8.19	702.90	623.98		561.33	349.82	580.57	491.49	425.52	507.87	608.58	659.45	478.16	8653.36	576.89
623-66         652.11         674.03         666.11         601.83         608.43         709.68         675.63         622.01         611.95         606.86         691.28         9756.36           631.49         674.17         704.45         570.80         595.67         529.87         667.65         525.64         559.61         600.64         680.55         744.02         9241.27           660.24         651.16         724.70         371.38         652.68         389.87         593.65         621.75         499.74         519.98         698.23         667.20         9107.05           702.51         677.79         703.36         377.28         56.88         396.87         621.75         499.74         519.98         682.76         864.97         8767.41           702.51         677.79         703.36         656.85         396.35         672.97         543.46         553.01         708.74         616.97         9766.62           714.75         773.6         689.50         624.14         709.71         666.81         732.28         571.73         706.73         495.09         668.59         614.32         671.48         592.22         683.43         406.92         668.33         107.05         671.4	643.11 697.72 72		72	91.0	701.98	621.85		589.44	607.77	737.21	650.36	642.23	570.50	662.78	691.62	567.92	9798.48	653.23
650.24         674.17         704.45         570.80         595.67         525.64         525.64         559.61         600.64         680.55         744.02         9241.27           660.24         651.16         724.70         371.38         652.68         389.87         593.65         621.75         499.74         519.98         698.23         667.20         9107.05           702.51         677.79         703.36         313.09         484.37         500.39         656.85         396.36         492.54         487.98         682.76         684.97         776.41           714.76         677.75         733.68         577.28         726.01         646.86         643.52         572.97         543.46         553.01         708.74         616.97         9766.62           695.06         651.84         689.50         624.14         709.71         666.81         732.28         571.73         706.72         495.09         668.53         611.74         9772.17           657.59         496.80         711.00         526.67         603.36         620.38         651.48         532.22         683.43         406.92         668.53         644.33         9118.50           7613.81         7627.40         6046.1	612.70 705.81 68		-8	8.27	629.66	652.11		11.999	601.83	608.43	89.607	675.63	622.01	611.95	98.909	691.28	9756.36	650.42
660.24         651.16         724.70         371.38         652.68         389.87         593.65         621.75         499.74         519.98         698.23         667.20         9107.05           702.51         677.79         703.36         313.09         484.37         500.39         656.85         396.36         492.54         487.98         662.76         684.97         8767.41           714.76         677.75         733.68         577.28         726.01         648.66         643.52         572.97         543.46         553.01         708.74         616.97         9766.62           695.06         651.84         689.50         624.14         709.71         666.81         732.28         571.73         706.73         495.09         668.59         611.74         9772.17           657.59         496.80         711.00         526.67         603.36         620.38         651.48         592.22         683.43         406.92         668.53         611.74         9772.17           7613.81         7627.40         8048.14         6354.07         6344.93         6448.01         6838.48         6392.67         6394.76         6561.30         7105.40         7392.85         105819.72           634.48	432.51 650.60 67		- 6	3.60	631.49	674.17		570.80	595.67	529.87	667.65	525.64	559.61	99.009	680.55	744.02	9241.27	80.919
702.51         677.75         703.36         313.09         484.37         500.39         656.85         396.36         492.54         487.98         682.76         684.97         677.41           714.76         677.75         733.68         577.28         726.01         648.66         643.52         572.97         543.46         553.01         708.74         616.97         9766.62           695.06         651.84         689.50         624.14         709.71         666.81         732.28         571.73         706.73         495.09         668.59         611.74         9772.17           657.59         496.80         711.00         526.67         603.36         620.38         651.48         592.22         683.43         406.92         668.53         644.33         9118.50           7613.81         7613.81         7613.81         6344.93         6448.01         6838.48         6362.67         6394.76         6561.30         7105.40         7392.85         105819.72         7           634.48         635.62         670.68         529.51         528.74         530.22         532.90         546.78         592.12         616.07         8818.31	618.56 714.24 72		72	13.67	92-099	651.16		371.38	652.68	389.87	593.65	621.75	42.667	519.98	698.23	667.20	9107.05	616.08
714.76         677.75         733.68         577.28         726.01         648.56         643.52         572.97         543.46         553.01         708.74         616.97         9766.62           695.06         651.84         689.50         624.14         709.71         666.81         732.28         571.73         706.73         495.09         668.59         611.74         9772.17           657.59         496.80         711.00         526.67         603.36         620.38         651.48         592.22         683.43         406.92         668.53         644.33         9118.50           7613.81         7613.81         7627.40         6344.93         6448.01         6838.48         6382.67         6394.76         6561.30         7105.40         7392.85         105819.72           634.48         535.62         670.68         529.51         528.74         537.33         569.87         530.22         532.90         546.78         592.12         616.07         8818.31	639.22 659.46 68	·	-89	5.76	702.51	677.79		313.09	484.37	500.39	656.85	396.36	492.54	86.784	682.76	684.97	8767.41	607.14
695.06 651.84 689.50 624.14 709.71 666.81 732.28 571.73 706.72 495.09 668.59 611.74 9772.17 657.59 496.80 711.00 526.67 603.36 620.38 651.48 592.22 683.43 406.92 668.53 644.33 9118.50 7613.81 7627.40 8048.14 6354.07 6344.93 6448.01 6838.48 6362.67 6394.76 6561.30 7105.40 7392.85 105819.72 7 634.48 635.62 670.68 529.51 528.74 537.33 569.87 530.22 532.90 546.78 592.12 616.07 8818.31	664.70 720.11 6	·	خة -	65.00	714.76	677.75		577.28	726.01	99.879	643,52	572.97	543.46	553.01	708.74	26.919	9766.62	584.49
657.59 496.80 711.00 526.67 603.36 620.38 651.48 592.22 683.43 406.92 668.53 644.33 9118.50 7613.81 7627.40 8048.14 6354.07 6344.93 6448.01 6838.48 6362.67 6394.76 6561.30 7105.40 7392.85 105819.72 7 634.48 635.62 670.68 529.51 528.74 537.33 569.87 530.22 532.90 546.78 592.12 616.07 8818.31	616.52 671.46 6		<u> </u>	26.09	90.269	651.84		624.14	17.607	18.999	732.28	571.73	706.73	60.264	658.59	611.74	9772.17	651.48
7613.81 7627.40 8048.14 6354.07 6344.93 6448.01 6838.48 6362.67 6394.76 6561.30 7105.40 7392.85 105819.72 7 634.48 635.62 670.68 529.51 528.74 537.33 569.87 530.22 532.90 546.78 592.12 616.07 8818.31	586.08 717.41 5		<u> </u>	52.30	65.759	08-967	711.00	526.67	603.36	620.38	651.48	592.22	683.43	406.92	658.53	644.33	9118.50	607.90
634.48 635.62 670.68 529.51 528.74 537.33 569.87 530.22 532.90 546.78 592.12 616.07 8818.31	Total 7042.77 7830.28 7	<del> </del>		354.85		7627.40	8048 14	6354.07	6344.93	10.8779	6838.48	6362.67	6394.76	6561.30	7105.40	7392.85		7054.64
	586.90 652.52 6			54.57	634.48	635.62	89.079	529.51	528.74	537.33	269.87		532.90	546.78	592.12	20.919	8818.31	587.89

