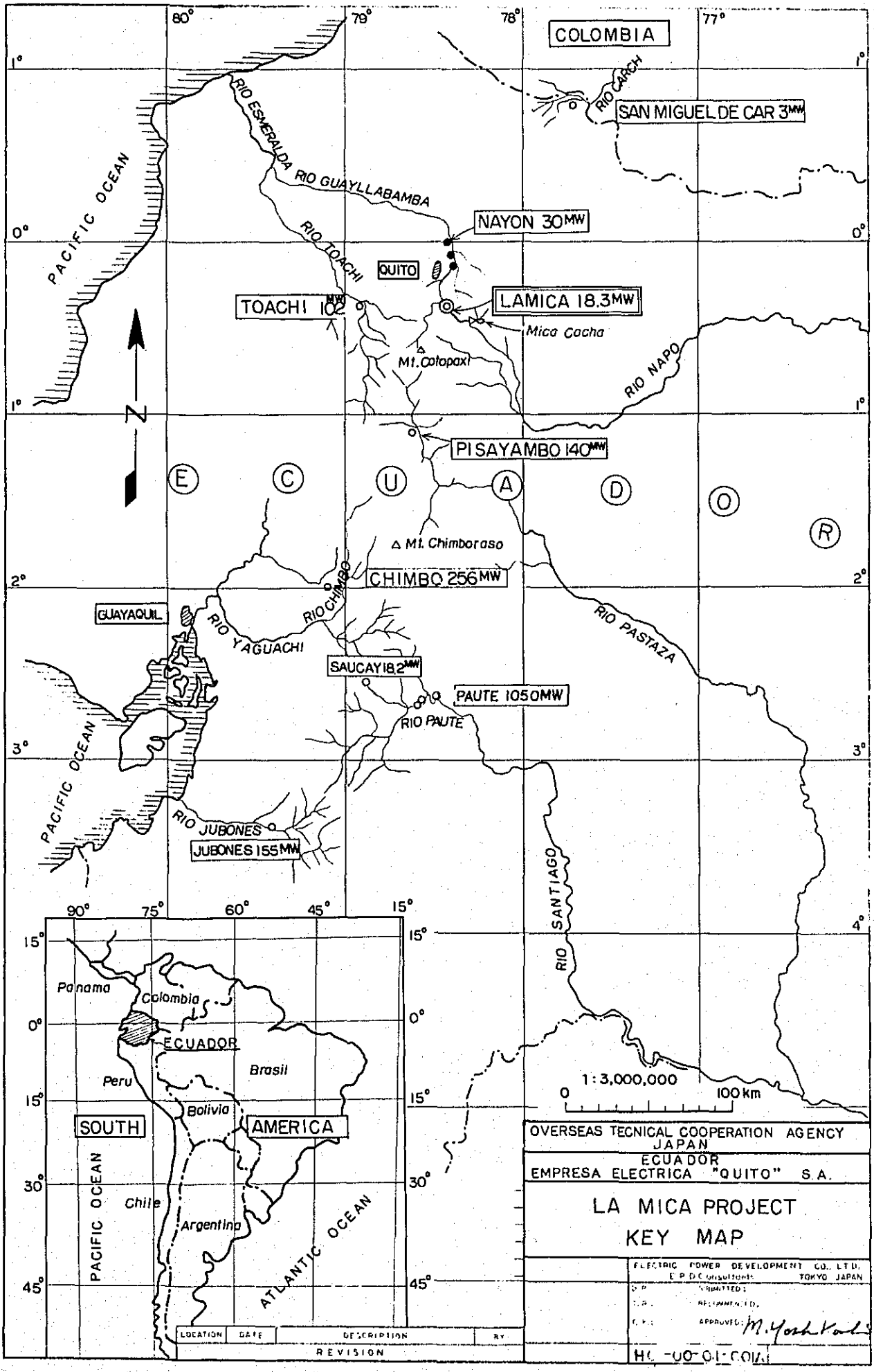
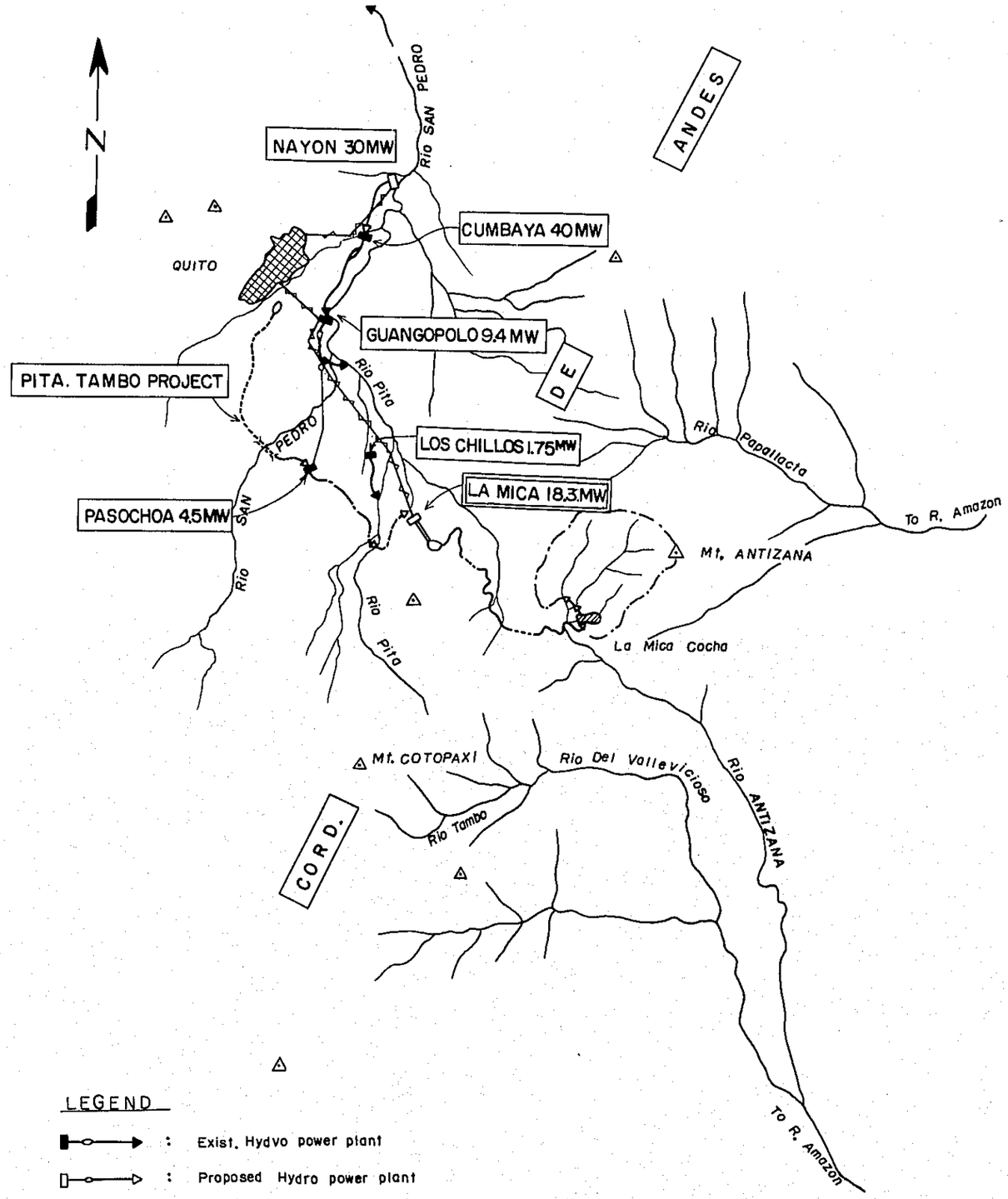
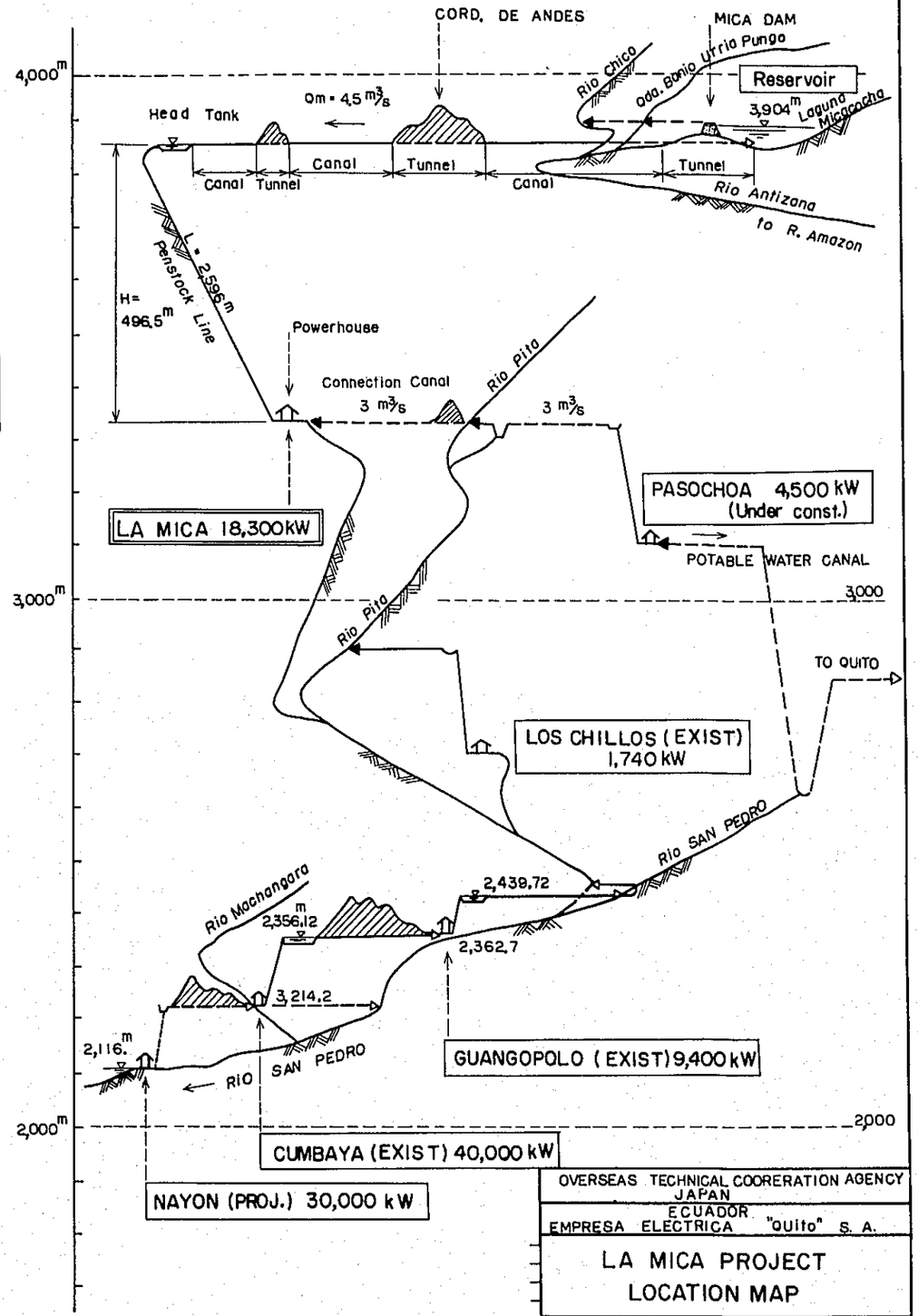
LIST OF DRAWINGS


COLOMBIA
RIO CARCH
SAN MIGUEL DE CAR 3MW
RIO ESMERALDA
RIO GUAYLLABAMBA
NAYON 30MW
PACIFIC OCEAN
RIO TOACHI
QUITO
TOACHI 102MW
LAMICA 18.3MW
Mica Cacha
Mt. Cotopaxi
RIO NAPO
PISAYAMBO 140MW
E C U A D O R
Mt. Chimborazo
CHIMBO 256MW
RIO CHIMBO
GUAYAQUIL
RIO YAGUACHI
RIO PASTAZA
SAUCAY 18.2MW
PAUTE 1050MW
RIO PAUTE
PACIFIC OCEAN
RIO JUBONES
JUBONES 155MW
RIO SANTIAGO
1:3,000,000
0
100 km
Panama
Colombia
ECUADOR
Peru
Brasil
Bolivia
SOUTH AMERICA
Chile
Argentina
PACIFIC OCEAN
ATLANTIC OCEAN
LOCATION
DATE
DESCRIPTION
BY
REVISION
OVERSEAS TECNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.
LA MICA PROJECT
KEY MAP
ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO JAPAN
SUBMITTED
RECOMMENDED
APPROVED
HC-00-01-C01

DRAWING NO. 1





OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "Quito" S. A.

LA MICA PROJECT
LOCATION MAP

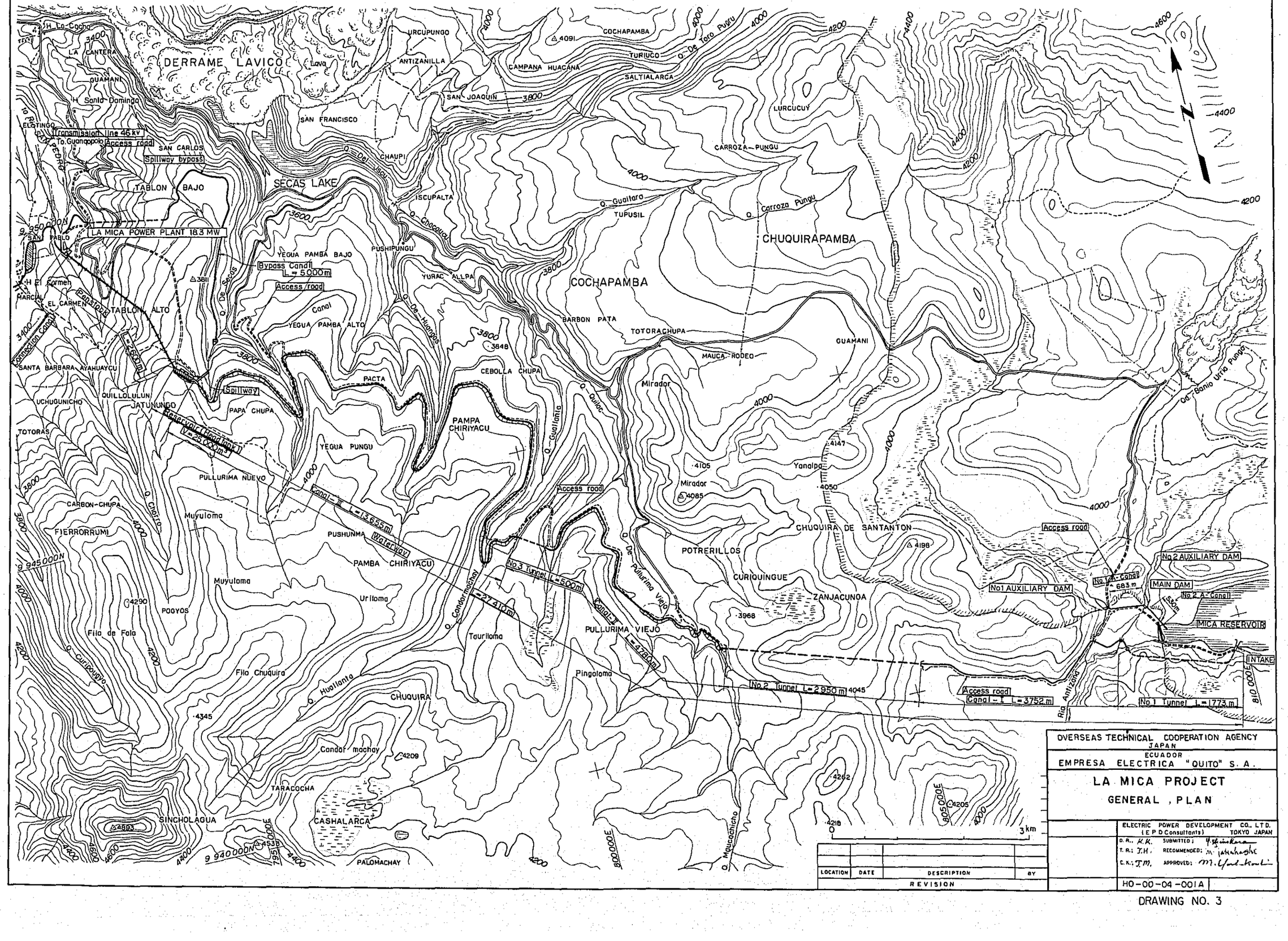
ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D. R.: SUBMITTED:
T. R.: RECOMMENDED:
C. R.: APPROVED: M. Yoshioka

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

HO- 00-00-001A

DRAWING NO. 2



LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN

ECUADOR
EMPRESA ELECTRICA "QUITO" S. A.

LA MICA PROJECT

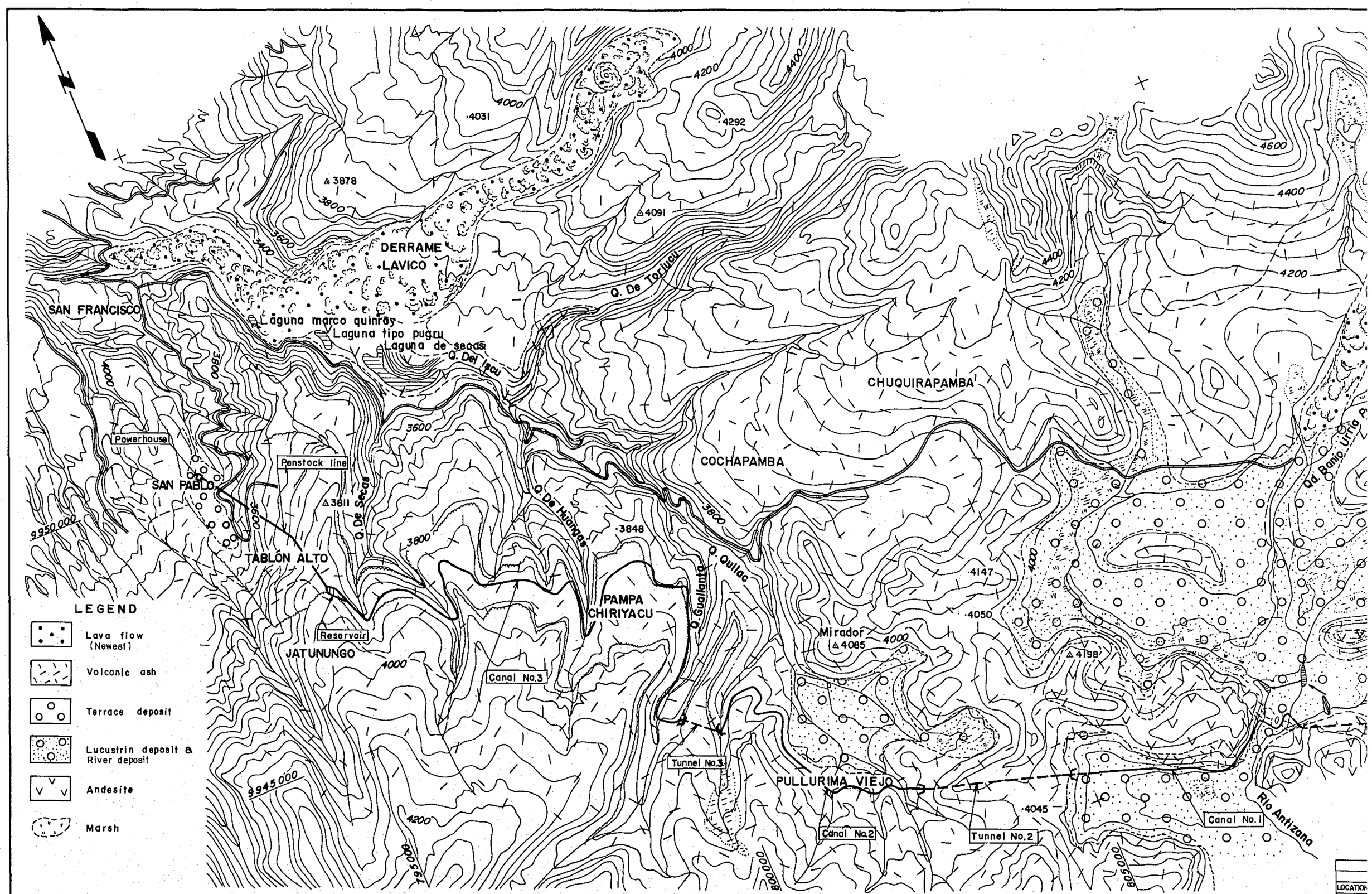
GENERAL , PLAN

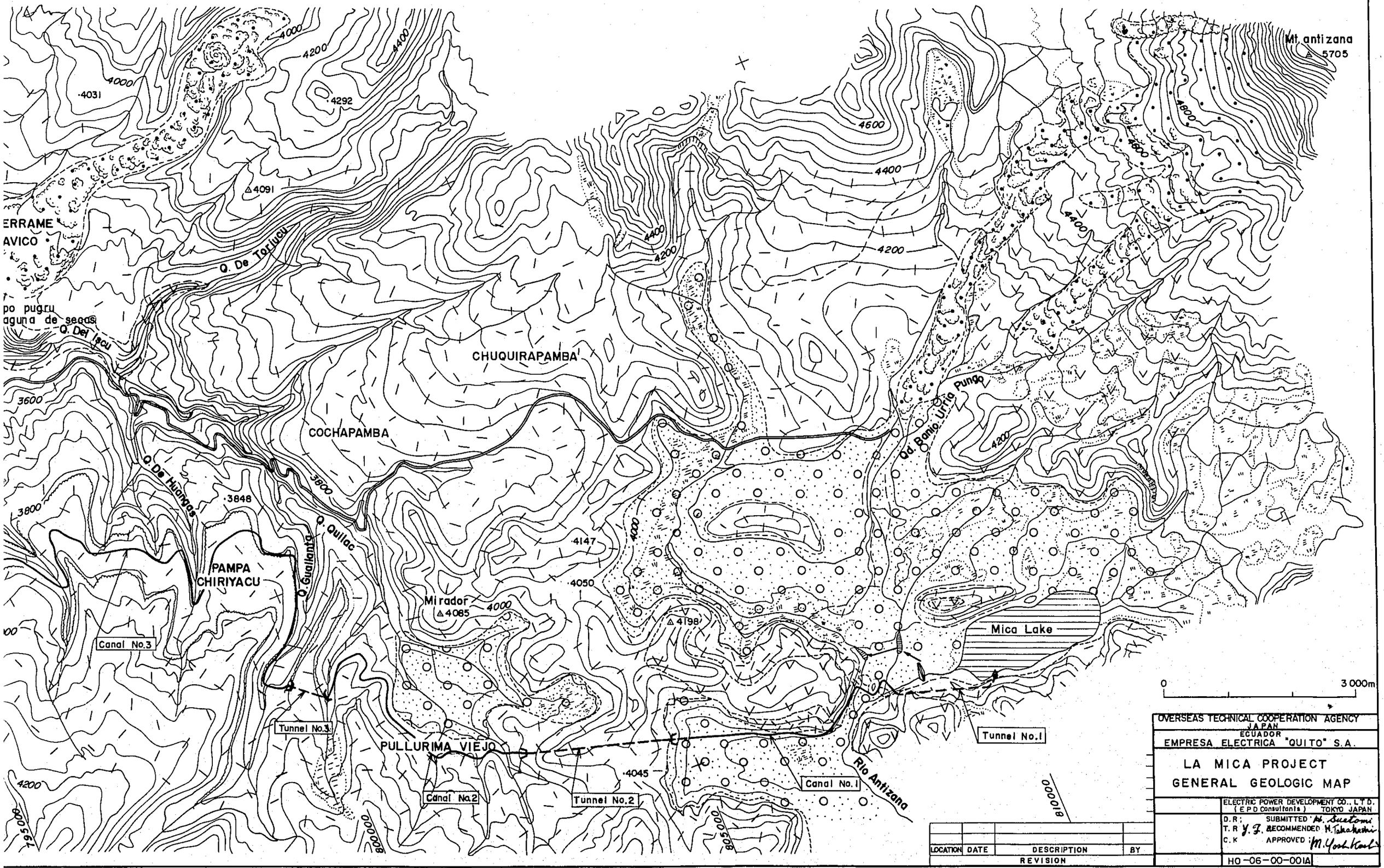
ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D. R.: K.K. SUBMITTED:
T. R.: J.H. RECOMMENDED:
C. K.: J.M. APPROVED:

H0-00-04-001A

DRAWING NO. 3


DERRAME
LAVICO
SAN FRANCISCO
Laguna marco quinray
Laguna tipo pugru
Laguna de secas
Q. Del Iscu
Q. De Tarjucu
CHUQUIRAPAMBA
COCHAPAMBA
Powerhouse
Penstock line
SAN PABLO
TABLÓN ALTO
Q. De Secas
Q. De Huangos
Q. Quilac
Q. Gualanta
PAMPA CHIRIYACU
Reservoir
JATUNUNGO
Canal No.3
Tunnel No.3
PULLURIMA VIEJO
Canal No.2
Tunnel No.2
Canal No.1
Río Antizana
Mirador
Qd. Banio Urria
LEGEND
Lava flow (Newest)
Volcanic ash
Terrace deposit
Lucustrin deposit & River deposit
Andesite
Marsh



LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
GENERAL GEOLOGIC MAP

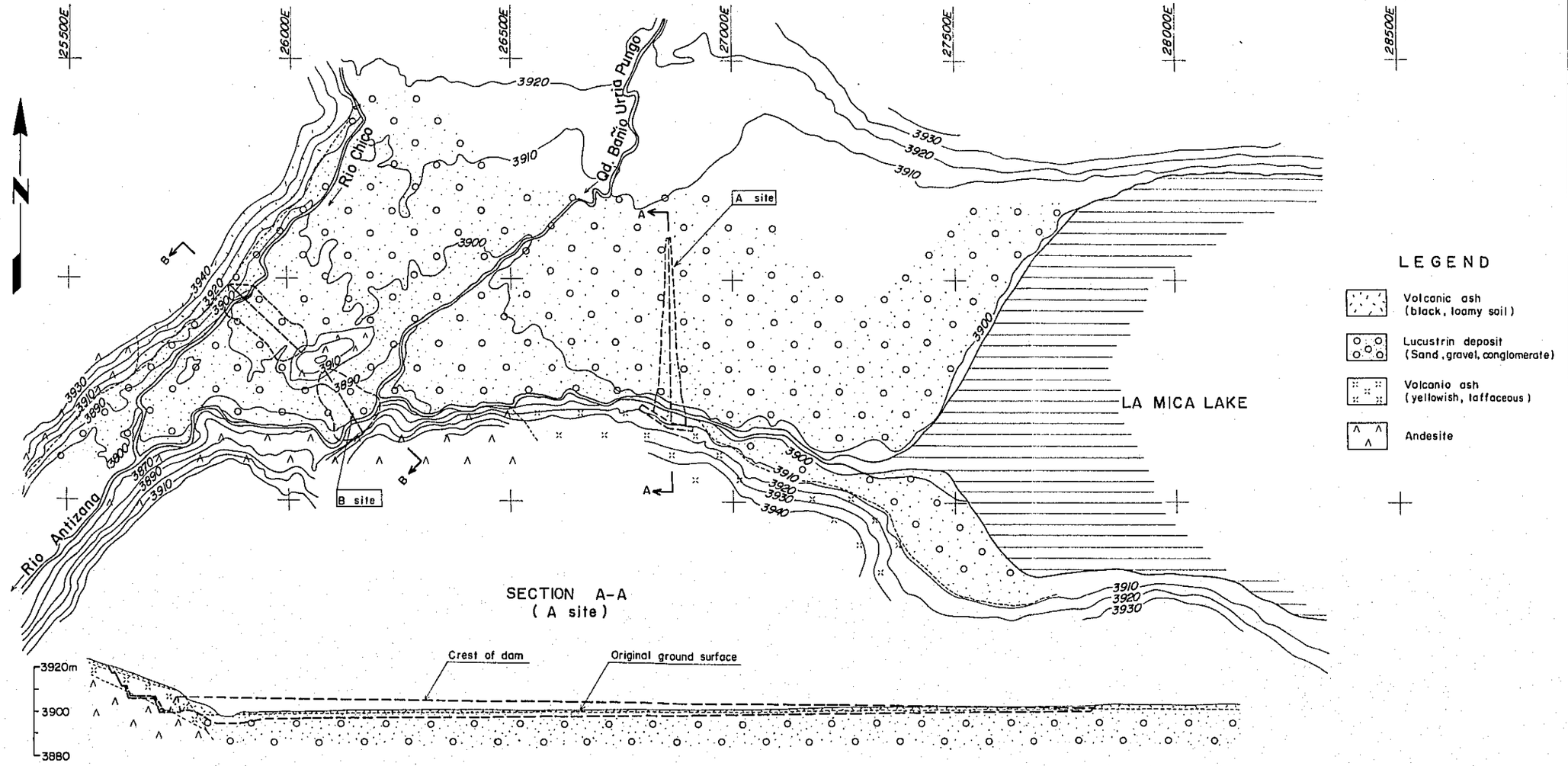
ELECTRIC POWER DEVELOPMENT CO., LTD.
(E.P.D Consultants) TOKYO JAPAN

D.R ; SUBMITTED : A. Suetomi
T.R ; RECOMMENDED : H. Takahashi
C.K ; APPROVED : M. Yoshikawa

HO-06-00-001A

DRAWING NO. 4

PLAN

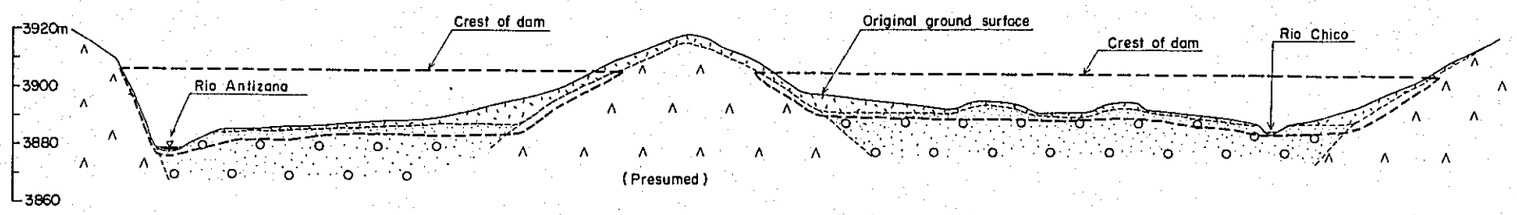


LEGEND

- Volcanic ash (black, loamy soil)
- Lucustrin deposit (Sand, gravel, conglomerate)
- Volcanic ash (yellowish, taffaceous)
- Andesite

SECTION A-A
(A site)

SECTION B-B
(B site)



0 500m
(Plan)

0 100m
(Section)

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
DAM
GEOLOGIC PLAN & SECTION

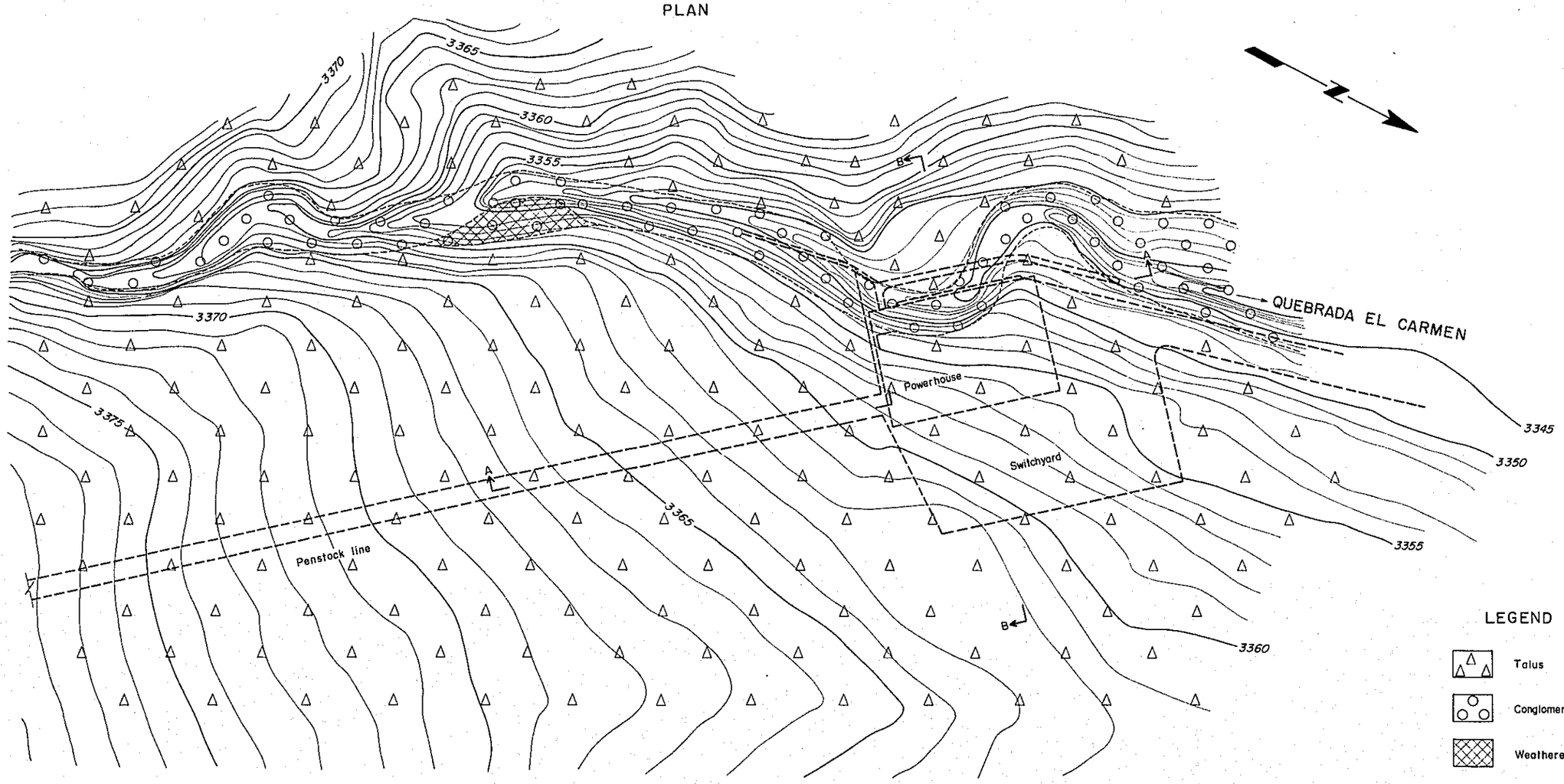
ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D. R.: SUBMITTED:
T. R.: RECOMMENDED:
C. K.: APPROVED:

HQ-06-02-001A

DRAWING NO. 5

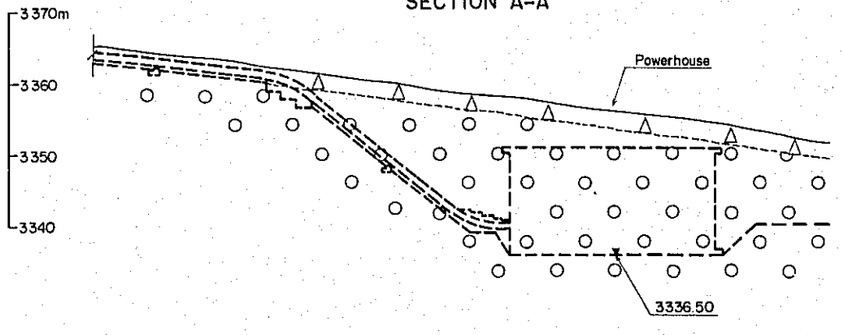
PLAN



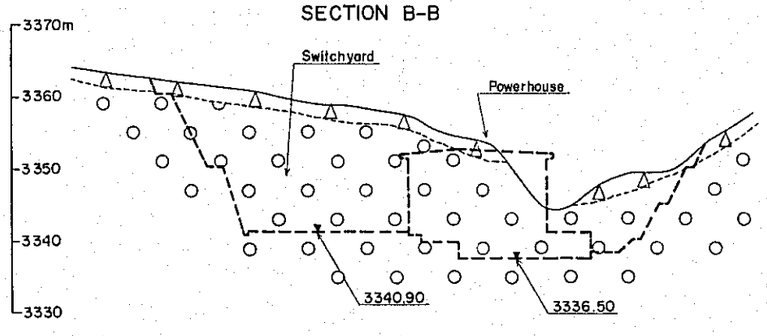
LEGEND

- Talus
- Conglomerate
- Weathered zone

SECTION A-A



SECTION B-B



0 40m

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN

ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
POWERHOUSE
GEOLOGIC PLAN & SECTION

ELECTRIC POWER DEVELOPMENT CO., LTD.
(E.P.D Consultants) TOKYO JAPAN

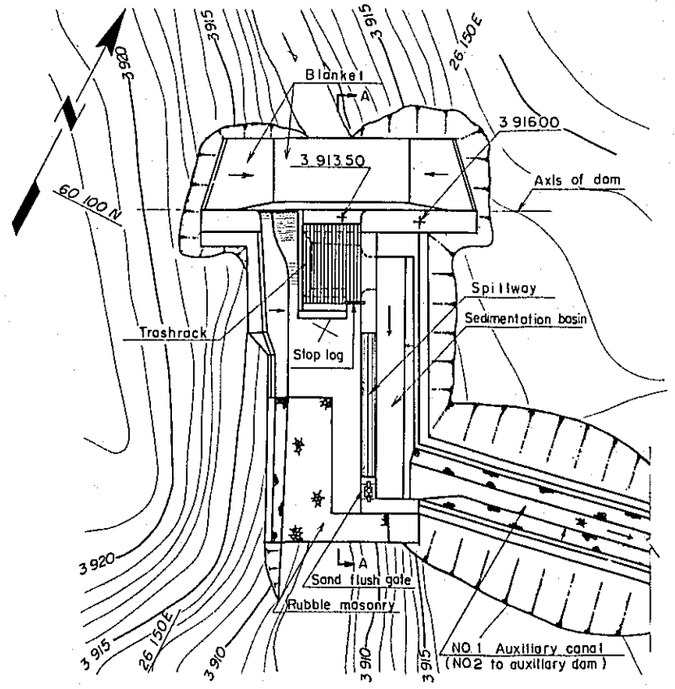
D. A.: SUBMITTED:
T. R.: Y. I. RECOMMENDED: H. Takahashi
C. K.: APPROVED: M. Yoshikawa

HO-06-04-001A

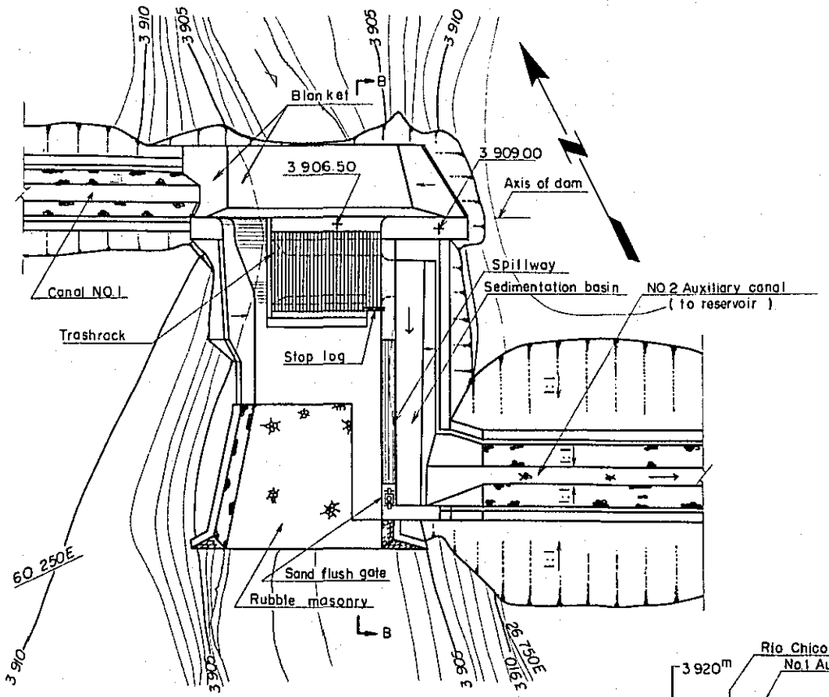
LOCATION	DATE	DESCRIPTION	BY
		REVISION	

DRAWING NO. 6

NO.1 AUXILIARY DAM

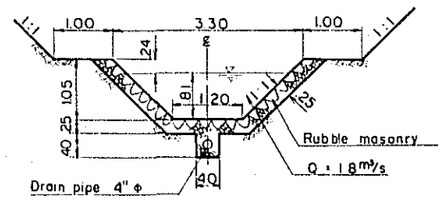


NO.2 AUXILIARY DAM

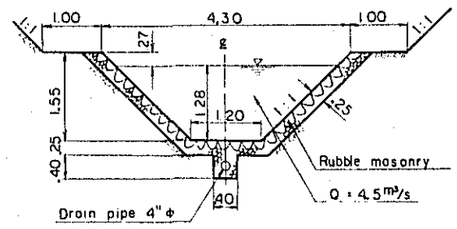


TYPICAL CROSS SECTION OF AUXILIARY CANAL

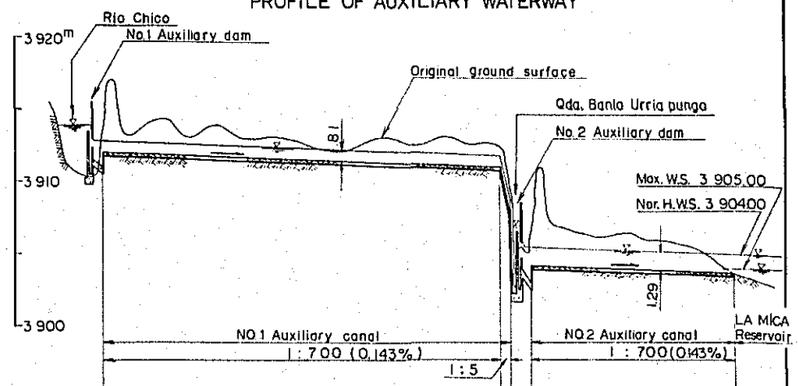
NO.1



NO.2

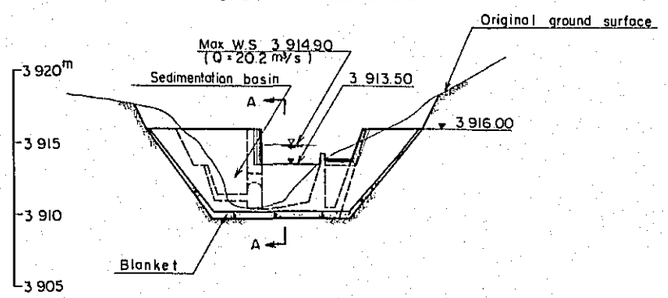


PROFILE OF AUXILIARY WATERWAY

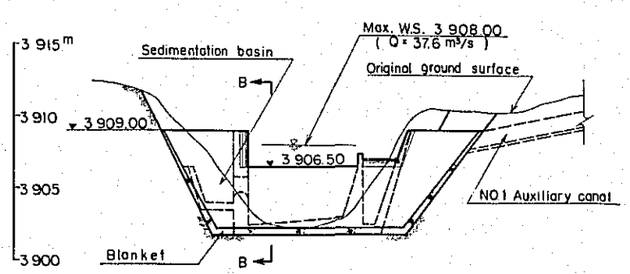


Formation height	3.911.94			3.910.96	3.907.60	3.904.22	3.903.72
Total distance	0.00			683.18	700.00	0.00	350.00
Distance	0.00			683.18	16.82	0	350.00
Station	0			NO			