IV-4 Monthly Firm Discharge for Power at El Siere No. 1 Power Station

Year																	
Month	1965	1970	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	7861	Total	Average
Jan	377.46	381.30	381.30	370.13	381.30	381.29	381.30	373.95	380.38	364.48	381.30	370.96	380,30	315.64	381.30	5602.39	373.49
Feb	342.87	344.18	356.70	331.69	344.40	344.40	356.70	307.75	321.34	262.28	356.70	320.47	344.40	270.87	356.70	4961.45	330.76
Yar	381.30	379.07	381.30	381.30	381.30	381,30	380.31	311.51	356.24	358.88	355.98	377.64	381.30	365.87	381.30	5554.60	370,31
Apr	369.00	369.00	369.00	369.00	369.00	369.00	369.00	321.17	369.00	367.39	357.55	367.62	369.00	369.00	368.16	68-1755	364.79
Masy	381,30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	381.30	5719.50	381,30
Jun	369.00	369.00	369.00	369.00	369.00	369.00	369.00	369:00	369,00	369.00	369.00	369,00	369.00	369.00	369.00	5535.00	369,00
Jul	371.41	381.30	381.30	381.30	381,30	381.30	381.30	381.30	381,30	381,30	381.30	381.30	380.83	381.30	381.30	5709.14	380,61
Aug	381.30	381.30	381.30	381.30	381.30	381.30	345.32	381.30	363.32	381.30	381.30	380.85	377.34	381.30	381.30	5661-13	377.41
Sep	369.00	369.00	369.00	369.00	369.00	369.00	297.06	369.00	368,70	369.00	355.08	369.00	366.81	369.00	369.00	5446.65	363.11
ő	381.30	381.30	381.30	381.30	381.30	381.30	379.25	381.30	381,30	381.30	381.30	380.85	381.30	381.30	381.30	5717.00	381.13
Nov	369.00	369.00	369.00	369.00	369.00	369.00	369.00	369.00	369.00	369.00	369.00	369.00	368.81	369.00	369.00	5534.81	368.99
ğ	381.30	381.30	381.30	381.30	380.20	381.30	381.30	381.30	381,30	381.30	381.30	381.30	375.52	381.30	381.30	5712,62	380.84
Total	4474.24	4487.05	4501.8	4465.62	04.8844	67.6857	4390.84	4327.88	4422.18	4366.53	4451.11	67.6777	16-575	4334.88	96"0057	66625.89	4441.72
Average	372.85	373.92	375.15	372.14	374.03	374.12	365.9	360.66	368,52	363.88	370.93	370.77	372.99	361.22	375.08	5552.16	370.14
									Ī								

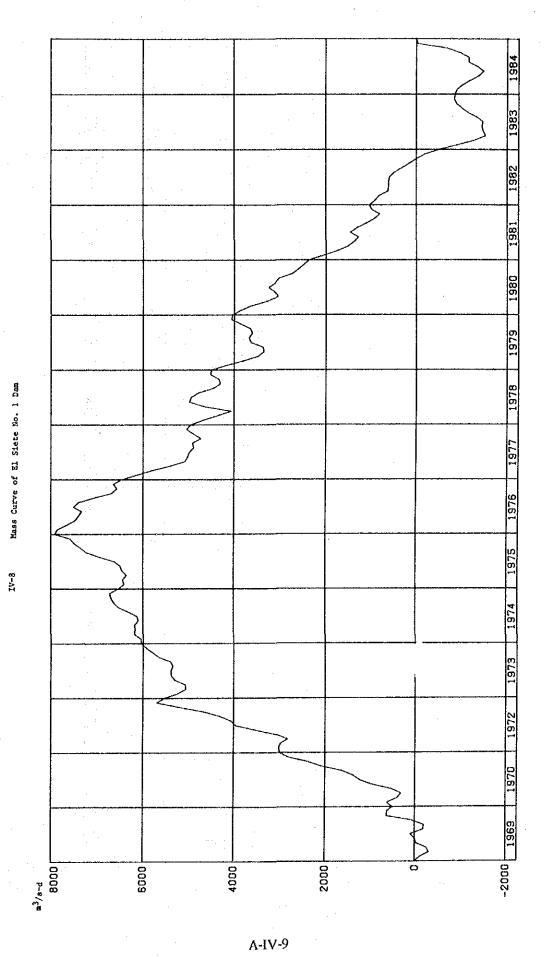
Year																	
Month	1969	1970	1972	1973	1974	1975	9761	1977	1978	1979	1980	1981	1982	1983	1984	Total	Average
Jan	96.54	133.06	118.99	67.39	117.60	94.46	107.92	63.35	71.80	97.69	86.93	99-99	96.14	51.20	109.50	1345.18	79.68
Feb	73.69	66-95	102.26	75.11	126.69	109.66	75.11	50.08	53.02	42.60	70.93	53.91	90.63	43.92	88.23	1122.79	74.85
Mar	123.31	103.03	89.72	117.36	112.66	101.85	84.92	51.13	67.14	63.08	59.70	. 75.82	83.09	73.86	88.88	1295.55	86.37
Apr	149.33	146.88	151.89	150.54	114.00	128.33	100.15	56.79	205.27	92.23	73.25	90.02	110.30	121.01	80,78	77.0771	118.05
May	119.63	186.14	188.79	127.99	103.17	121.15	104.35	106.75	169.53	118.84	126.33	98.01	114.95	119.81	97.19	1902.63	126.84
Jun	127.70	155.92	184.27	112.91	116.16	132.63	140.04	105.31	106.43	155.23	133.30	141.02	109.12	107.75	134.22	1962,01	130.80
Jaj	70.27	139.24	130.90	109.03	147.44	166.95	98.07	99.87	98 06	121.77	93.47	92.99	64.66	136.44	147.79	1742.08	116-13
2my	113.78	155.48	154.17	123.52	150.46	162.95	60.30	120.44	63.31	104.27	103.31	81.23	87.85	147.98	113.83	1742.88	116.19
Şeb	153.75	187.60	167.63	154.09	127.71	132.44	50.84	80.58	87.07	118.57	64.38	82.71	10.28	134.61	142.03	1769.02	117.93
oct.	206-83	162.28	206.79	136.88	124.46	138.09	98.42	142.71	121.87	148.62	93.28	96.93	96.68	135.04	163.53	2065.69	137.71
Nov	110.73	182.78	192.39	134.74	115.87	126.11	123.17	137.45	16.041	146.25	93.06	141,02	82.50	119.07	217.25	2063.30	137.55
Dec	97.66	146-00	89.83	132.78	86.31	169.13	87.65	101.19	112.14	112.17	96.43	122.64	66.05	112.47	119.56	1652.01	110.13
Total	Total 1443.22	1765.36	1777.63	1442.34	1442.53	1583.95	1130.94	1115.65	1286.55	1287.07	1094.37	1142.96	1115.39	1303.16	1502.79	20433.91	1362.26
Average	120.27	147-11	148.14	120.20	120.21	132.00	94.25	92.97	107.21	107.26	91.20	95.25	92.95	108.86	125.23	1702.83	113.52