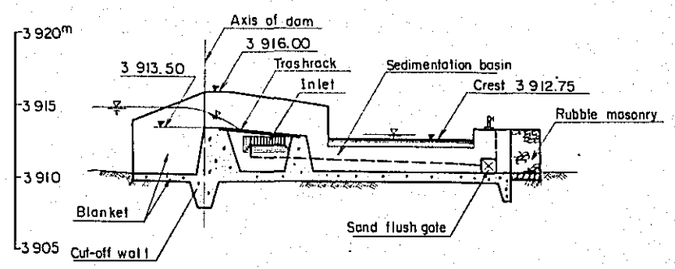
UPSTREAM ELEVATION



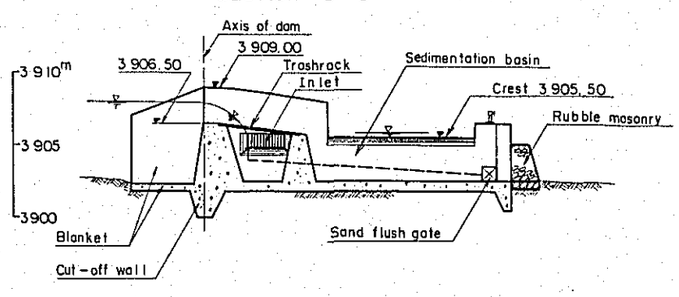
UPSTREAM ELEVATION



SECTION A—A



SECTION B—B



0 — 20m (Auxiliary dam NO.1 & NO.2)

0 — 5m (Typical cross section of auxiliary canal)

0 — 500m (Horizontal scale of profile)

LOCATION	DATE	DESCRIPTION	BY

REVISION

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT

AUXILIARY DAM & CANAL PLAN & SECTIONS

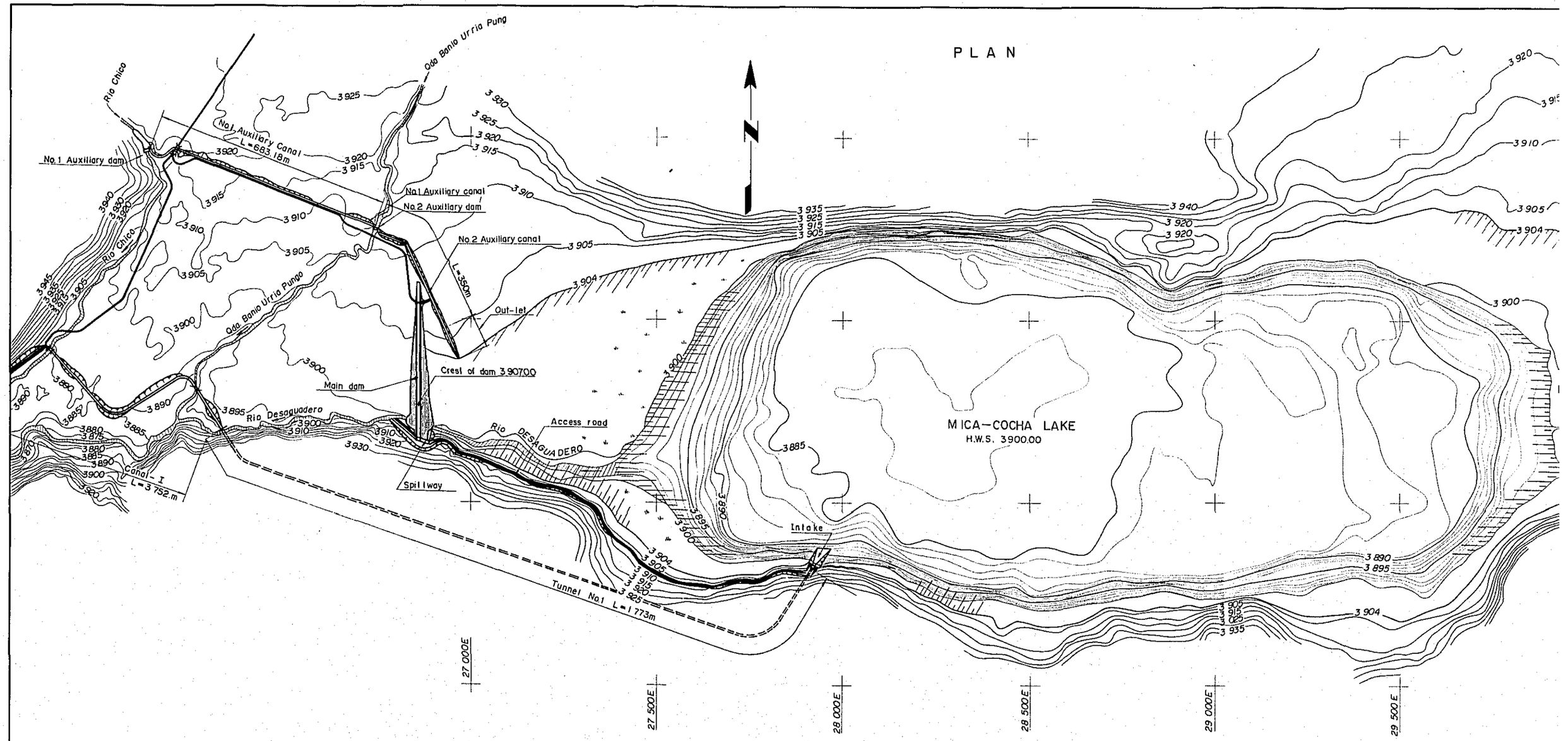
ELECTRIC POWER DEVELOPMENT CO., LTD.
(E.P.D Consultants) TOKYO JAPAN

D. R.: K.K. SUBMITTED: T. Hirabayashi
T. R.: T.H. RECOMMENDED: M. Takahashi
C. K.: T.M. APPROVED: M. Yoshikuni

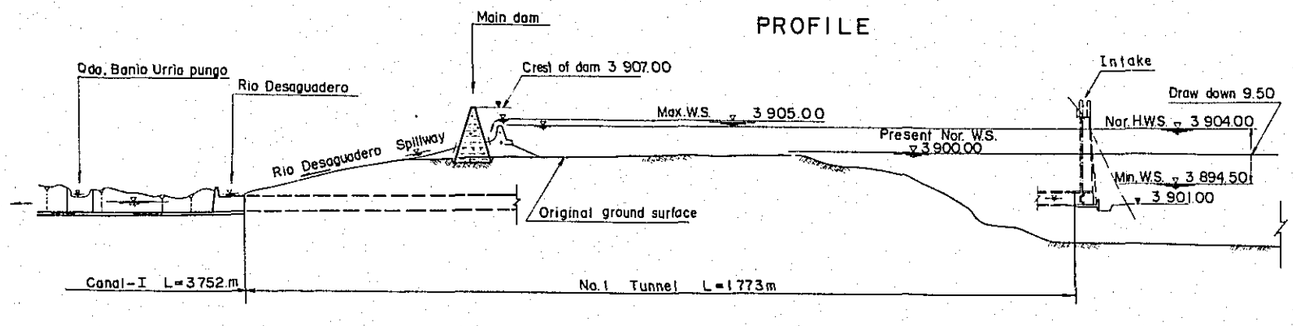
H3-01-00-001A

DRAWING NO. 7

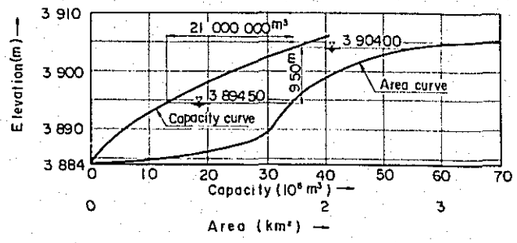
PLAN



PROFILE



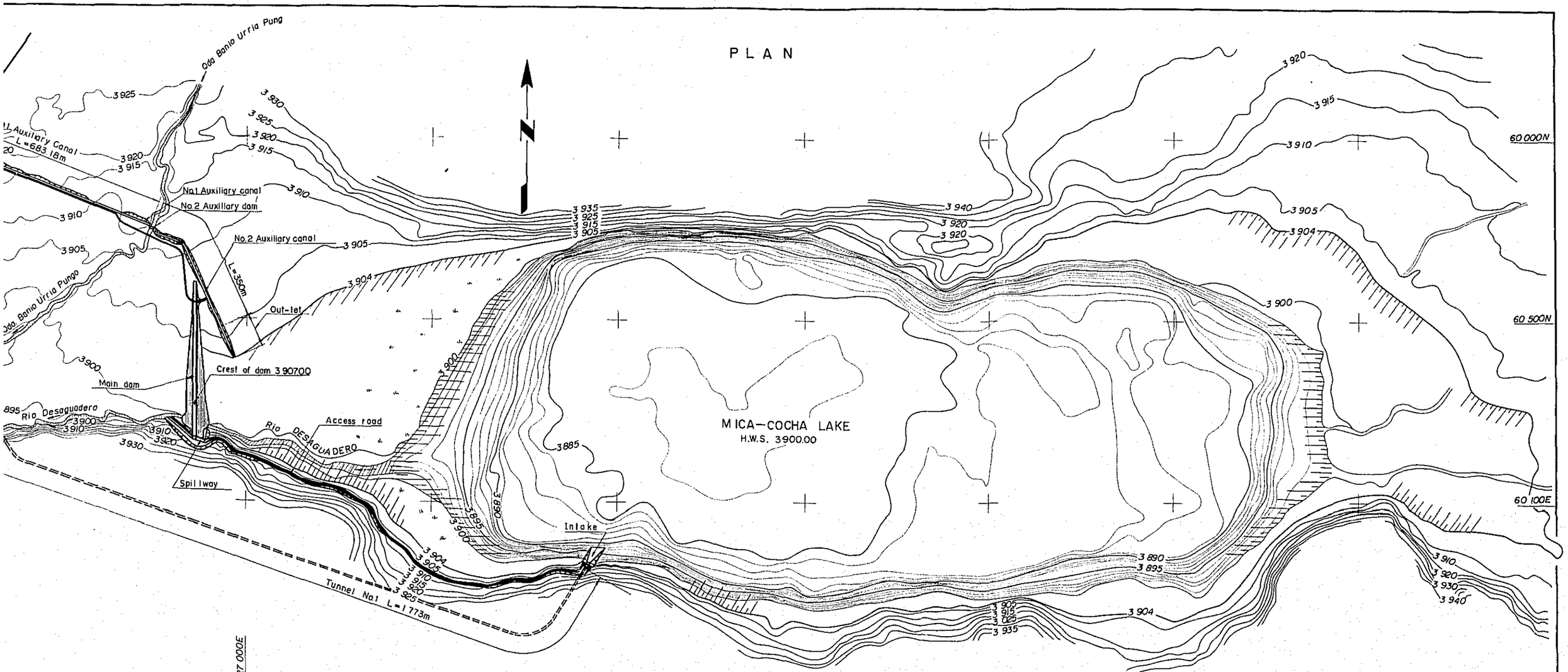
STORAGE CAPACITY CURVE



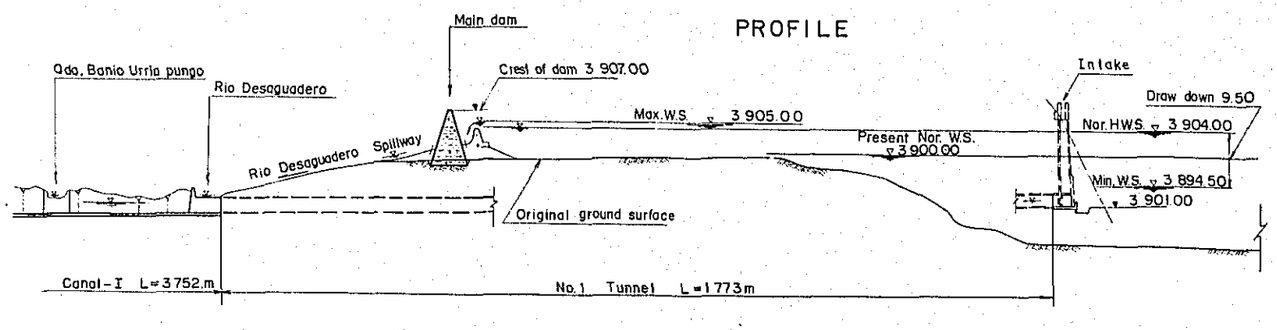
Elevation (m)	Area (km²)	Capacity (10⁶ m³)
3 905	3.26	37.16
3 900	2.09	23.79
3 895	1.77	14.14
3 890	1.56	5.81
3 885	0.633	0.323
3 884	0.014	—

LOCATION	DATE	DESCRIPTION	BY
REVISION			

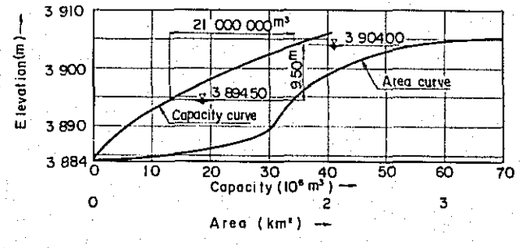
PLAN



PROFILE



STORAGE CAPACITY CURVE



Elevation (m)	Area (km²)	Capacity (10⁶ m³)
3 905	3.26	37.16
3 900	2.09	23.79
3 895	1.77	14.14
3 890	1.56	5.81
3 885	0.633	0.323
3 884	0.014	—

0 500m
(Plan & horizontal scale of profile)

LOCATION	DATE	DESCRIPTION	BY
REVISION			

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
RESERVOIR
PLAN & PROFILE

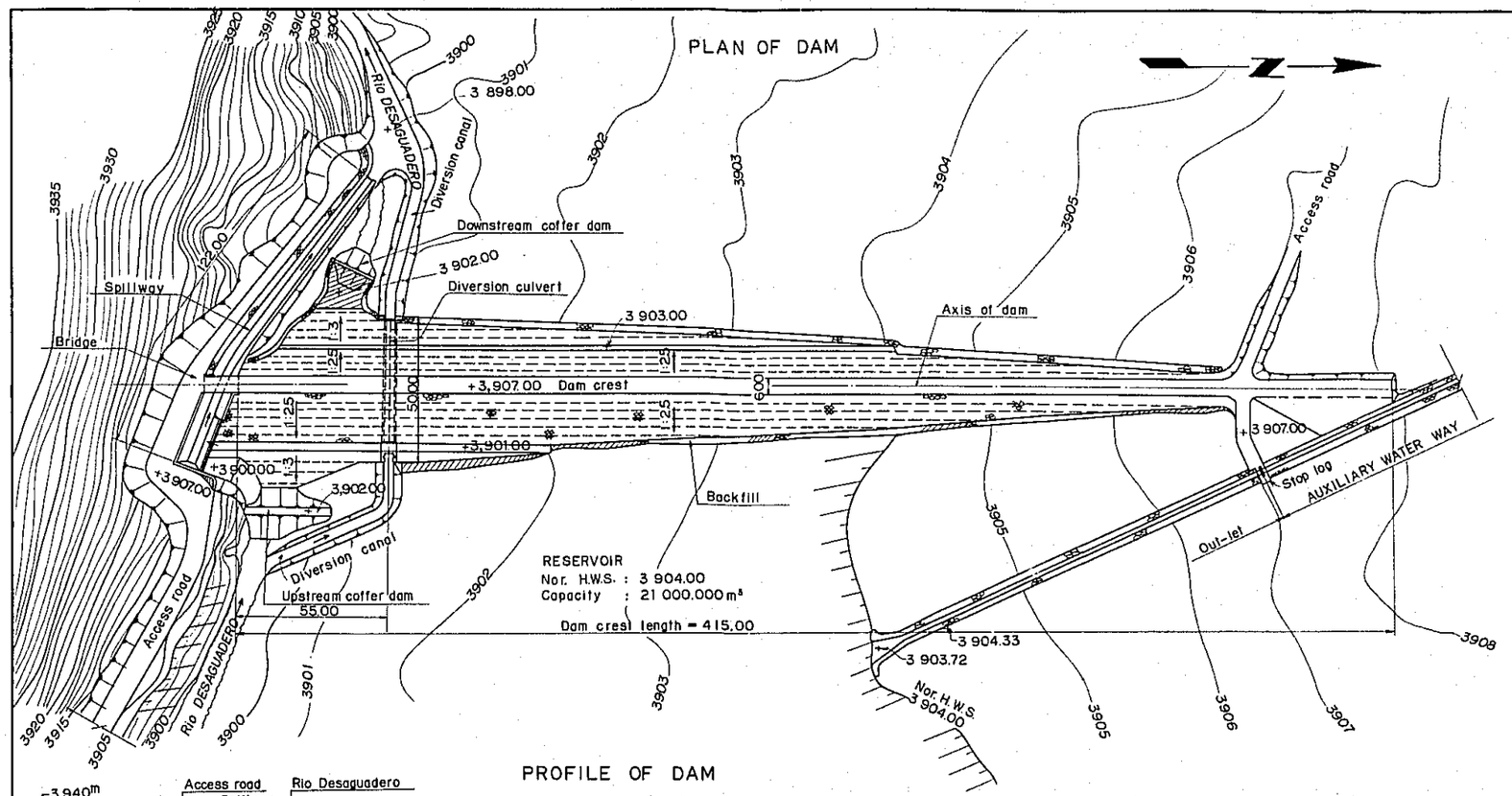
ELECTRIC POWER DEVELOPMENT CO., LTD.
(E.P.D Consultants) TOKYO JAPAN

D. R.: H.K. SUBMITTED: Y. Ishimaru
T. R.: T.H. RECOMMENDED: M. Takahashi
C. K.: T.M. APPROVED: M. Uchikawa

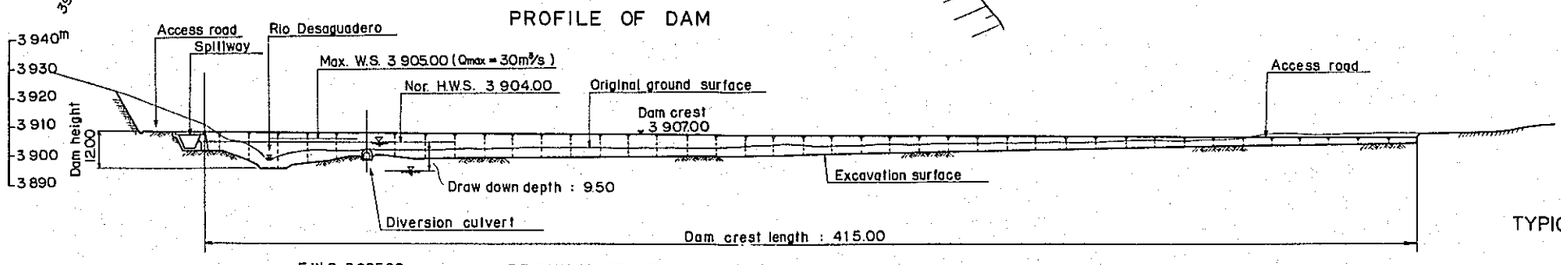
HO-04-00-001A

DRAWING NO. 8

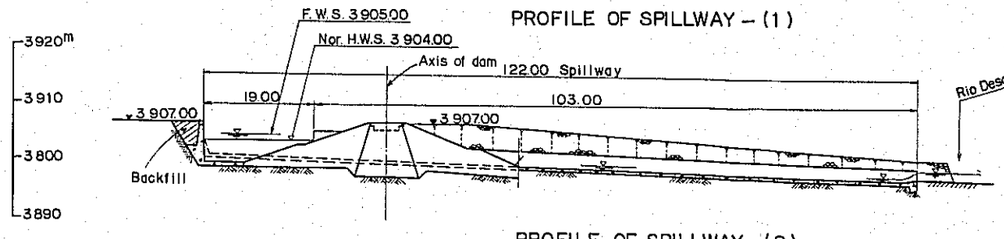
PLAN OF DAM



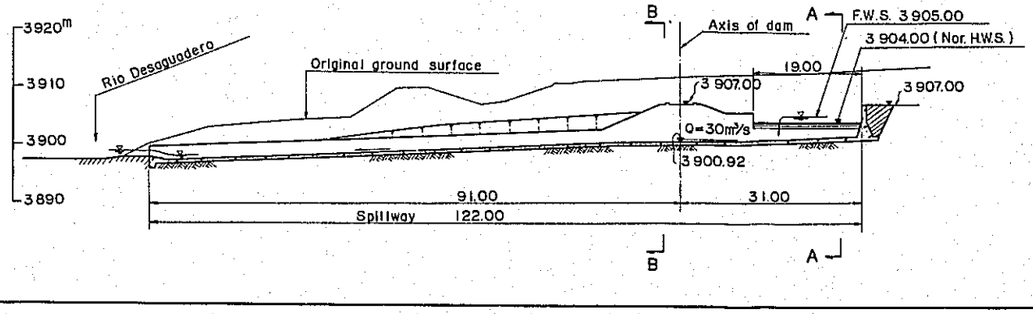
PROFILE OF DAM



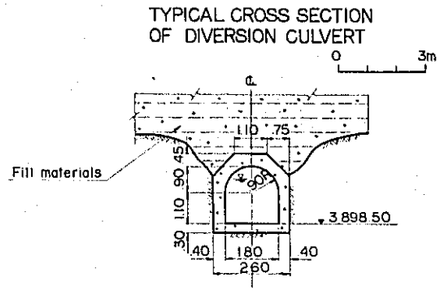
PROFILE OF SPILLWAY – (1)



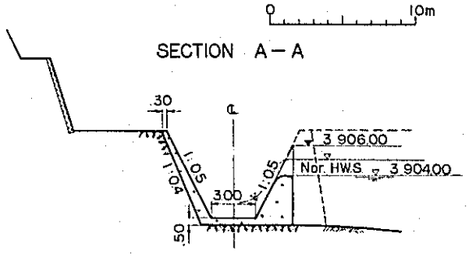
PROFILE OF SPILLWAY – (2)