Note: Above inflow represents the inflow from remaining catchment area of No.1 Dam.

IV-6 Monthly Available Discharge for Power at El Siete No. 2 Power Station

Total         1970         1971         1970         1970         1970         1980         1980         1970         1980         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970         1970 <t< th=""><th>Γ</th><th>···</th><th></th><th>·</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>	Γ	···		·												
1966   1970   1972   1972   1974   1975   1976   1977   1978   1978   1979   1960   1961   1962   1962   1963   1964   77   1966   1970   1972   1972   1974   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   1975   19		Average	26"765	503.84	579.60	629.79	744.87	739.67	704.51	693.37	99-999	742.27	740-46	695.94	96.2908	672-16
1969   1970   1972   1973   1974   1975   1976   1977   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978   1978		Total	8924.53	7557.54	8693.96	9896.93	11173.06	11095.06	10567.68	10400.53	96*6666	11134.06	11106.98	10439.18	120989,47	10082,46
1956         1970         1972         1973         1974         1975         1975         1977         1978         1978         1978         1979         1980         1981         1982           612.36         757.62         766.34         482.31         721.20         627.18         690.84         453.38         513.69         454.18         620.26         476.57         646.37           525.86         478.90         673.71         518.90         709.26         683.70         500.07         358.89         379.63         304.83         585.48         620.26         476.57         646.37           550.37         657.22         653.24         77.53         733.71         687.64         604.69         366.00         461.37         451.63         586.38         695.42         676.43         451.65         581.65         676.48         676.60         461.37         461.63         566.30         461.37         451.63         566.30         461.97         461.63         756.83         385.48         693.54         695.62         776.83         776.83         776.83         776.83         776.83         776.83         776.83         776.83         776.83         776.83         776.83         776.83         776.8		1984	735.47	595.26	612.62	554.98	655.80	781.28	837.02	760-10	774.80	709.28	701-74	734.14	8452,49	704.37
612.36         1970         1972         1974         1975         1976         1976         1977         1976         1977         1976         1977         1976         1977         1976         1977         1976         1977         1976         1979         1979         1976         1977         1978         1979         1979         1980         1981           525.86         757.62         766.34         482.31         721.20         627.18         690.84         453.38         513.69         454.18         620.26         476.57           525.86         478.90         673.71         518.90         709.26         683.70         500.07         358.89         379.63         304.83         506.38         451.69         451.67         451.63         451.69         451.77         451.63         451.69         451.67         451.63         451.69         451.63         451.63         451.69         451.63         451.69         451.63         366.03         366.03         366.03         461.37         451.63         451.16         451.16         451.63         451.63         451.63         451.63         451.63         451.63         451.63         451.63         461.63         461.63         461.63 <td< th=""><th></th><td>1983.</td><td>366.76</td><td>314,45</td><td>523.84</td><td>749.23</td><td>784.62</td><td>695.47</td><td>773.47</td><td>791.23</td><td>772.76</td><td>801.74</td><td>7.58.59</td><td>761.53</td><td>8093.69</td><td>674.47</td></td<>		1983.	366.76	314,45	523.84	749.23	784.62	695.47	773.47	791.23	772.76	801.74	7.58.59	761.53	8093.69	674.47
1969         1970         1972         1974         1975         1976         1977         1978         1979         1980           612.36         757.62         766.34         482.31         721.20         627.18         690.84         453.38         513.69         454.18         620.26           525.86         478.90         673.71         518.90         709.26         683.70         500.07         358.89         379.63         304.83         506.38           650.37         657.22         673.71         518.90         709.26         683.70         500.07         358.89         379.63         454.18         650.38           650.37         657.22         637.22         777.53         733.71         687.64         604.69         366.00         461.37         451.63         467.89           770.37         730.73         758.11         764.03         764.63         764.63         764.63         764.63         764.63         764.63         764.63         764.69         766.05         769.68         765.63           770.37         730.72         719.18         741.45         764.03         756.11         691.57         769.68         769.53           501.69         743.24		1982	646.37	622.22	593.54	695.42	755.78	76.869	10.889	599.83	562.77	96-669	572.66	472.97	7548.50	629.04
1969         1970         1972         1973         1974         1975         1976         1977         1978         1979         1979           612.36         757.62         766.34         482.31         721.20         627.18         690.84         453.38         513.69         454.18           525.86         478.90         673.71         518.90         709.26         683.70         500.07         358.89         379.63         304.83           650.37         650.37         635.24         747.53         733.71         687.64         604.69         366.00         461.37         451.63           770.37         736.11         792.90         711.93         762.63         644.89         406.61         670.57         568.88           770.37         736.11         687.64         604.69         366.61         751.63         304.83           770.37         736.11         792.90         711.93         762.63         644.89         406.61         670.57         568.88           770.37         813.18         794.98         714.34         786.81         680.37         769.68         830.21         742.82           891.69         749.46         775.76         773.74         <		1981	75.974	385.48	541.16	586.34	658.83	711.65	645.91	579.61	571.10	625.52	796.73	776.43	7355.33	612.94
1969         1970         1972         1973         1974         1975         1975         1975         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1978         1979 <th< th=""><th></th><td>1980</td><td>620.26</td><td>506.38</td><td>427 40</td><td>493.34</td><td>734.33</td><td>765.63</td><td>610.11</td><td>713.16</td><td>460-74</td><td>660.93</td><td>660.31</td><td>683.57</td><td>7336.16</td><td>611.35</td></th<>		1980	620.26	506.38	427 40	493.34	734.33	765.63	610.11	713.16	460-74	660.93	660.31	683.57	7336.16	611.35
1969         1970         1972         1974         1974         1975         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977         1977 <th< th=""><th></th><td>1979</td><td>454.18</td><td>304.83</td><td>451-63</td><td>568.88</td><td>742.82</td><td>89 662</td><td>260.08</td><td>684.71</td><td>746.85</td><td>736.46</td><td>822.28</td><td>744.01</td><td>7816.41</td><td>651.37</td></th<>		1979	454.18	304.83	451-63	568.88	742.82	89 662	260.08	684.71	746.85	736.46	822.28	744.01	7816.41	651.37
1969         1970         1972         1973         1974         1975         1976           612.36         757.62         766.34         482.31         721.20         627.18         690.84           525.86         478.90         673.71         518.90         709.26         683.70         500.07           525.86         478.90         673.71         518.90         709.26         683.70         500.07           650.37         650.37         635.24         747.53         733.71         687.64         604.69           770.37         730.73         758.11         792.90         711.93         762.63         644.89           770.37         730.72         813.18         794.98         714.34         786.81         680.73           735.23         790.72         813.18         794.98         714.34         786.81         680.73           708.41         807.24         816.67         710.18         744.36         764.03         756.11           708.41         807.24         755.76         751.33         742.37         817.70         431.30           728.20         765.27         755.76         755.70         767.79         779.50         713.45		1978	513.69	379.63	461.37	670.57	830.21	696.52	614.90	452.88	578.15	741.66	756.16	710.81	7406.55	617.21
1969         1970         1972         1973         1974         1975           612.36         757.62         766.34         482.31         721.20         627.18           525.86         478.90         673.71         518.90         709.26         683.70           650.37         657.22         635.24         747.53         733.71         687.64           770.37         730.73         738.11         792.90         711.93         762.63           735.23         790.72         813.18         794.98         714.45         764.03           899.44         795.81         778.27         719.18         741.45         764.03           801.69         743.22         766.42         720.93         767.17         797.45           708.41         807.24         816.67         751.33         742.37         817.70           728.20         749.46         775.76         792.51         767.79         793.36           757.70         813.11         758.00         807.70         770.75         826.68           706.52         761.46         750.97         785.06         741.84         779.50           673.12         810.41         638.89         749.82<		1977	453.38	358.89	366.00	19-907	89.769	691.57	684.93	743.99	561.99	10.618	799.71	694.33	7275.09	606.26
1969         1970         1972         1973         1974           612.36         757.62         766.34         482.31         721.20           525.86         478.90         673.71         518.90         709.26           650.37         657.22         635.24         747.53         733.71           770.37         730.73         758.11         792.90         711.93           735.23         790.72         813.18         794.98         714.34           699.44         795.81         778.27         719.18         741.45           501.69         743.22         766.42         720.93         767.17           708.41         807.24         816.67         751.33         742.37           728.20         749.46         775.76         792.51         767.79           706.52         761.46         750.97         785.06         741.84           673.12         810.41         638.89         749.82         573.21           8669.27         8895.90         89311.56         8663.15         8695.02         9           8663.15         8663.15         8663.15         8695.02         9		1976	78*069	500.07	697,09	68**799	680.73	756.11	656.37	431.30	363.72	95.599	713.45	611.94	7319.67	609.97
1969         1970         1972         1973           612.36         757.62         766.34         482.31           525.86         478.90         673.71         518.90           650.37         657.22         635.24         747.53           770.37         730.73         758.11         792.90           735.23         790.72         813.18         794.98           699.44         795.81         778.27         719.18           501.69         743.22         766.42         720.93           708.41         807.24         816.67         751.33           728.20         749.46         775.76         792.51           757.70         813.11         758.00         807.70           706.52         761.46         750.97         785.06           673.12         810.41         638.89         749.82           673.12         810.41         638.89         749.82           8663.15         8         652.44         741.33           744.30         721.93         744.30         721.93		1975	627.18	683.70	687.64	762.63	786.81	764.03	797.45	817.70	793.36	826.68	779.50	804.00	9130.68	760.89
612.36 1970 1972 612.36 757.62 766.34 525.86 478.90 673.71 650.37 657.22 635.24 770.37 730.73 738.11 735.23 790.72 813.18 699.44 795.81 778.27 501.69 743.22 766.42 708.41 807.24 816.67 728.20 749.46 775.76 728.20 749.46 775.76 757.70 813.11 758.00 766.52 761.46 750.97 673.12 810.41 638.89		1974	721.20	709.26	733.71	711.93	714.34	741.45	767-117	742.37	767.79	770.75	741.84	573.21	8695.02	724.59
612.36 757.62 525.86 478.90 650.37 657.22 770.37 730.73 735.23 790.72 699.44 795.81 501.69 743.22 708.41 807.24 728.20 749.46 757.70 813.11 706.52 761.46 673.12 810.41		1973	482.31	518.90	747.53	792.90	86.467	719.18	720.93	751.33	792.51	807.70	785.06	749.82	8663.15	721.93
1969 612.36 525.86 650.37 770.37 735.23 699.44 501.69 708.41 728.20 757.70 706.52 673.12 673.12		1972	766.34	673.71	635.24	758.11	813.18	778.27	766.42	816.67	775.76	758.00	750.97	638.89	8931.56	744-30
		1970	757-62	478.90	657.22	730.73	790.72	795.81	743.22	807.24	749.46	813.11	761.46	810.41	8895.90	741.33
Year  Sonth  Jan  Hay  Jun  Jul  Aug  Sop  Oct  Nov  Dec		1969	612.36	525.86	650.37	770.37	735.23	77.669	501.69	708.41	728.20	757.70	706.52	673.12		
	Year	Month	Jan	Feb	Mar	Apr	Kay	Jun	Jul	Aug	Sep	Ö	Nov	Dec	Total	Average