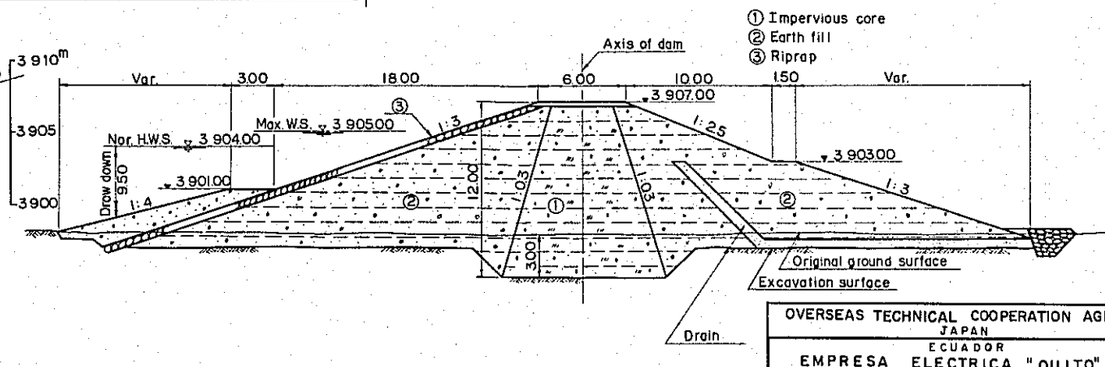
TYPICAL CROSS SECTION OF DIVERSION CULVERT



TYPICAL CROSS SECTION OF SPILLWAY CHUTE



TYPICAL CROSS SECTION OF DAM



0 100m (Plan and profile of dam)

0 20m (Typical cross section of dam)

0 50m (Profile of spillway)

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN

ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
DAM
PLAN & PROFILE

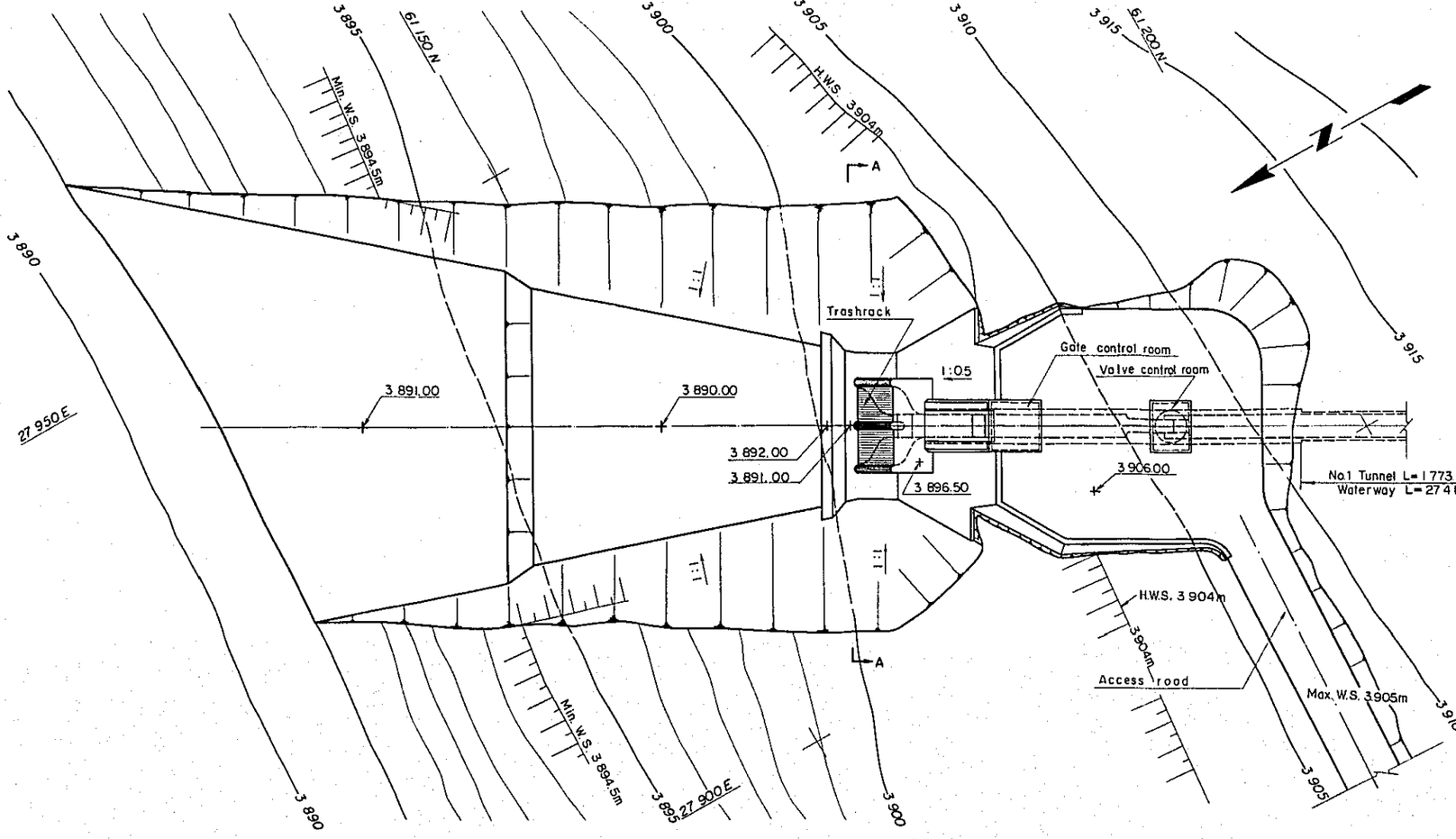
ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D. R.: K.K. SUBMITTED: Y. Shiokawa
T. R.: T.H. RECOMMENDED: M. Takahashi
C. K.: T.M. APPROVED: M. Uchida

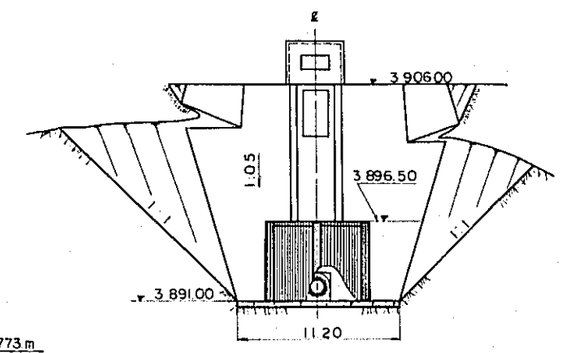
H2 – 00 – 00 – 001A

DRAWING NO. 9

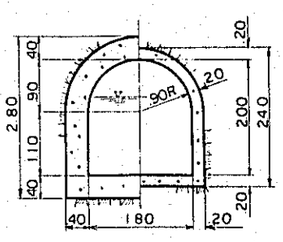
PLAN



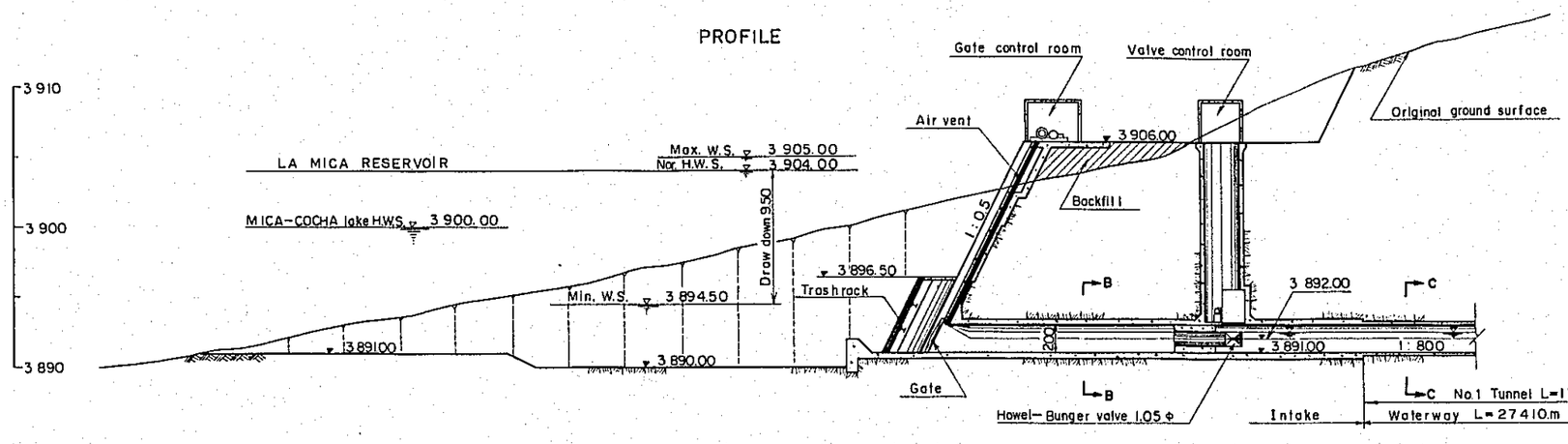
SECTION A – A



SECTION B – B SECTION C – C



PROFILE



0 20m
(Plan Profile & Section A–A)

0 5m
(Section B–B, C–C)

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S. A.

LA MICA PROJECT
INTAKE
PLAN & SECTIONS

ELECTRIC POWER DEVELOPMENT CO. LTD.
(E.P.D Consultants) TOKYO JAPAN

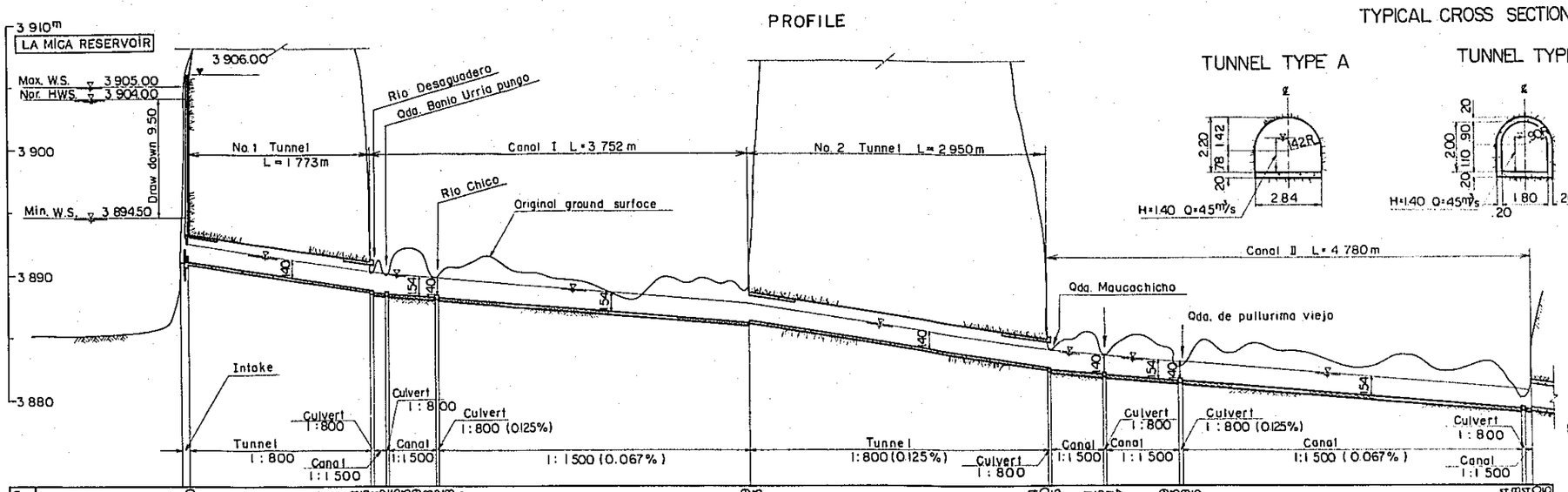
D. R.: K.K. SUBMITTED: Y. Shiobara
T. R.: T.H. RECOMMENDED: M. Takahashi
C. K.: T.M. APPROVED: M. Yoshikawa

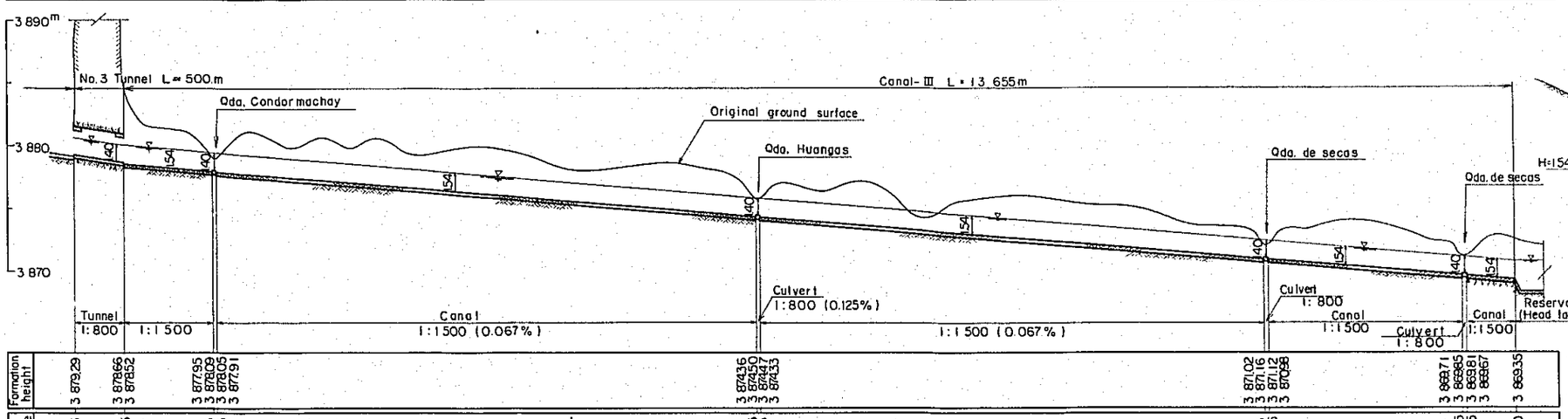
H3-02-13-001A

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

DRAWING NO. 10

PROFILE



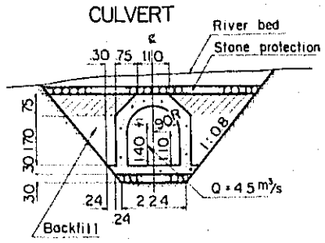


TYPICAL CROSS SECTION OF WATERWAY

TUNNEL TYPE A

TUNNEL TYPE B

CULVERT



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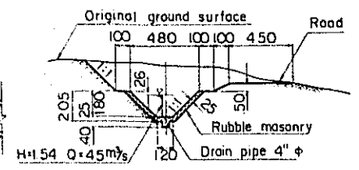

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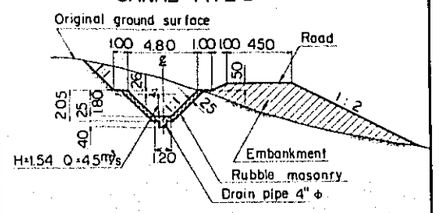

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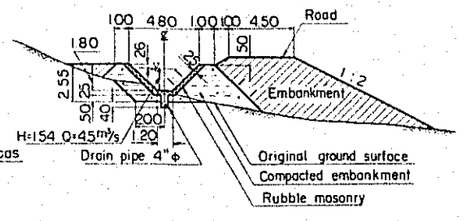


0 — 2.5 km (Horizontal scale of profile)

0 — 10m (Tunnel & Culvert)

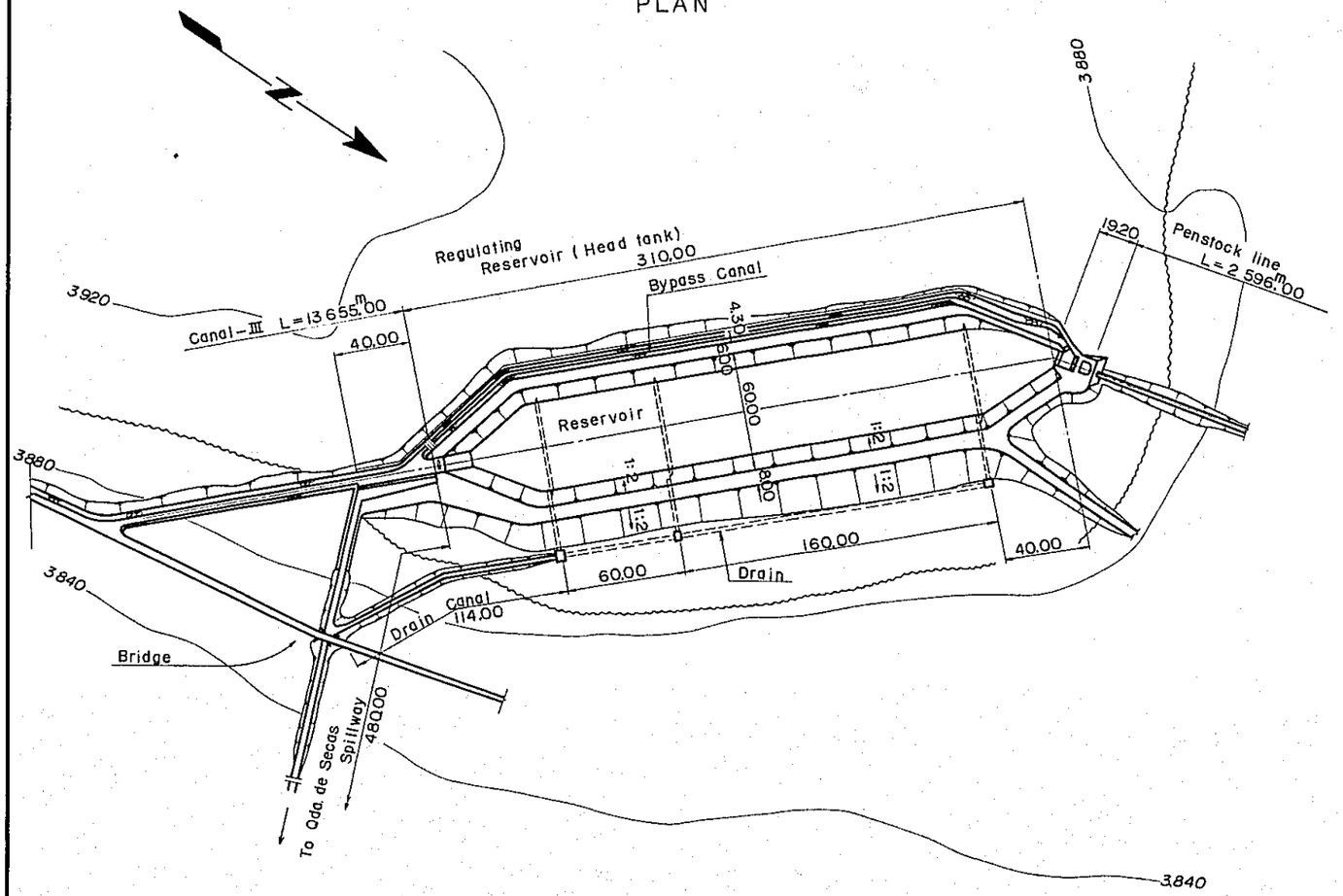
0 — 20m (Canal type A, B, C)

OVERSEAS TECHNICAL COOPERATION AGENCY JAPAN			
EMPRESA ELECTRICA "QUITO" S. A. ECUADOR			
LA MICA PROJECT WATERWAY PROFILE & SECTIONS			
		ELECTRIC POWER DEVELOPMENT CO., LTD. (E P D Consultants) TOKYO JAPAN	
		D.R.: K.K. SUBMITTED: Y. Shinohara	
		T.R.: T.H. RECOMMENDED: M. Takahashi	
		C.K.: T.M. APPROVED: M. Murakami	
		H3-00-00-001A	

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

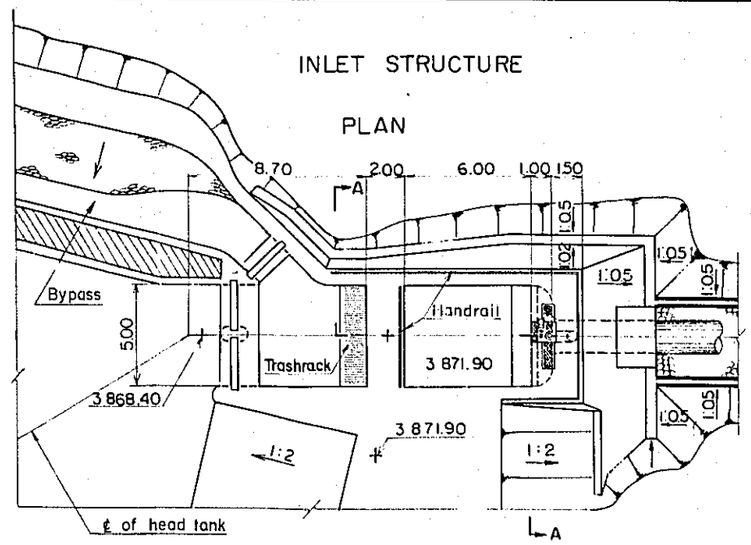
DRAWING NO. 11

PLAN



INLET STRUCTURE

PLAN



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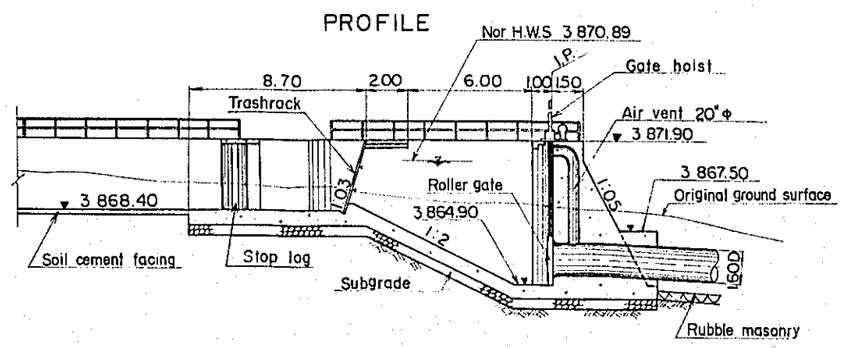
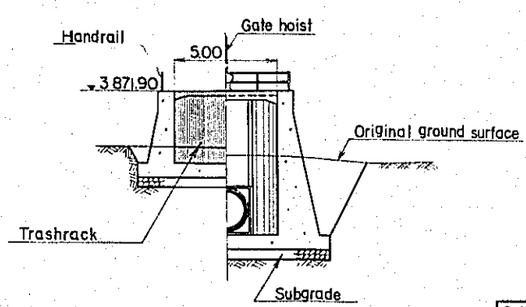


SECTION A—A

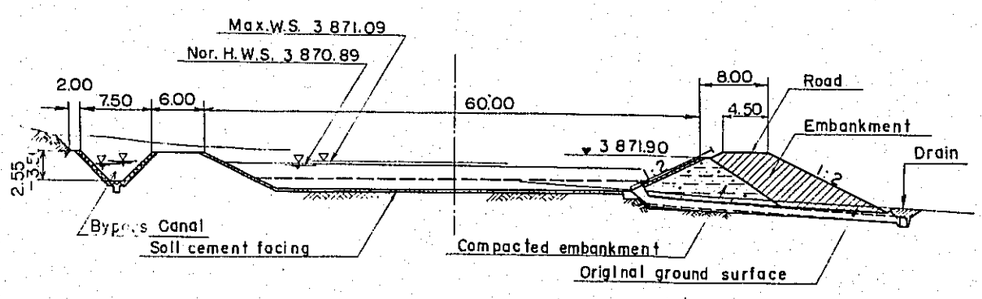


0 400m (Plan)

0 30m (Typical cross section)

0 15m (Inlet Structure)

TYPICAL CROSS SECTION OF HEAD TANK



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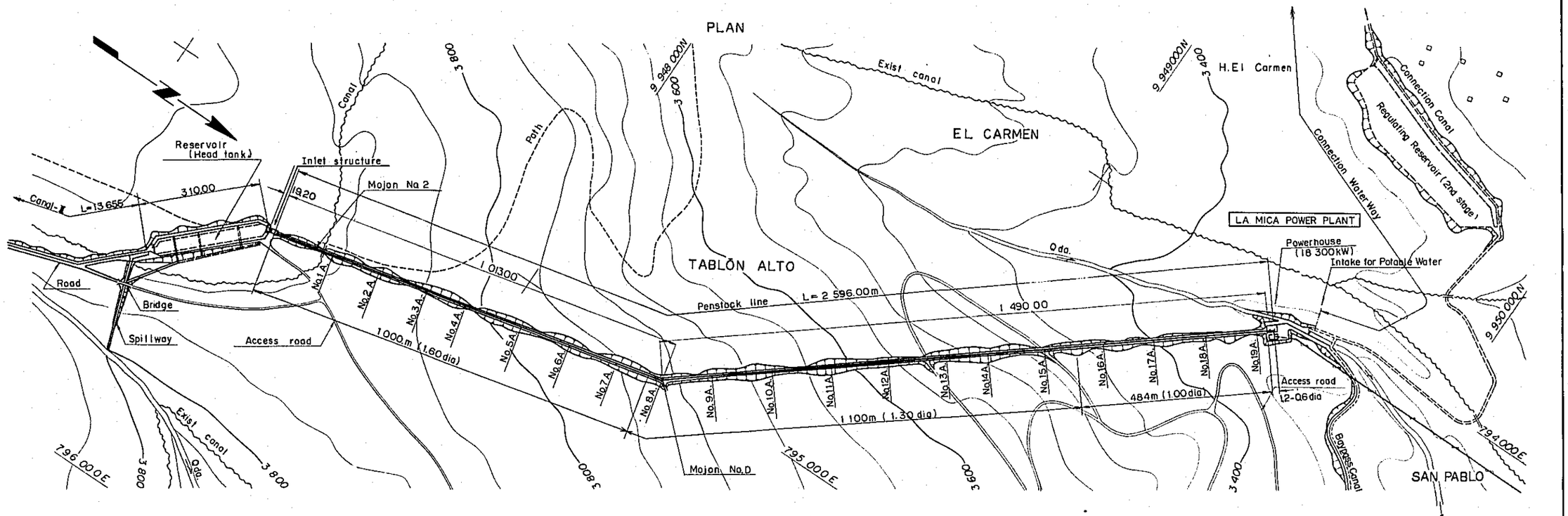
EMPRESA ELECTRICA "QUITO" S.A. ECUADOR	
LA MICA PROJECT REGULATING RESERVOIR PLAN & SECTIONS	
	ELECTRIC POWER DEVELOPMENT CO., LTD. (E P D Consultants) TOKYO JAPAN
	D R: K.K. T. R: T.H. C.K.: T.M. SUBMITTED: Y. Shimbara RECOMMENDED: M. Takahashi APPROVED: M. Yoshida
	H3—05—00—001A

LOCATION	DATE	DESCRIPTION	BY

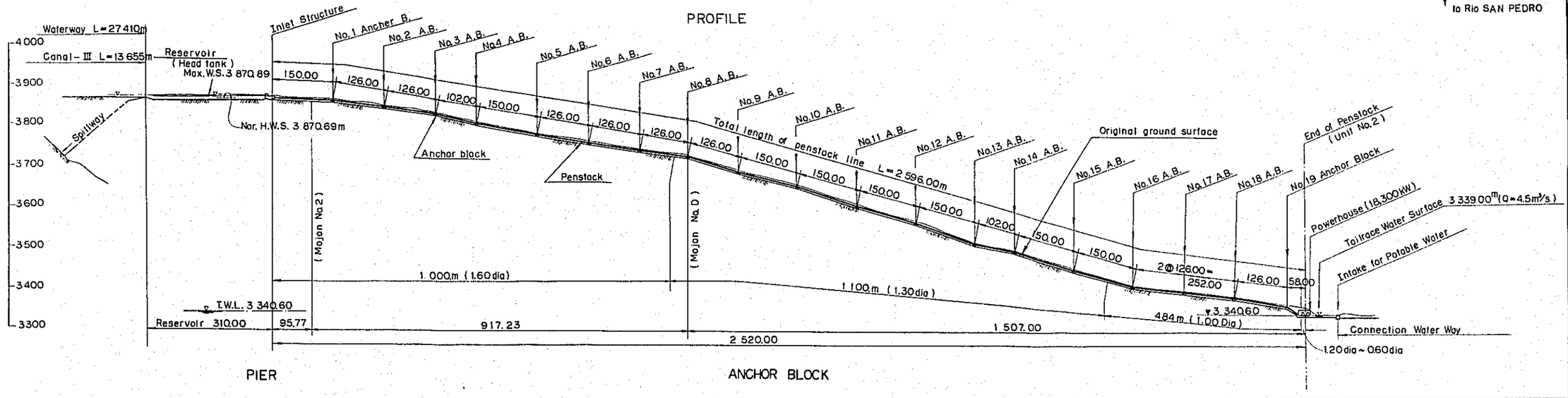
REVISION

DRAWING NO. 12

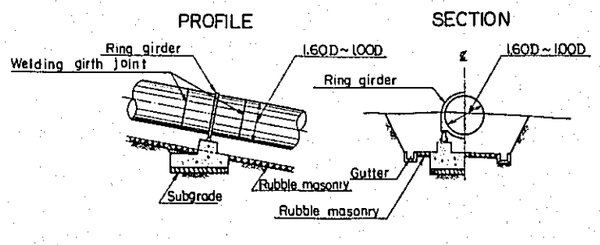
PLAN



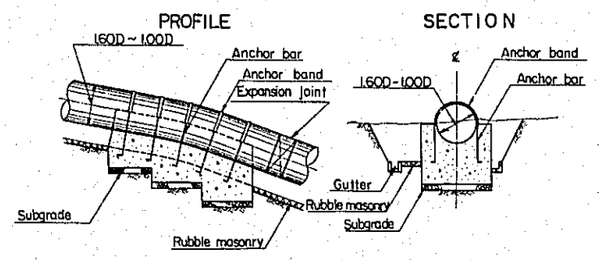
PROFILE

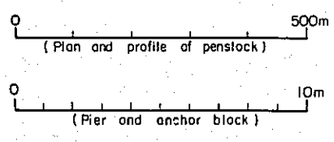


PIER



ANCHOR BLOCK





LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
PENSTOCK
PLAN & PROFILE

ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D. R.: K.K. SUBMITTED: Y. Hirabayashi
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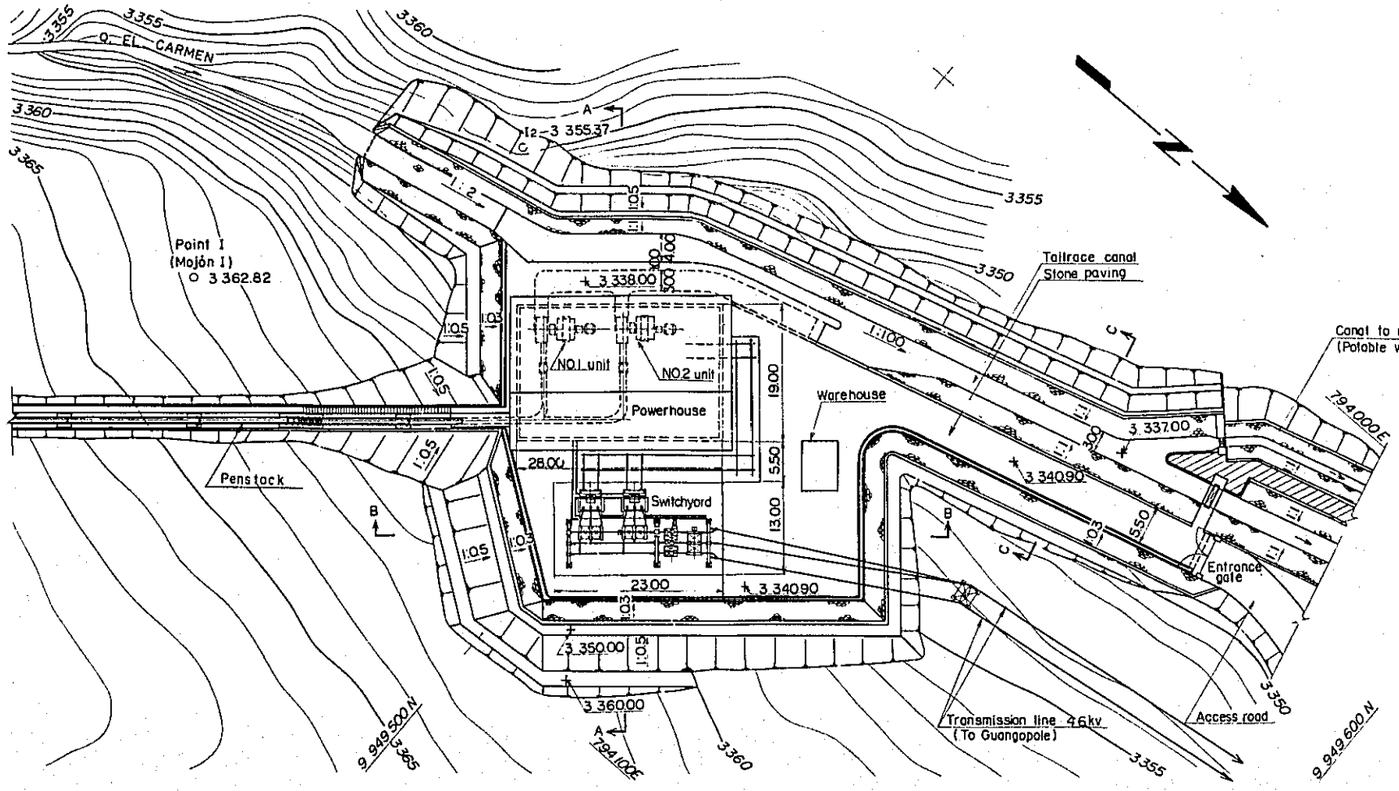
C. K.: T.M. APPROVED: M. Yoshikawa

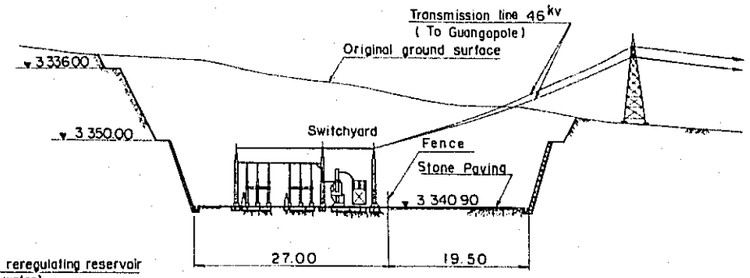
H3 – 06 – 00 – 001A

DRAWING NO. 13

PLAN



SECTION B—B



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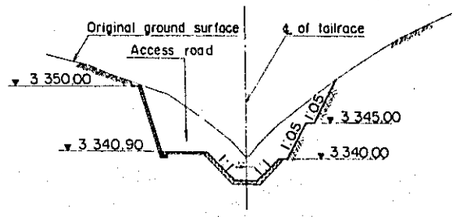

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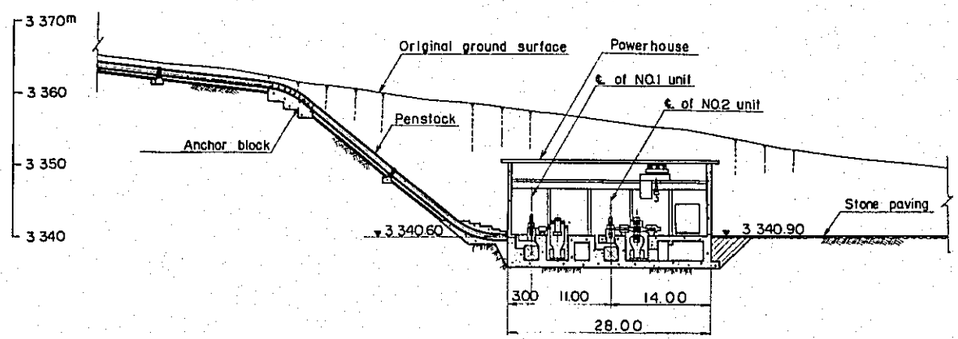

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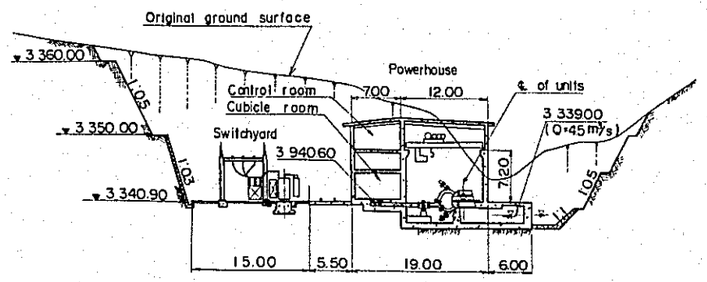

0 — 40m
(Plan & sections)

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN

ECUADOR
EMPRESA ELECTRICA "QUITO S. A.

LA MICA PROJECT
POWERHOUSE
PLAN & SECTIONS

ELECTRIC POWER DEVELOPMENT CO., LTD.
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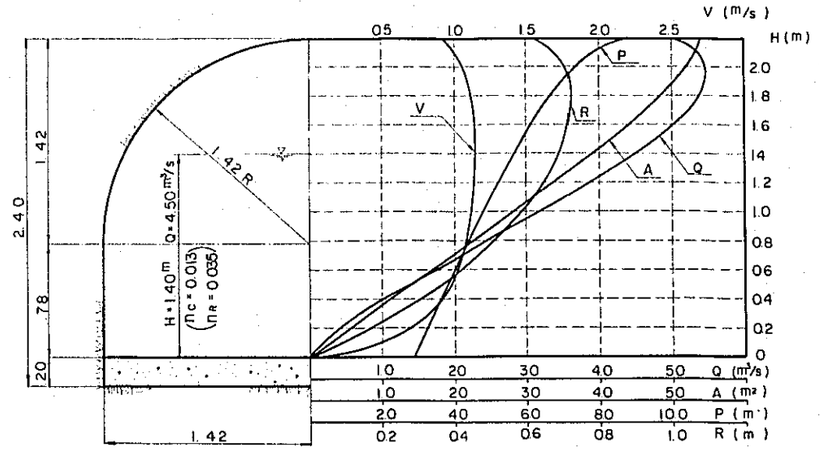
C. K.: S. M. APPROVED: M. Uchiumi

H4-00-00-001A

DRAWING NO. 14

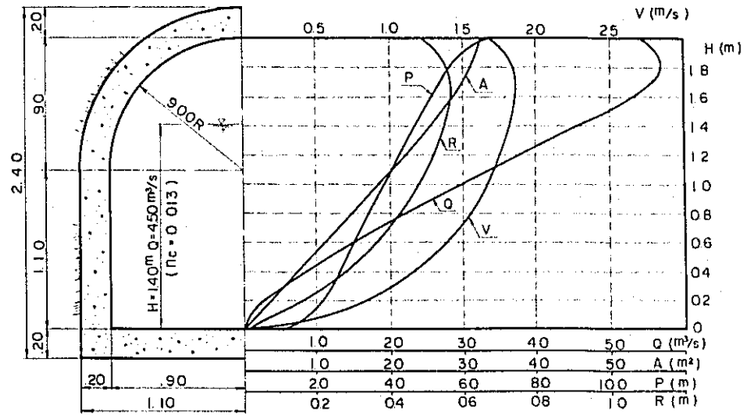
TUNNEL TYPE A

TYPICAL SECTION HYDRAULIC CHARACTERISTIC CURVES



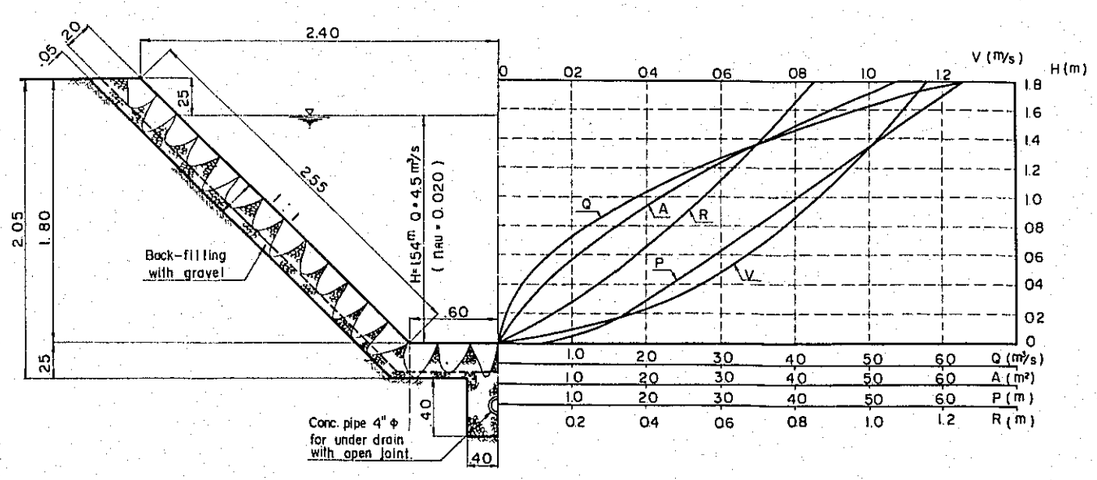
TUNNEL TYPE B

TYPICAL SECTION HYDRAULIC CHARACTERISTIC CURVES



CANAL

TYPICAL SECTION HYDRAULIC CHARACTERISTIC CURVES



NOTE

Manning's Formula

$V = \frac{1}{n} R^{2/3} I^{1/2}$

$Q = A V$

Where,

- I : Gradient of tunnel 1/800, Canal 1/1500
- H : Depth of water (m)
- A : Sectional area of flow (m^2)
- P : Wetted perimeter (m)
- R : Hydraulic mean depth (m)
- V : Velocity of flow (m/s)
- Q : Quantity of discharge (m^3/s)
- nc : Coefficient of roughness of concrete surface.
- nR : Coefficient of roughness of rock surface.
- nRU : Coefficient of roughness of rubble masonry

0 2m

LOCATION	DATE	DESCRIPTION	BY

REVISION

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S. A.