Year																		
Month	1969	1970	1972	1973	1974	1975	1976	1977	1978	6261	1980	1861	1982	1983	1984	Total	Average	
Jan	438.72	443.18	443.18	430.20	443.18	443.17	443.18	434.64	442.12	453.64	443.18	431.17	442.02	366.87	443.18	6511.63	434.10	
Peb	398.52	<b>400.00</b>	414.59	385.52	400.30	06.004	414.59	357.70	373.49	304.85	414.59	372.48	06-004	314.50	414.59	5766.36	384.42	
Max	443.18	440.59	443.18	443.18	443.18	443.18	442.03	362.07	414.06	417.13	413.76	438.93	443.18	425.25	443.18	6456.08	430.40	
Apr	428.89	428.89	428.89	428.89	428.89	428.89	428.89	373.30	428.89	427.02	415.58	427 - 28	428.89	428.89	427.91	6359.99	453.99	
Мау	443.18	443.18	443.18	443.18	443.18	443.18	443.18	443.18	443.18	443-18	443.18	443.18	443.18	81.679	443.18	6647.70	443.18	
Jun	428.89	428.89	428.89	423.89	428.89	428.89	428.89	428.89	428.89	428.89	428.89	428.89	428.89	428.89	428.89	6433.35	428.89	
Jul	431.69	443.18	443.18	443.18	81.677	443.18	443.18	443.18	443.18	443.18	443.18	443.18	442.64	443.18	443.18	6635-67	442.37	
Aug	443.18	443.18	443.18	443.18	443.18	443.18	401.37	443.18	422.29	443.18	443.18	442.56	438.58	443.18	443.18	6579.88	438.65	
Sep	428.89	428.89	428.89	428.89	68.827	428.89	345.27	428.89	428.54	428.89	412.71	428.89	426.34	428-89	428.89	6330.65	422.04	. :
Oct	443.18	443.18	443.18	443.18	443.18	443.18	08.077	443.18	443.18	443.18	443.18	442.66	443.18	443.18	443.18	6644.80	442,98	
Nov	428-89	428.89	428.89	428.89	428.89	428.89	428.89	68.825	428.89	428.89	428.89	428.89	428.67	428-89	428.89	6433.13	428.87	
Dec	443.18	443.18	443.18	443.18	441.91	443.18	443.18	443.18	443.18	443.18	443.18	443.18	436.47	443-18	443.18	6639.72	442.64	
Total	5200.39	5215.27	5232.41	5190,36	5216.85	5218.11	5103.45	5030.28	5139.89	5075.21	5173.50	5171.39	5202.34	5038-08	5231.43	96*887//	5162.59	
Average	433.37	434.61	436.03	432.53	434.74	434.84	425.29	419.19	428.32	422.93	431.13	430.95	433.53	419.84	435.95	6453.25	430.22	