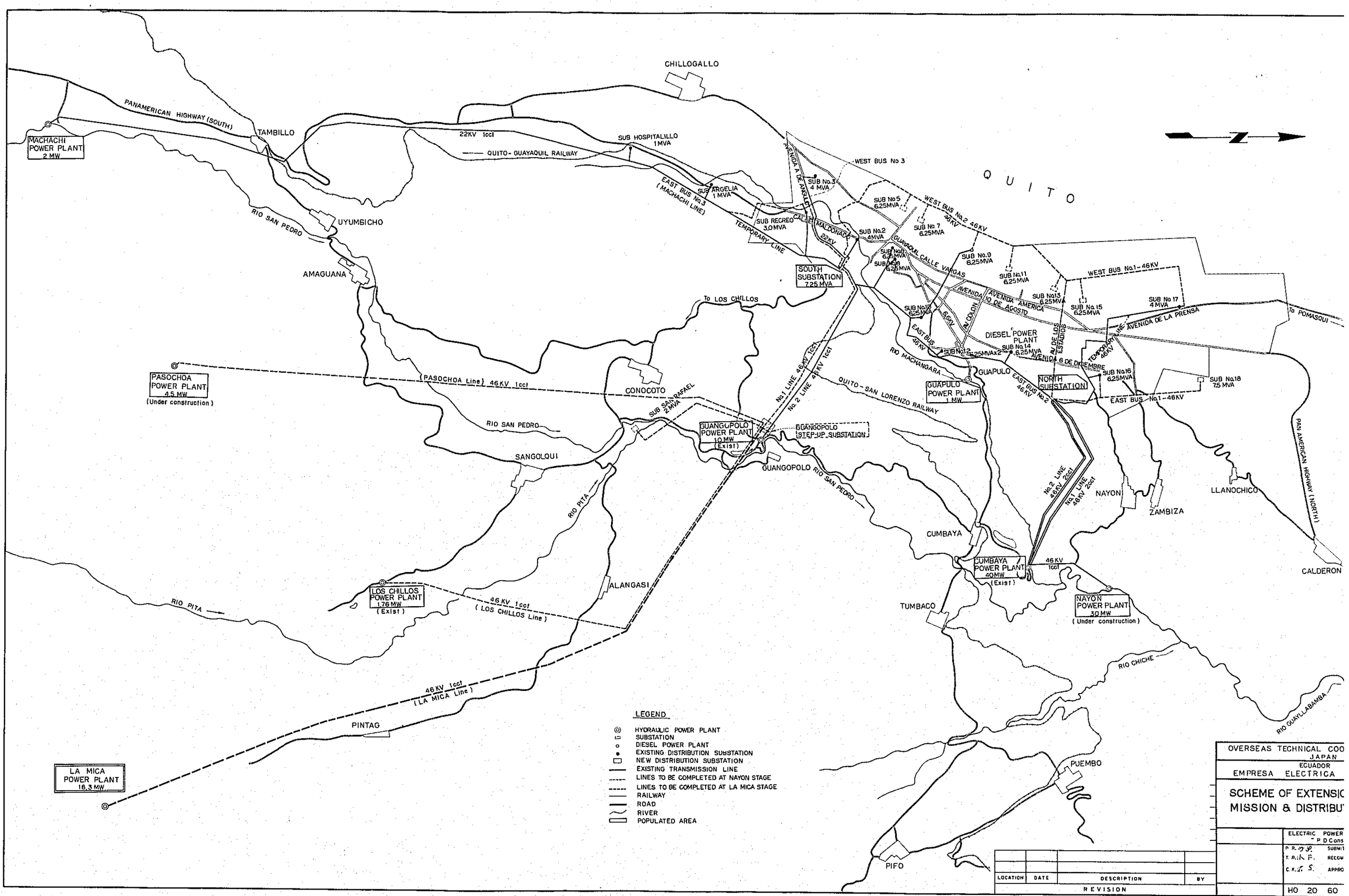
LA MICA PROJECT
WATER WAY
HYDRAULIC CHARACTERISTIC CURVES

ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D. R.: K.K. SUBMITTED:
T. R.: J.H. RECOMMENDED:
C. K.: APPROVED: M. Yoshikawa

H3 - 04 - 03 - 001A

DRAWING NO. 15


CHILLOGALLO
PANAMERICAN HIGHWAY (SOUTH)
TAMBILLO
MACHACHI POWER PLANT 2 MW
22KV 1cct
QUITO - GUAYAQUIL RAILWAY
SUB HOSPITALILLO 1 MVA
EAST BUS No.3 (MACHACHI LINE)
SUB ARGELIA 1 MVA
SUB RECREO 3.0 MVA
TEMPORARY LINE
RIO SAN PEDRO
UYUMBICHO
AMAGUANA
AVENIDA A DE ANGAMARCA
WEST BUS No 3
SUB No.3 4 MVA
SUB No.5 6.25MVA
WEST BUS No.2 46KV
SUB No.7 6.25MVA
CALLE MALDONADO
22KV
SUB No.2 4MVA
SUB No.8 6.25MVA
SUB No.9 6.25MVA
SUB No.11 6.25MVA
WEST BUS No.1-46KV
GUAYAQUIL CALLE VARGAS
AVENIDA AMERICA
AVENIDA 9 DE OCTUBRE
AVENIDA 6 DE DICIEMBRE
SUB No.13 6.25MVA
SUB No.15 6.25MVA
SUB No.17 4 MVA
AVENIDA DE LA PRENSA
To POMASQUI
SOUTH SUBSTATION 7.25 MVA
To LOS CHILLOS
SUB No.10 6.25MVA
46KV
AVENIDA COLON
EAST BUS 46KV
SUB No.12 6.25MVAx2
SUB No.14 6.25MVA
DIESEL POWER PLANT
BLOQUE LOS ESTADIOS
TEMPORARY LINE 46KV
SUB No.16 6.25MVA
NORTH SUBSTATION
SUB No.18 7.5 MVA
EAST BUS No.1-46KV
PASOCHOA POWER PLANT 4.5 MW (Under construction)
(PASOCHOA Line) 46KV 1cct
CONOCOTO
SUB SAN RAFAEL 2MVA
No.1 LINE 46KV 1cct
No.2 LINE 46KV 1cct
RIO MACHANGARA
QUITO - SAN LORENZO RAILWAY
GUAPULO POWER PLANT 1 MW
GUAPULO EAST BUS No.2 46KV
RIO SAN PEDRO
GUANGOPOLO POWER PLANT 10 MW (Exist)
GUANGOPOLO STEP-UP SUBSTATION
SANGOLQUI
GUANGOPOLO RIO SAN PEDRO
No.2 LINE 46KV 2cct
No.1 LINE 46KV 2cct
NAYON
ZAMBIZA
LLANOCHICO
PAN AMERICAN HIGHWAY (NORTH)
CALDERON
RIO PITA
CUMBAYA
CUMBAYA POWER PLANT 40MW (Exist)
46KV 1cct
ALANGASI
LOS CHILLOS POWER PLANT 1.76 MW (Exist)
46 KV 1cct (LOS CHILLOS Line)
TUMBACO
NAYON POWER PLANT 30 MW (Under construction)
RIO CHICHE
RIO GUAYLLABAMBA
46 KV 1cct (LA MICA Line)
PINTAG
LA MICA POWER PLANT 18.3 MW
PUEMBO
PIFO
LEGEND
HYDRAULIC POWER PLANT
SUBSTATION
DIESEL POWER PLANT
EXISTING DISTRIBUTION SUBSTATION
NEW DISTRIBUTION SUBSTATION
EXISTING TRANSMISSION LINE
LINES TO BE COMPLETED AT NAYON STAGE
LINES TO BE COMPLETED AT LA MICA STAGE
RAILWAY
ROAD
RIVER
POPULATED AREA
LOCATION
DATE
DESCRIPTION
BY
REVISION
OVERSEAS TECHNICAL COO
JAPAN
EMPRESA ELECTRICA
ECUADOR
SCHEME OF EXTENSIC
MISSION & DISTRIBU
ELECTRIC POWER
P.D.Cons
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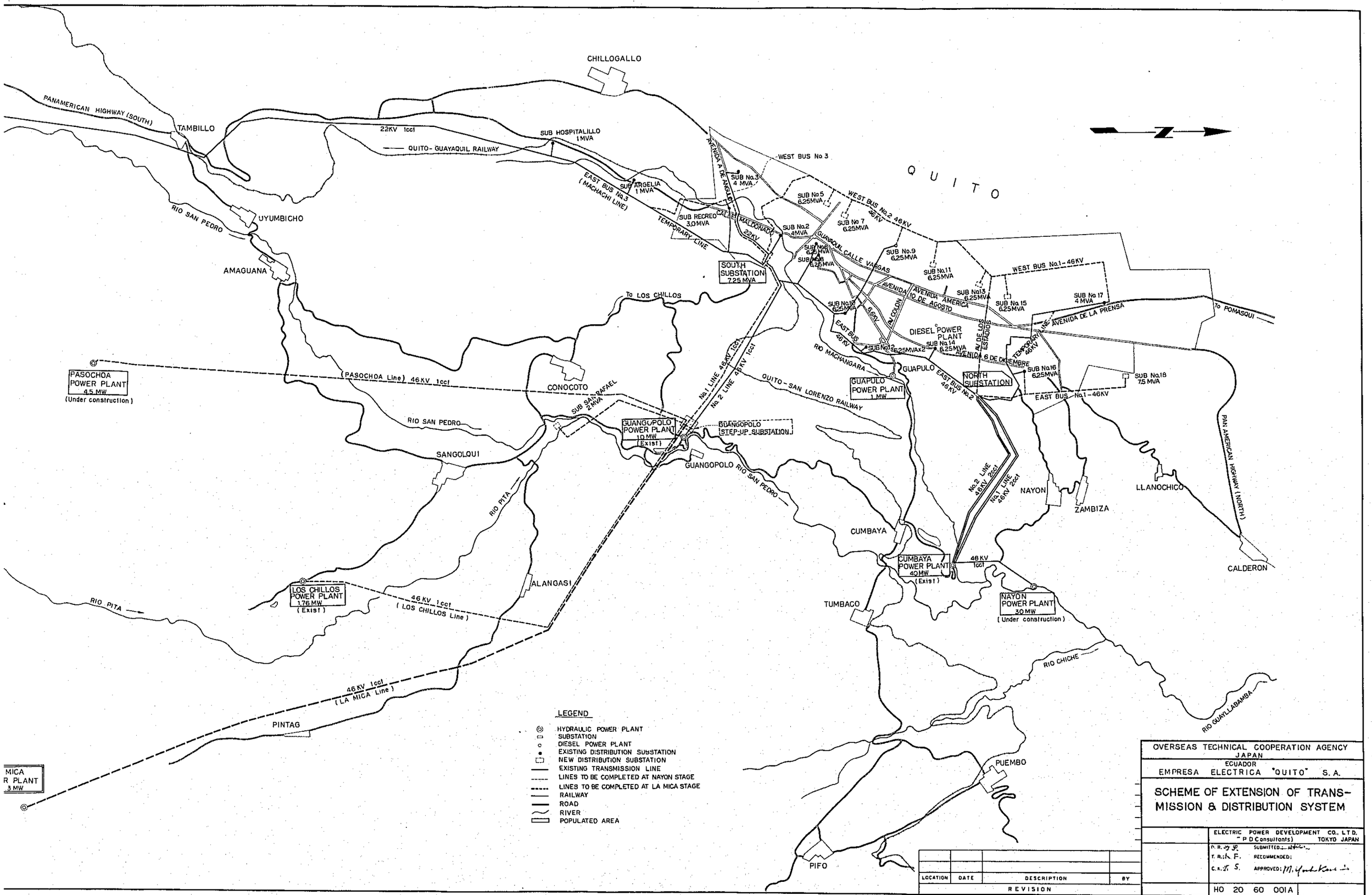


LEGEND

- HYDRAULIC POWER PLANT
- SUBSTATION
- DIESEL POWER PLANT
- EXISTING DISTRIBUTION SUBSTATION
- NEW DISTRIBUTION SUBSTATION
- EXISTING TRANSMISSION LINE
- LINES TO BE COMPLETED AT NAYON STAGE
- LINES TO BE COMPLETED AT LA MICA STAGE
- RAILWAY
- ROAD
- RIVER
- POPULATED AREA

LOCATION	DATE	DESCRIPTION	BY

REVISION

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN

ECUADOR
EMPRESA ELECTRICA "QUITO" S. A.

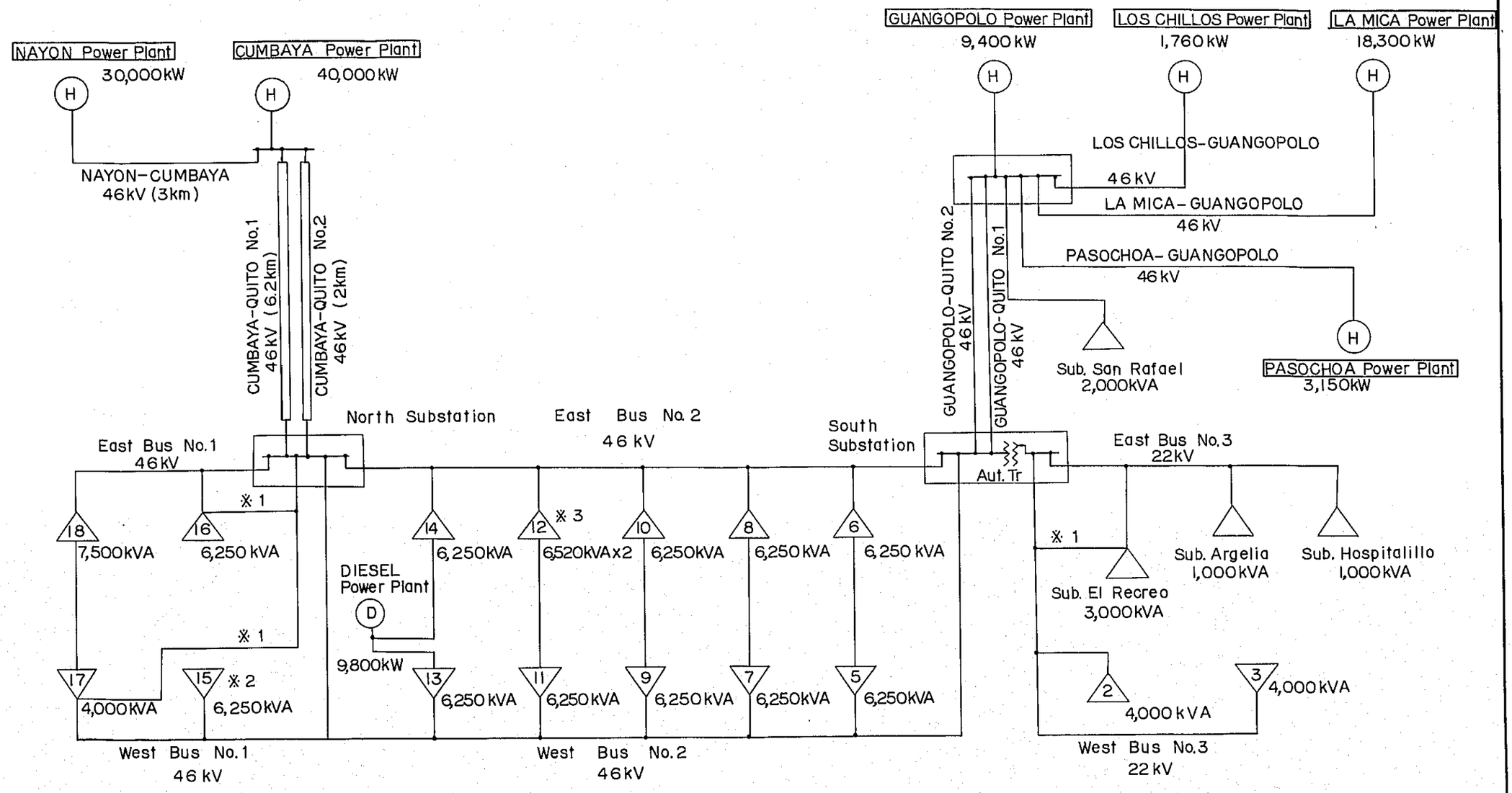
SCHEME OF EXTENSION OF TRANSMISSION & DISTRIBUTION SYSTEM

ELECTRIC POWER DEVELOPMENT CO., LTD.
("P D Consultants) TOKYO JAPAN

D. R. SUBMITTED:
T. R. RECOMMENDED:
C. R. APPROVED:

HO 20 60 001A

DRAWING NO. 16



LEGND

- (H) : Hydro Power Plant
- (D) : Diesel Power Plant
- ▭ : Main Substation
- △ : Distribution Substation
- ——— : Existing Lines
- ——— : Lines to be Complited at NAYON stage
- ——— : Lines to be Complited at LA MICA stage

NOTE

※1 These lines will be removed after completion of transmission line system at NAYON stage

※2 Either substation No.13 or No.15 will be constructed

※3 One 6,250kVA transformer will be moved to substation No.11 after completion

LOCATION	DATE	DESCRIPTION	BY
REVISION			

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN

ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
SINGLE LINE DIAGRAM
IN EEQ'S SYSTEM

ELECTRIC POWER DEVELOPMENT CO., LTD.
(EPDC consultants) TOKYO JAPAN

D.P. T.J. SUBMITTED:
T.R K.F RECOMMENDED:
C.K T.S. APPROVED:

HO-20-50-001A

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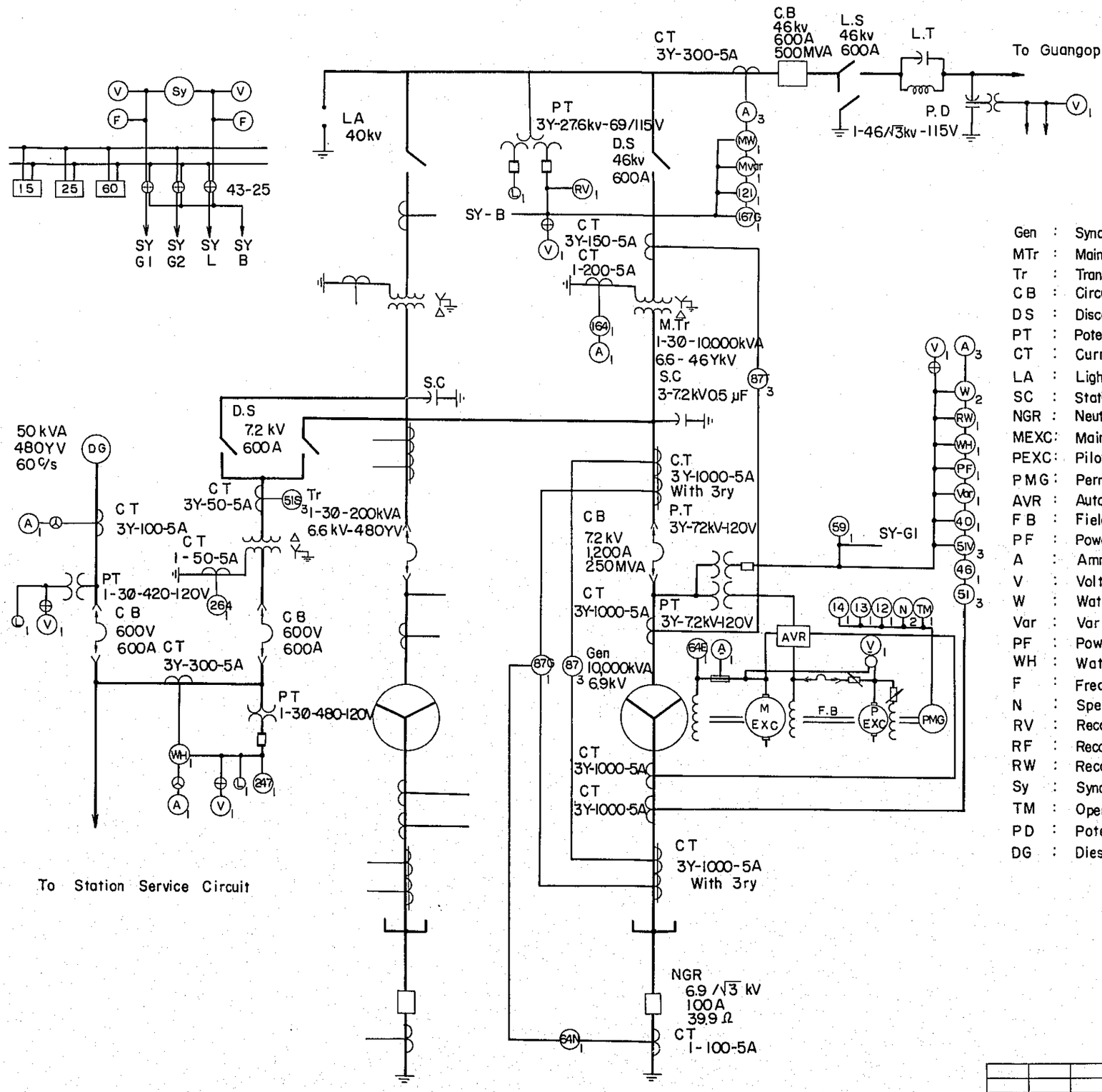


LEGEND

Gen	:	Synchronous Generator	12	:	Over-speed Relay
MTr	:	Main Transformer	13	:	Normal-speed Relay
Tr	:	Transformer	14	:	Under-speed Relay
CB	:	Circuit Breaker	15	:	Speed Matcher
DS	:	Disconnecting Switch	25	:	Synchronizer
PT	:	Potential Transformer	40	:	Excitation Loss Relay
CT	:	Current Transformer	43-25	:	Synchronizing Swith
LA	:	Lightning Arrester			
SC	:	Static Condenser	46	:	Phase Balance Relay
NGR	:	Neutral Ground Resistor	51	:	Over-current Relay
MEXC	:	Main Exciter	51S	:	Over-current Relay
PEXC	:	Pilot Exciter	51V	:	Voltage Restrained Over-current Relay
PMG	:	Permanent Magnetic Generator			
AVR	:	Automatic Voltage Regulator	59	:	Over-voltage Relay
FB	:	Field Breaker	60	:	Voltage Balancer
PF	:	Power Fuse	64E	:	Exciter Circuit Ground Relay
A	:	Ammeter	64N	:	Generator Neutral Ground Relay
V	:	Voltmeter	67	:	Generator Differential Relay
W	:	Wattmeter	87G	:	Generator Ground Differential Relay
Var	:	Var Meter			
PF	:	Power Factor Meter	87T	:	Transformer Differential Relay
WH	:	Watt-Hour Meter	121	:	Short Circuit Distance Relay
F	:	Frequency Meter	247	:	Phase Sequence Voltage Relay
N	:	Speed Meter	264	:	Over-current Ground Relay
RV	:	Recording Valtmeter	167G	:	Directional Ground Relay
RF	:	Recording Frequency Meter			
RW	:	Recording Wattmeter			
Sy	:	Synchroscope			
TM	:	Operation Time Meter			
PD	:	Potential Device			
DG	:	Diesel Engine Generator			

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN

ECUADOR
EMPRESA ELECTRICA "QUITO" S.A.

LA MICA PROJECT
MAIN SINGLE LINE DIAGRAM

ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D.R SUBMITTED:
T.R RECOMMENDED:
C.K.1 APPROVED:

HO -20-40-001A

DRAWING NO. 18

APPENDIX

Appendix-I

STUDY OF LA MICA DAM SITE

Appendix–I. STUDY OF LA MICA DAM SITE

Three possible dam sites can be considered for construction of a reservoir by making use of Lake La Mica. These are, A-site 400 m on the downstream of Lake La Mica, B site 1,300 m on the downstream of the lake and C-site 2,100 m on the downstream of the lake(See Fig. A-I-1).

Of the above three sites, C-site is estimated to be expensive and uneconomical, because the dam will be 52 m high which is higher than the other two sites and will contain 650,000 m^3 of embankment. Therefore, C-site was encluded from detailed study, and A-site and B-site were studied.

Table A-I-1 and A-I-2 give the features and benefits of A and B-sites. It will be noted in the tables that in case of A site, an auxiliary diversion dam must be constructed on the Rio Chico and Qda. Bañio Urria Pungo, and the River run-off must be conducted into Lake La Mica through canals. Besides, at A-site water must be drawn from the bottom of the lake through No. 1 tunnel. However, the total construction cost of A-site amounts to S/. 15,620,000 which is far less than that of B-site. As the dam is 12 m at the highest section and 6 m on the average, the design of the structure is very simple. In case of B-site, the total river run-off can be stored in the reservoir by constructing Rio Antizana No. 1 dam and Rio Chico No. 2 dam, but the dams will be 28 m high and will require 340,000 m^3 of embankment. Moreover, the spillway must be designed with a capacity of 80 m^3/sec. The estimated total construction cost is S/. 29,190,000.

Furthermore, as shown in Fig. A-I-1, it is necessary to excavate the plateau in downstream of Lake La Mica to El. 3,895 meters. This excavation works is not an easy task because the work has to be carried out underwater.

In consideration of the physical features described above and the geological conditions stated in Chapter 6, A-site was selected because it is extremely economical and relatively simple to execute.

Table A-I-1 Comparison of dam dimension of each site

	A-Site (Rio Desaguadero)	B-Site (Rio Antizana)
Reservoir		
Normal high water level	3,904 m	3,094 m
Min. water level		
Total reservoir capacity	3,420,000 m^3	36,000,000 m^3
Effective capacity	21,000,000 m^3	21,000,000 m^3
Drawdown	9.5 m	9.0 m
Dam		
Height	12 m	28 m
Crest length	415 m	400 m
Volume	55,000 m^3	340,000 m^3
Spillway		
Design flood discharge	30 m^3/sec	80 m^3/sec
Estimated construction costs	s/. 5,012,000	s/. 29,190,000

Table A-I-2 Comparison of construction cost of dam of each site

Unit: sucres

	A-Site (Rio Desaguadero)	B-Site (Rio Antizana)	
No. 1 diversion dam	526,200		
No. 1 diversion canal	456,000		
No. 2 diversion dam (including spillway)	713,000		
No. 2 diversion canal	903,000		
Main dam	5,012,000	Main dam	29,190,000
No. 1 tunnel	7,350,000		
Canal-I (= 690 m)	660,000		
Total cost	15,620,000		29,190,000

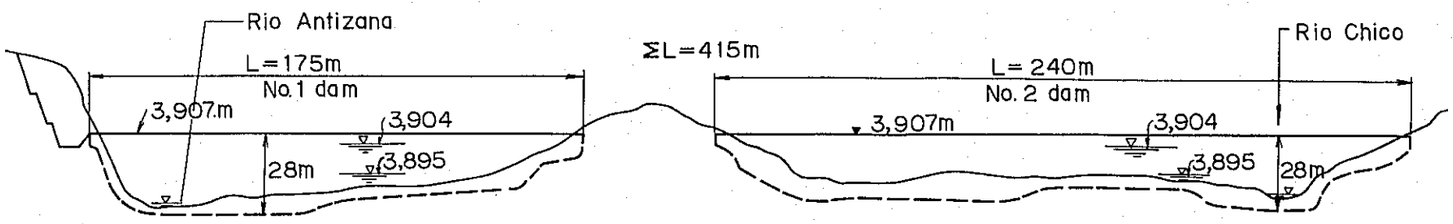
Note: See Table 9-1

Table A-I-3 Construction cost of main dam at B-site

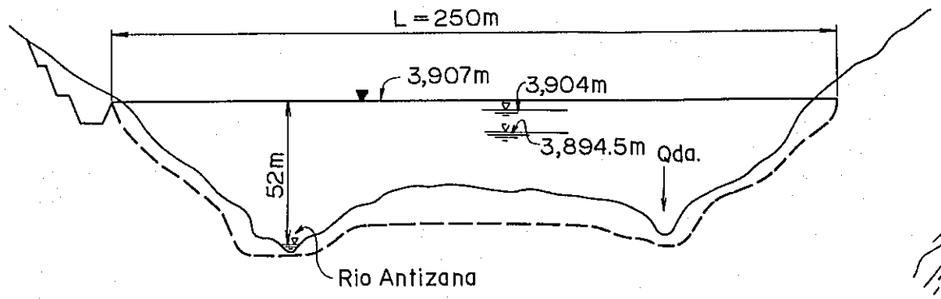
Unit: sucres

	Quantity	Unit Price	Total
Open-cut excavation (common) including dike excavation	250,000 m^3	15	3,750,000
Open-cut excavation (rock)	30,000 m^3	40	1,200,000
Embankment (impervious zone)	85,000 m^3	37	3,145,000
Embankment (rock zone)	197,000 m^3	40	7,880,000
Concrete in spillway	5,000 m^3	800	4,000,000
Concrete in diversion canal including plug	1,500 m^3	800	1,200,000
Excavation of coffer dam	3,500 m^3	20	75,000
Embankment of coffer dam	2,800 m^3	25	70,000
Reinforcement steel bar	50 ton	4,000	200,000
Foundation grouting	lump-sum	—	2,000,000
Handrail, steel pipe	20 ton	13,000	260,000
Illumination system	30 post	3,100	93,000
Other works	lump-sum	—	2,657,000
Total			29,190,000

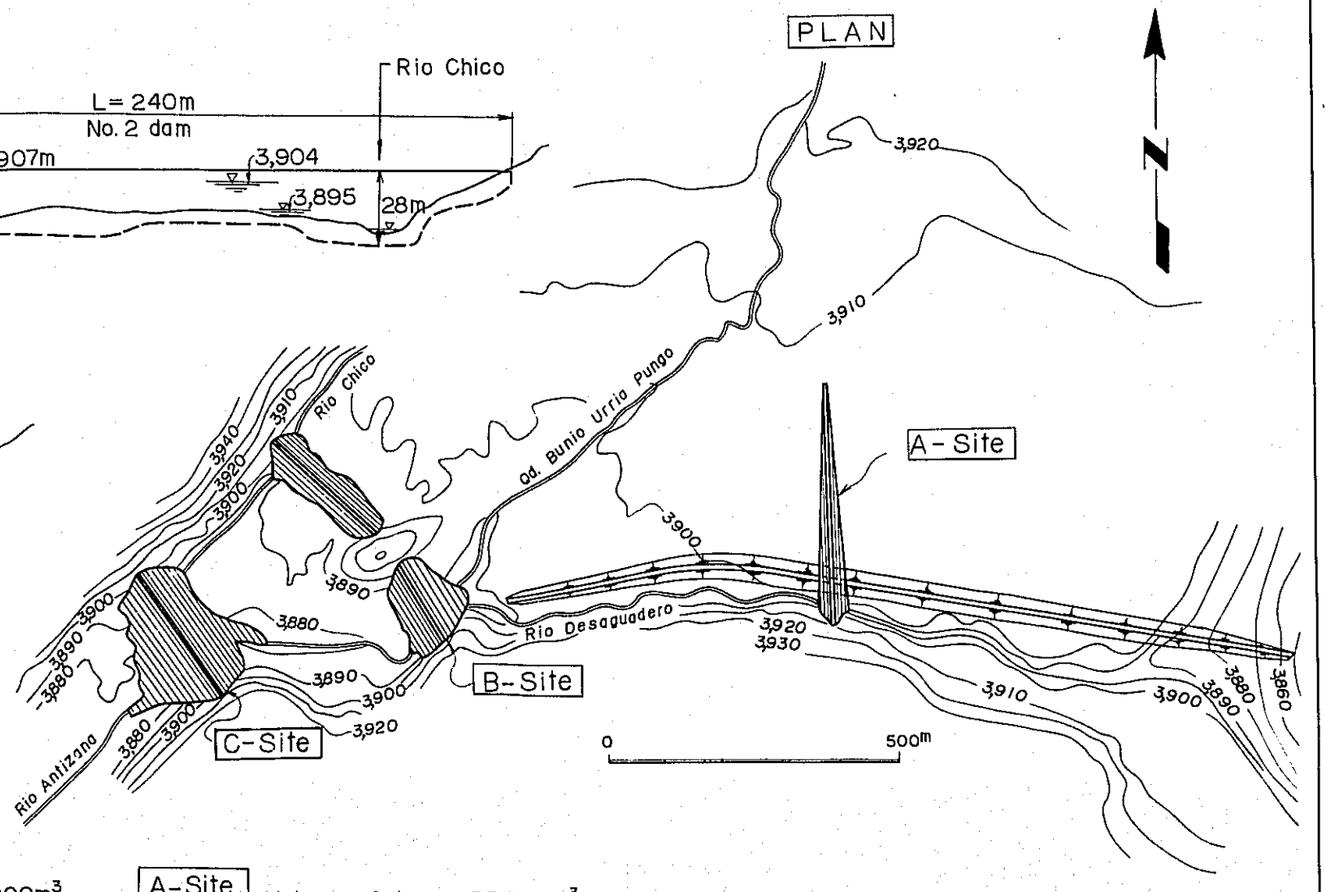
PROFILE OF "B" Site Dam



PROFILE OF "C" Site Dam



PLAN



C-Site Volume of dam=650.000m³ B-Site Volume of dam=340.000m³ A-Site Volume of dam = 55.000m³

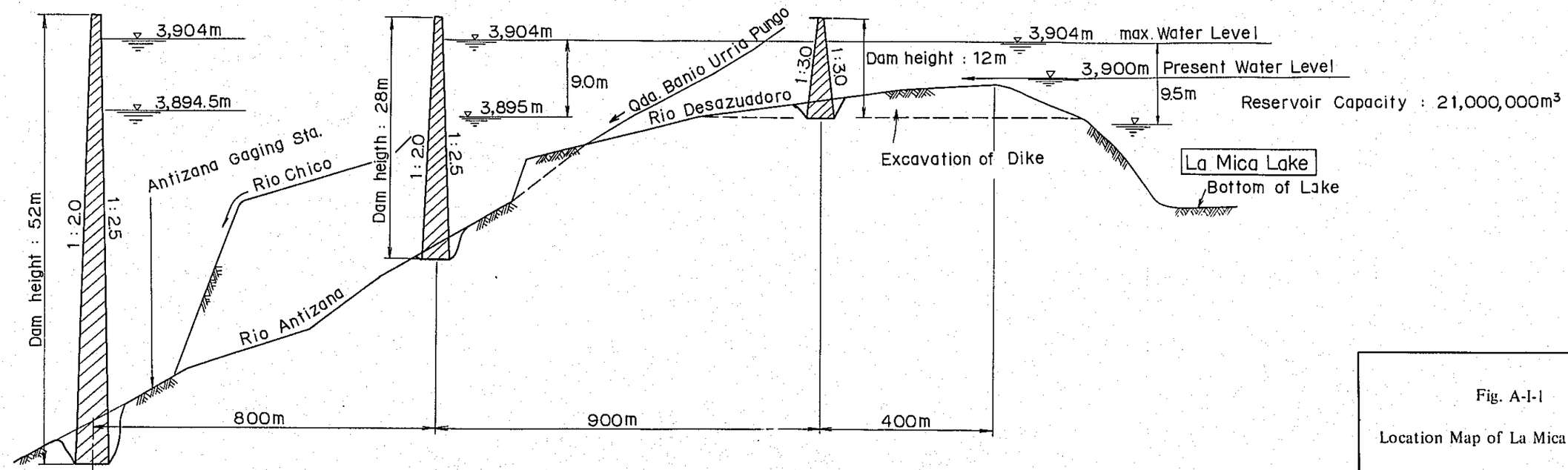


Fig. A-I-1

Location Map of La Mica Dam Site

Appendix-II

RELATION BETWEEN LA MICA HYDRO POWER PROJECT AND WATER SERVICE PROJECT

Appendix-II. RELATION BETWEEN LA MICA HYDRO POWER PROJECT AND WATER SERVICE PROJECT

"Empresa de Agua Potable" is promoting the Pita-Tambo Project to augment the storage of potable water, supply to Quito City. In the first stage it is scheduled to draw an average of 1.6 m^3/sec. of water from Rio Pita. The scheduled completion date of the first stage is 1972. However, this water will satisfy the demand for only 12 years from 1973 to 1984. Therefore, the following three plans are being studied to cover the water shortage after 1984.

(1) To conduct potable water of maximum 3 m^3/sec. from La Mica Power Plant through the interconnection waterway after 1984.

(2) To conduct water of 1.4 m^3/sec. from Rio Tambo and divert it to Rio Rita.

(3) To construct a seasonal regulating reservoir in the mid-stream of Rio Pita to store water in the wet seasons, and to supply the potable water in the dry seasons.

A. Demand of potable water in Quito City

The population using the potable water in Quito City was 394,992 in 1967 and consumption was 1,000 liter/sec. Under the present condition, because of limited supply capability the maximum demand is restricted, and if the potential demand is taken into consideration, it is estimated that the maximum demand is 1,600 liter/sec.

Table A-II-1 shows the actual results of water supplied by "Empresa de Agua Potable" in 1967.

Table A-II-1 Actual Results of Potable Water Supply in 1967

Month	Actual Result		Demand
	m^3	m^3/s	m^3/s
Jan.	2,749,300	1.025	0.960
Feb.	2,481,490	0.600	0.960
Mar.	2,731,210	1.019	0.960
Apr.	2,722,920	0.706	0.960
May	2,832,490	1.056	0.960
Jun.	2,708,590	0.702	0.960
Jul.	2,707,370	1.010	1.600
Aug.	2,556,650	0.954	1.600
Sept.	2,329,680	0.604	1.600
Oct.	2,723,700	1.016	1.600
Nov.	2,504,290	0.649	1.280
Dec.	2,406,920	0.898	1.280
Total	31,454,610	0.857	1.229

Note: The population served in 1967 was 394,992. If the maximum demand is 350 liter/day (0.000405 *l* /sec) per capita, the maximum demand by population will be 1.600 *l*/sec.

At present, the maximum demand is greatly restricted in Quito City from June to October. Only 60–70% of the maximum demand is being supplied in these months.

The potable water demand in the future will be forecasted on the basis of 350 liters per day per capita. The result is as shown in Table A-II-2.

B. Supply facilities owned by "Empresa de Agua Potable"

The facilities for water service is very poor in Quito City at present. The water of 0.38 m^3/sec. is obtained from Placer and Rumipanba sites and the water of about 0.62 m^3/sec. is drawn from the pumping station established in Quito City. The facilities has the capacity to secure the water of only 1.0 m^3/sec. in total. The maximum demand cannot be met under the present condition.

C. Pita Project (First Stage)

The description of Pita Project are as follows. Rio Pita flows in the eastern slope of Mt. Cotopaxi. The run-off of Rio Pita will be intaken at elevation 3,322.15 m and will be conducted through a waterway with a maximum capacity 3.0 m^3/sec. A part of the waterway will be open canal, about 15.5 km, at the foot of Mt. Pasochoa. The electric power of 4,500 KW will be generated by utilizing the head of 194 m on the way. Water released from Pasochoa power plant, will be conducted by a tunnel and an open canal and cross the large valley of Rio San Pedro by a siphon. Finally, the water will be led to the purification plant in the suburbs of Quito City.

The construction of this project is expected to begin in 1969 and completed in 1972. By this work, there will be no shortage of potable water in Quito City for 12 years until 1984.

Table A-II-2 Demand of Potable Water in Quito City

Year	Population of Consumer	Demand of (A) Potable Water (m^3/sec.)	Placer (1) (m^3/sec.)	Pumping-up (2) (m^3/sec.)	Rumipanba (3) (m^3/sec.)	Pita Project (4) (m^3/sec.)	Pita Project (5) (m^3/sec.)	Total (1) – (5) = (B) (m^3/sec.)	Shortage (B) - (A) (m^3/sec.)	Diverted Water from La Mica (m^3/sec.)
1967	394,992	1.60	0.508	0.493	0.03			1.031	-0.569	
68	409,620	1.66	0.50	0.530	0.03			1.06	-0.60	
69	424,248	1.72	0.50	0.580	0.03			1.11	-0.61	
1970	438,876	1.78	0.50	0.580	0.03			1.11	-0.67	
71	453,504	1.84	0.50	0.580	0.03			1.11	-0.73	
72	468,132	1.90	0.35	0.17	0.03	*0.35	1.00	1.90	0	
73	482,760	1.96	0.35	0.23	0.03	0.35	1.00	1.96	0	
74	497,388	2.02	0.35	0.29	0.03	0.35	1.00	2.02	0	
75	512,016	2.07	0.35	0.34	0.03	0.35	1.00	2.07	0	
76	526,644	2.13	0.35	0.15	0.03	0.35	1.25	2.13	0	
77	541,272	2.19	0.35	0.21	0.03	0.35	1.25	2.19	0	
78	555,900	2.25	0.35	0.27	0.03	0.35	1.25	2.25	0	
79	570,528	2.31	0.35	0.33	0.03	0.35	1.25	2.31	0	
1980	585,156	2.37	0.35	0.39	0.03	0.35	1.25	2.37	0	
81	599,784	2.43	0.35	0.45	0.02	0.35	1.25	2.43	0	
82	614,412	2.49	0.35	0.51	0.03	0.35	1.25	2.49	0	
83	629,040	2.55	0.35	0.57	0.03	0.35	1.25	2.55	0	
84	643,668	2.61	0.35	0.18	0.03	0.35	1.25	2.16	-0.45	** 0.45
85	658,296	2.67	0.35	0.18	0.03	0.35	1.25	2.16	-0.51	0.51
86	672,924	2.73	0.35	0.18	0.03	0.35	1.25	2.16	-0.57	0.57
87	687,552	2.79	0.35	0.18	0.03	0.35	1.25	2.16	-0.63	0.63
88	702,180	2.84	0.35	0.18	0.03	0.35	1.25	2.16	-0.68	0.68
89	716,808	2.90	0.35	0.18	0.03	0.35	1.25	2.16	-0.74	0.74
1990	731,435	2.96	0.35	0.18	0.03	0.35	1.25	2.16	-0.80	0.80
91	746,062	3.02	0.35	0.18	0.03	0.35	1.25	2.16	-0.86	0.86
92	760,689	3.08	0.35	0.18	0.03	0.35	1.25	2.16	-0.92	0.92
93	775,316	3.14	0.35	0.18	0.03	0.35	1.25	2.16	-0.98	0.98
94	789,943	3.20	0.35	0.18	0.03	0.35	1.25	2.16	-1.04	1.04
95	814,308	3.30	0.35	0.18	0.03	0.35	1.25	2.16	-1.14	1.14
96	838,673	3.40	0.35	0.18	0.03	0.35	1.25	2.16	-1.24	1.24
97	863,038	3.50	0.35	0.18	0.03	0.35	1.25	2.16	-1.34	1.34
98	887,403	3.59	0.35	0.18	0.03	0.35	1.25	2.16	-1.43	1.43
99	911,768	3.69	0.35	0.18	0.03	0.35	1.25	2.16	-1.53	1.53
2000	936,133	3.79	0.35	0.18	0.03	0.35	1.25	2.16	-1.63	1.63
01	960,498	3.89	0.35	0.18	0.03	0.35	1.25	2.16	-1.73	1.73
02	984,863	3.99	0.35	0.18	0.03	0.35	1.25	2.16	-1.83	1.83
03	1,009,228	4.09	0.35	0.18	0.03	0.35	1.25	2.16	-1.93	1.93
04	1,033,593	4.19	0.35	0.18	0.03	0.35	1.25	2.16	-2.03	2.03
05	1,065,468	4.32	0.35	0.18	0.03	0.35	1.25	2.16	-2.16	2.16
06	1,097,342	4.45	0.35	0.18	0.03	0.35	1.25	2.16	-2.29	2.29
2007	1,129,217	4.57	0.35	0.18	0.03	0.35	1.25	2.16	-2.41	2.41

Note: * Pasochoa, in operation in 1972 ** Diversion from La Mica, 1984

(B): Supply sources

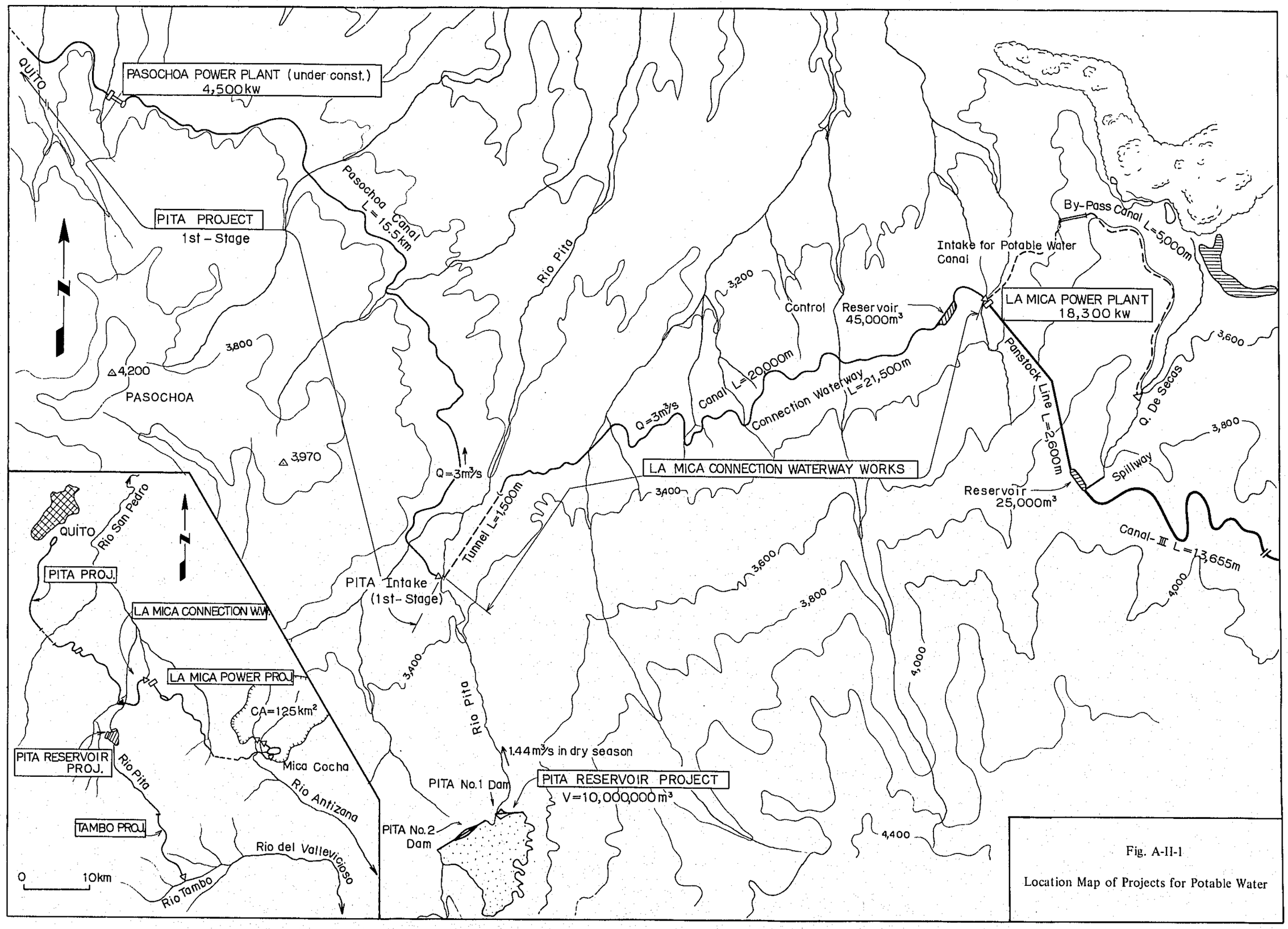


Fig. A-II-1

Location Map of Projects for Potable Water

D. Project to Conduct potable water from La Mica

This project is the second stage work to supply potable water to Quito after 1985. This project is to conduct an annual average of 2.3 m^3/sec. and a maximum of 3.0 m^3/sec. of water from La Mica Power Plant which is scheduled to be in operation in 1974.