A-IV-10

A-IV-11

# APPENDIX-Y CONVERSION FACTORS BASED ON SHADOW PRICES

- V-1 Calculation of Conversion Factors Based on the Shadow Prices
- V-2 Economic Costs Based on Conversion Factors

## V-l Calculation of Conversion Factors Based on the Shadow Prices

#### 1. Civil Works

(1)	Lobour	Cost

		C.F	Cost	ratio	Remarks
	Urban unskilled labour	0.61	0.287	0.175	
	Rural unskilled labour	0.46	0.287	0.132	
	Semi and technical skilled	0.81	0.213	0.173	
	Academically skilled	0.94	0.213	0.200	
	Average (Total)	0.68	1.000	0.68	
(2)	Materials				
	Cement	0.83	0.808	0.671	
	Steel bars	0.89	0.192	0.171	
	Average (Total)	0.84	1.000	0.842	
(3)	Fue1	3.00	1.000	3.000	
(4)	Transportation	1.09	1.000	1.090	
(5)	Administration and profit	1.00			Standard C.F
(6)	Engineering & administration	1.00			Standard C.F

## 2. Electrical & Mechanical Equipment

## (1) Labour cost

		C.F	Cost	ratio	Remarks
	Semi and technical skilled	0.81	0.560	0.454	
	Academically skilled	0.94	0.440	0.414	
	Average (Total)	0.87	1.000	0.868	
(2)	Transportation	1.09	1.000	1.090	
(3)	Installation materials	0.94	1.000	0.940	
(4)	Engineering & administration	1.00			Standard C.F

## 3. Telecommunication Equipment

#### (1) Labour cost

		C.F	Cost ratio	Remarks
	Semi and Technically skilled	0.81	1.000 0.810	
(2)	Transpotation	1.09	1.000 1.090	

## 4. Transmission Lines

(1) Lahour cost

		C.F	Cost	ratio	Remarks
	Rural unskilled labour	0.46	0.250	0.115	
	Semi and technically skilled	0.81	0.600	0.486	
	Academically skilled	0.94	0.150	0.141	
	Average (Total)	0.742	1.000	0.742	
(2)	Transportation	1.09	1.000	1.090	
(3)	Access road	0.87	1.000	0.870	
(4)	Foundation concrete	0.83	1.000	0.830	•
(5)	Stringing facilities	0.94	1.000	0.940	

## 5. Operation and Maintenance Costs

				r 11	nanciai cost
(1)	Inport duties	(CIF x	0.2)		L.C206
(2)	Local materials	0.94	1.000	0.940	L.C651
(3)	Fue1	3.00	1.000	3.000	L.C109
(4)	Labour cost	0.87	1.000	0.870	L.C1,411

Appendix V-2 Economic Costs Based on Conversion Factors

					and the second		•	
	F.C	1.C	Total	F.C	L.C	Total	кешагка	IT KB
1. Civil Works						n en en en en en en en en en en en en en	٠.	
	· <del></del> -							
(1) CIVIL SCRUCEURE		,	,			1	,	. ,
Labour cost	ı	19,996	19,996	i	13,597	13,597	C H	0.68
Materials	1	65,765	65,765	ı	55,243	55,243	CO	0.84
Construction machinery	21,786	1	21,786	21,786	· J	21,786		
1000		2,323	2,323	.1	696.9	696.9	C.H.	3,00
Admi. and profit	34,502	12,586	47,088	34,502	12,586	47,088		1.00
	(56,288)	(100,670)	(156,958)	(56,288)	(88,395)	(144,683)		
Engineering & Admi.	5,629	10,067	15,696	5,629	10,067	15,696	C.F:	1.00
Sub-total	61,917	110,737	172,654	61,917	98,462	160,379		
		-						
(2) Hydraulic Equipment	13,645	1	13,645	13,645	1	13,645		
Import duties	)	2,481	2,481	ı	0	0		
Transportation	ì	1,240	1,240	ı	1,352	1,352	C. F.	1.09
Labour cost	ı	5,273	5,273	ı	4,429	4,429	CF	78.0
Provisional installation	,	4,394	4,394	1	3,823	3,823	C.F.	0.87
Admi. and profit	,	4,188	4,188	ı	4,188	4,188	C.F.	1.00
	(13,645)	(17,576)	(31,221)	(13,645)	(13,79)	(27,437)		
Engineering & admi.	1,501	666	2,500	1,501	666	2,500	C.F:	1.00
Sub-total	15,146	18,575	33,721	15,146	14,791	29,937		
Total	77,063	129,312	206,375	77,063	113,253	190,316		
2. E and M. Equipment	27,919	ı	27,919	27,919	ł	27,919		
Import duties	1	5,076	5,076	` I	0	0		
Transportation	ı	2,538	2,538	1	2,766	2,766	C.F.	1.09
Labour cost	ł	1,626	1,626	ı	1,416	1,415	C.F:	0.87
Installation materials	ı	1,167	1,167	ı	1,097	1,097	C.F:	0.94
	(27,919)	(10,401)	(38,326)	(27,919)	(5,278)	(33,197)		
Engineering & admi.	1,928	1,265	3,193	1,928	1,265	3,193	C.F:	1.00
Total	29,847	11,672	41,519	29,847	6,543	36,390		

-	F	Financial Cost		Ee3	Economic Cost		,
	F.C	r.c	Total	F.C	סיד	Total	Remarks
	000		000	000			
<ol> <li>refecommunication rquip.</li> </ol>	1,433	 I	1,299	1,4299	,	1,239	
Import duties	ı	236	236	. 1	0	0	
Transportation	ı	29	59	t	79	9	
Labour cost	ı	23	23	ı	17	17	C.F: 0.81
Total	1,299	318	1,617	1,299	81	1,380	
4. Transmission Line	9,199	ı	9,199	9,199	1	9,199	
Import duties	1	1,768	1,768		_	0	
Transportation	1	442	442		482	482	C.F: 1.09
Access road	I.	380	380	1	331	331	
Foundation concrete	1	925	925	1	768	768	
Stringing facilities	525	200	725	525	188	713	C.F: 0.94
Labour cost	1	3,432	3,424	ı	2,534	24.534	
	(6,724)	(7,139)	(16,863)	(6,724)	(4,303)	(14,027)	
Engineering & admi.	778	571	1,349	778	571	1,349	C.F: 1.00
Total	10,502	7,710	18,212	10,502	4,874	15,376	
Grand Total	118,711	149,012	267,723	118,711	124,751	243,462	