Considering the potable water demand, the reservoir capacity is decided to be 21,000,000 m^3 which is the same as the capacity for power generation.

With this reservoir, it will be possible to supply 3 m^3/sec. of water in the dry months of July, August and September and 2.8 m^3/sec. to 2.35 m^3/sec. in October to December (See Fig. 5-9).

For conducting the water from La Mica Power Plant to Pita diversion dam (first stage) it will be necessary to construct a re-regulating pond, a bypass waterway for potable water, an interconnection waterway, etc. The estimated cost of the work is s/. 19,237,500, and including the allocation of s/. 79,681,900, for common structures of the La Mica Project, (when division of water is started in 1984) the total costs amounts to s/. 98,919,400.

Principal features of Interconnection Waterway

(1) Bypass Waterway for Potable Water

This is the facility to conduct water from the head tank to the interconnection waterway during the maintenance of the powerhouse or penstock of La Mica Power Station.

Volume of flow:	3 m^3/sec.
Length:	5,000 m
Cross section:	Trapezoidal, 1.40 m in height, 1.20 m in width
Gradient:	1/1,000 (0.1%)

(The water drop facilities of 40 m in height is necessary for the bypass waterway)

As an alternative a bypass waterway of steel pipe can be considered. The pipe will be installed parallel with the penstock for power generation. However, the alternative plan is more expensive.

(2) Re-regulating Pond

With this re-regulating pond, the maximum discharge of 4.5 m^3/sec. for power generation is re-regulated and released into the connection waterway with a capacity of 3 m^3/sec.

Normal high water level:	3,339.00 m
Low water level:	3,337.80 m
Effective storage capacity:	42,000 m^3

Drawdown:	1.20 m		
Dimensions:	Length = 500 m	Width =	100 m

(3) Open Canal between Power Plant and Re-regulating Pond

Discharge:	4.5 m^3/sec.	
Length:	1,100 m	
Cross section:	trapezoidal	
	bottom width:	1.20 m
	slope gradient:	1 : 1
	height:	1.80 m
	gradient:	1/1,500 (0.067%)

(4) Interconnection Waterway (between Re-regulating Pond and Pita Diversion Dam)

Length:	21,500 m (open canal: 20,000 m, tunnel: 1,500 m)

(4)-1 Open canal

Length:	20,000 m	
Cross section:	trapezoidal	
	bottom width:	1.20 m
	slope gradient:	1 : 1
	height:	1.50 m
	gradient:	1/1,000 (0.1%)

(4)-2 Tunnel

Length:	1,500 m	
Cross section:	lining invert only	
	arch section – semi-circular:	1.20 m
	invert section – rectangular:	0.70 m
	height:	1.90 m
	width:	2.40 m
	gradient:	1/1,000 (0.1%)

Table A-II-3 Construction Costs of La Mica Interconnection Waterway

Unit: sucres

		Total Cost	Local Currency	Foreign Currency
(1)	Re-regulating pond	9,500,000	6,462,100	3,037,900
(2)	Bypass waterway for city water	7,000,000	5,481,000	1,519,000
(3)	Waterway between power plant and re-regulating pond	8,102,000	6,343,700	1,758,300
(4)	Waterway between re-regulating pond and Pita intake dam	34,220,000	26,794,300	7,425,700
(5)	Overhead costs (40%)	(58,822,000) 23,538,000	(45,081,100) 18,038,900	(13,740,900) 5,499,100
	Total	82,360,000	63,120,000	19,240,000

Note: Unit cost of canal: s/. 1,400 per meter
Unit cost of tunnel: s/. 4,150 per meter

E. Tambo Project

This project is the second stage of the Pita Project to divert 1.4 m^3/sec. of water from Rio Tambo, tributary of Rio Antizana which flows into Amazon River to the Rio Pita basin and to store the water behind a diversion dam which is scheduled to be constructed in the first stage. There are technical and economic problems involved because of the relatively high cost of the waterway which will be long and the very limited availability of run-off records. However, this is a promising second stage project for water supply to Quito.

F. Pita Reservoir Project

The first stage diversion structure is a run-off-river type scheme and there will be substantial spill in the rainy seasons even if water for irrigation on the downstream is deducted. (See Fig. A-II-2)

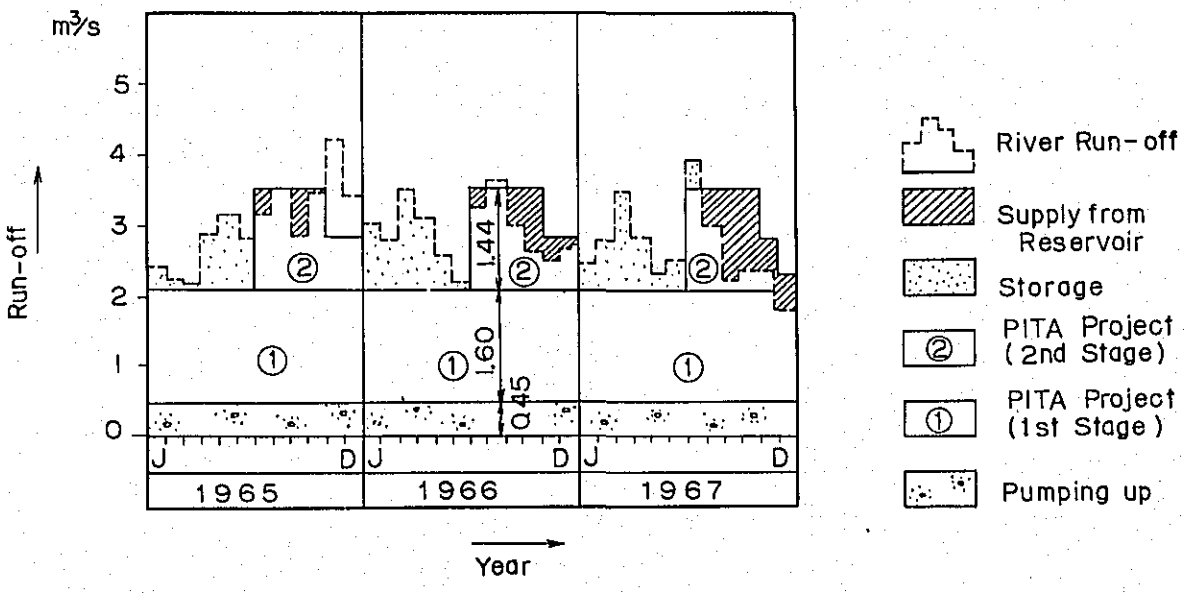


Fig. A-II-2 Gaging discharge in Rio Pita

According to this project, this water will be stored a reservoir of 10,000,000 m^3 stotage capacity and released for water supply during the period from July to December to cover the potable water shortage. A rock-fill dam of 45 m in height will be constructed in the valley 300 m upstream of the confluence of Qda. Panzapunga in the mid-stream of Rio Pita at this time. There are run-off data for 4.5 years from 1965 to date. The data are shown in Fig. A-II-1 and Table A-II-4. The operating rule of Pita reservoir is shown in Tables A-II-5 to A-II-7.

Table A-II-4 5 days-Discharge in Rio Pita (4-1)

(Unit: m^3/s) Year: 1965

Date	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Date
1–5	2.39	2.36	2.15	4.48	3.28	2.79	2.89	6.10	2.92	2.53	3.33	3.60	1–5
6–10	2.39	2.21	2.16	2.49	2.99	2.79	2.53	3.33	2.93	3.41	3.98	4.56	6–10
11–15	2.39	2.15	2.12	2.42	3.53	2.59	3.11	2.82	2.58	4.39	5.66	2.86	11–15
16–20	2.32	2.20	2.23	2.66	2.65	2.97	4.09	3.03	2.74	3.17	5.30	2.80	16–20
21–25	2.39	2.19	2.14	2.41	3.11	3.19	3.03	2.81	2.86	2.79	3.61	2.97	21–25
26–31	2.45	2.15	2.16	2.78	3.11	2.40	2.99	2.80	2.76	4.15	3.30	3.31	26–31
Average	(2.39)	(2.21)	(2.16)	(2.87)	(3.11)	(2.79)	(3.11)	(3.48)	(2.80)	(3.41)	(4.20)	(3.35)	Average
Total	14.33	13.26	12.96	17.24	18.67	16.73	18.64	20.89	16.79	20.44	25.18	20.10	Total
									Annual Total		(17.94)	215.23	

5 days-Discharge in Rio Pita (4-2)

(Unit: m^3/s) Year: 1966

Date	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Date
1–5	3.25	2.68	4.44	3.67	2.60	2.19	2.25	3.22	2.74	2.88	2.36	2.72	1–5
6–10	3.41	2.96	3.10	–	2.57	2.13	2.25	4.24	2.66	2.44	2.73	2.53	6–10
11–15	3.30	2.99	2.78	–	2.74	2.22	3.22	–	3.94	2.92	2.18	2.80	11–15
16–20	2.66	2.63	3.32	2.72	2.39	2.12	2.61	–	2.79	2.64	2.36	3.15	16–20
21–25	2.65	2.72	2.69	3.08	2.57	2.16	5.72	4.14	2.69	2.16	2.29	2.27	21–25
26–31	2.71	2.61	4.48	2.80	2.27	2.29	3.10	2.73	2.80	2.30	2.82	2.35	26–31
Average	(3.00)	(2.77)	(3.47)	(3.07)	(2.52)	(2.19)	(3.19)	(3.58)	(2.94)	(2.56)	(2.46)	(2.64)	Average
Total	17.98	16.59	20.81	12.27	15.14	13.11	19.15	14.33	17.62	15.34	14.74	15.82	Total
									Annual Total		(16.08)	192.90	

5 day-Discharge in Rio Pita (4-3)

(Unit: m^3/s) Year: 1967

Date	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Date
1–5	2.31	2.36	2.82	2.80	2.20	3.12	3.63	3.31	2.86	2.16	1.54	2.11	1–5
6–10	2.18	3.51	4.76	2.87	2.21	2.37	2.97	3.89	1.85	2.33	2.14	1.66	6–10
11–15	2.82	2.38	4.13	2.34	2.43	4.00	2.75	2.35	1.85	1.85	2.09	1.89	11–15
16–20	2.67	2.95	3.35	2.70	2.36	2.49	3.70	2.26	2.24	2.09	4.14	2.04	16–20
21–25	2.15	2.67	2.73	3.47	2.24	2.96	3.04	3.20	2.30	1.98	1.68	1.47	21–25
26–31	2.33	2.48	2.72	2.50	2.24	2.81	7.21	2.64	1.95	3.57	2.53	1.59	26–31
Average	(2.41)	(2.73)	(3.42)	(2.78)	(2.28)	(2.96)	(3.88)	(2.94)	(2.18)	(2.33)	(2.35)	(1.79)	Average
Total	14.46	16.35	20.51	16.68	13.68	17.75	23.30	17.65	13.05	13.98	14.12	10.76	Total
									Annual Total		(16.02)	192.29	

5 day-Discharge in Rio Pita (4-4)

(Unit: m^3/s) Year: 1968

Date	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.		Date
1–5	2.13	2.20	2.06	2.06	2.13	2.11	2.17		1–5
6–10	2.20	1.12	2.28	2.73	2.07	2.96	2.36		6–10
11–15	1.69	1.75	2.67	2.52	1.84	3.12			11–15
16–20	1.38	2.16	2.38	2.18	1.70	2.37			16–20
21–25	2.26	1.40	2.23	2.10	1.92	2.94			21–25
26–31	2.43	3.25	2.25	1.99	2.01	2.62			26–61
Average	(2.02)	(1.98)	(2.31)	(2.26)	(1.95)	(2.69)	(2.27)		Average
Total	12.09	11.88	13.87	13.58	11.67	16.12			Total

Annual Total (13.20) 79.21

Table A-II-5 Regulating of Rio Pita's Discharge by Reservoir in 1965

Month	River Run-off m^3/s(1)	(1) – (2.05 m^3/s)		Storage	Supply	
		m^3/s	m^3	m^3	m^3	m^3/s
Jan.	2.39	0.34	910,660	0	0	0
Feb.	2.21	0.16	387,070	1,297,730	0	0
Mar.	2.16	0.11	294,620	1,592,350	0	0
Apr.	2.87	0.82	2,125,400	3,717,750	0	0
May	3.11	1.06	2,839,100	6,556,850	0	0
Jun.	2.79	0.74	1,918,080	8,474,930	0	0
Jul.	3.11	1.06	2,839,100	7,462,120	3,856,890	1.44
Aug.	3.48	1.43	3,830,110	7,435,340	3,856,890	1.44
Sept.	2.80	0.75	1,944,000	5,622,450	3,756,890	1.44
Oct.	3.41	1.36	3,642,620	5,408,180	3,856,890	1.44
Nov.	4.20	2.15	5,572,800	9,114,740	1,866,240	0.72
Dec.	3.35	1.30	3,481,920	over 10,000,000	1,928,450	0.72
Annual			29,785,480		19,122,250	

Table A-II-6 Regulating of Rio Pita's Discharge by Reservoir in 1966

Month	River Run-off m^3/s (1)	(1) – (2.05 m^3/s)		Storage	Supply	
		m^3/s	m^3	m^3	m^3	m^3/s
Jan.	3.00	0.95	2,544,480	0	0	0
Feb.	2.77	0.72	1,741,820	4,286,300	0	0
Mar.	3.47	1.42	3,803,330	8,089,630	0	0
Apr.	3.07	1.02	2,467,580	over 10,000,000	0	0
May	2.52	0.47	1,258,850	over 10,000,000	0	0
Jun.	2.19	0.14	338,690	over 10,000,000	0	0
Jul.	3.19	1.14	3,053,380	9,196,490	3,856,890	1.44
Aug.	3.58	1.53	4,097,950	9,437,550	3,856,890	1.44
Sept.	2.94	0.89	2,153,090	7,833,750	3,756,890	1.44
Oct.	2.56	0.51	1,365,980	9,199,730	3,856,890	1.44
Nov.	2.46	0.41	991,870	8,325,360	1,866,240	0.72
Dec.	2.64	0.59	1,580,260	7,977,170	1,928,450	0.72
Annual			25,397,280		19,122,250	

Table A-II-7 Regulating of Rio Pita's Discharge by Reservoir in 1967

Month	River Run-off m^3/s (1)	(1) – (2.05 m^3/s)		Storage m^3	Supply	
		m^3/s	m^3		m^3	m^3/s
Jan.	2.41	0.36	964,200	0	0	0
Feb.	2.73	0.68	1,645,000	2,609,200	0	0
Mar.	3.42	1.37	3,669,400	6,278,600	0	0
Apr.	2.78	0.73	1,892,200	8,170,800	0	0
May	2.28	0.23	616,000	8,786,800	0	0
Jun.	2.96	0.91	2,358,720	10,000,000	0	0
Jul.	3.88	1.83	4,901,500	10,000,000	3,856,890	1.44
Aug.	2.94	0.89	2,383,780	8,526,890	3,856,890	1.44
Sept.	2.18	0.13	336,960	5,105,960	3,756,890	1.44
Oct.	2.33	0.28	749,950	1,999,020	3,856,890	1.44
Nov.	2.35	0.30	777,600	910,380	1,866,240	0.72
Dec.	1.79	0		0	910,380	
Annual			20,295,310		10,390,400	

The principal features of the Rio Pita Project are as follows.

Effective reservoir capacity:	10,000,000 m^3
Normal high water level:	3,560 m
Low water level:	3,535 m
Drawdown:	25 m
Pita No. 1 Dam	
Type:	rock-fill dam
Height:	43 m
Crest length:	515 m
Width at crest:	8 m
Volume:	570,000 m^3
Upstream slope gradient:	1 : 2.5
Downstream slope gradient:	1 : 2,0
Pita No. 2 Dam	
Type:	rock-fill dam
Height:	25 m
Crest length:	715 m
Width at crest:	8 m
Volume:	380,000 m^3
Upstream slope gradient:	1 : 2.5
Downstream slope gradient:	1 : 2.0

The estimated construction costs of the Pita Project are estimated to be S/. 72,300,000. The breakdown is as shown in Table A-II-8.

Table A-II-8 Estimated Construction Costs of Pita Project

Unit: Sucres

No.	Works	Total Cost	Remarks
A-1	Pita No. 1 dam	33,800,000	dam volume : 570,000 m^3
A-2	Pita No. 2 dam	21,800,000	dam volume : 380,000 m^3
A-3	Spillway	1,780,000	
A-4	Outlet structure	755,000	See A-1, A-2, A-3, A-4
	Sub-total	58,135,000	
B-1	Preliminary works	500,000	
	Sub-total (A – B)	58,635,000	
C	Studies & investigation	1,255,000	
D	Land acquisition	100,000	
E	Administration	1,000,000	
F	Engineering fee	1,600,000	
	Sub-total (A – F)	62,790,000	
G	Contingency	6,210,000	
H	Interest during construction	3,300,000	0.4 R.T. = 0.048 T = 1.5
	Grand Total	72,300,000	Annual interest R = 0.08

[A-1] Works of Pita No. 1 dam — volume of dam: 570,000 m^3, crest length: 515 m

Item No.	Item of Works	Quantity	Unit	Unit Price	Construction Cost
1	Excavation, common	190,000	m^3	s/. 15	s/.2,850,000
2	" rock	20,000	m^3	40	800,000
3	Embankment, core	100,000	m^3	25	2,500,000
4	" , filter	90,000	m^3	40	3,600,000
5	" , earth	380,000	m^3	38	14,400,000
6	Grouting	3,400	m	750	2,550,000
7	Water treatment	–	lump-sum	–	1,200,000
8	Division tunnel	300	m	5,000	1,500,000
9	Others	–	lump-sum	–	4,400,000
Total					s/. 33,800,000

[A-2] Works of Pita No. 2 dam — volume of dam: 380,000 m^3, crest length: 715 m, dam height: 25 m

1	Excavation, common	160,000	m^3	15	s/. 2,400,000
2	" , rock	13,000	m^3	40	520,000
3	Embankment, core	80,000	m^3	25	2,000,000
4	" , filter	70,000	m^3	40	2,800,000
5	" , earth	230,000	m^3	38	8,720,000
6	Grouting	2,000	m	750	1,500,000
7	Others	–	lump-sum	–	2,860,000
Total					s/. 21,800,000

[A-3] Works of Spillway

1	Excavation, common	50,000	m^3	15	s/. 750,000
2	" , rock	10,000	m^3	40	400,000
3	Concrete	1,200	m^3	530	396,000
4	Others	–	lump-sum	–	234,000
Total					s/. 1,780,000

[A-4] Outlet Structure

1	Intake	–	lump-sum	–	s/. 120,000
2	Tunnel	150	m	4,000	600,000
3	Others	–	lump-sum	–	35,000
Total					s/. 755,000

G. Development Schedule of Project for Potable Water Supply (Second Stage)

After completion of the first stage of Pita Project, the works to be executed after 1984 are (1) the diversion of water from La Mica, (2) Tambo Project and (3) Pita Reservoir Project.

The problems of which of the three works to select as the second stage work must be coordinated between "Empresa de Agua Potable" and "EEQ" S.A. However, it is necessary to investigate what influence La Mica Project will have on each of the three second stage work for potable water supply.

The results of study of the relation between La Mica Project and the three potable water schemes are as follows:

1) Diversion of water from La Mica in 1984

As shown in Fig. A-II-2, if water diverted from La Mica is plotted on the estimated demand curve for city water, the volume of flow will be 0.45 m^3/sec. at the maximum in 1984 and thereafter increase year by year until it reaches 3 m^3/sec. in the year 2012. *This shows that the water diverted from La Mica for potable water supply can meet the* demand of Quito City for 18 years from 1984.

2) Construction of Tambo Project in 1984

As shown in Fig. A-II-3, if the Tambo Project is plotted on the estimated demand curve for potable water, a maximum of 0.45 m^3/sec. must be supplied in 1984, and the demand will increase year by year and ultimately reach the maximum supply capability of *1.4 m^3/sec. in 1998. It is therefore possible to supply potable water from the Tambo* Project for 15 years from 1984, and thereafter, in 1999, execute the diversion scheme from La Mica as the third stage work.

3) Construction of Pita Reservoir in 1984

As shown in Fig. A-II-4, if the Pita Reservoir Project is plotted on the demand curve for potable water as the second stage work, the supply from this source will start with a *maximum of 0.45 m^3/sec. in 1986, and increase year by year to reach the ultimate capacity* of 1.44 m^3/sec. in 1998. Pita Reservoir Project can supply the water requirements of Quito for 15 years from 1984 which is the same as (2) above. The diversion of water from La Mica may start in 1999 as the third stage work.

Judging from the above results, there are two alternatives in respect of time to divert water from La Mica Project for potable water supply. One is to start supply of water in 1984, 10 years after start of operation of La Mica, and the other is to start supply of water *in 1999, 25 years after start of operation of the Project.*

Fig. A-II-5 shows the monthly distribution of water between power and potable water in case water supply from La Mica Project starts in *1985.*

Fig. A-II-3 Diagram of Potable Water Demand and Supply
(in case of La Mica Project Diverted in 1985)

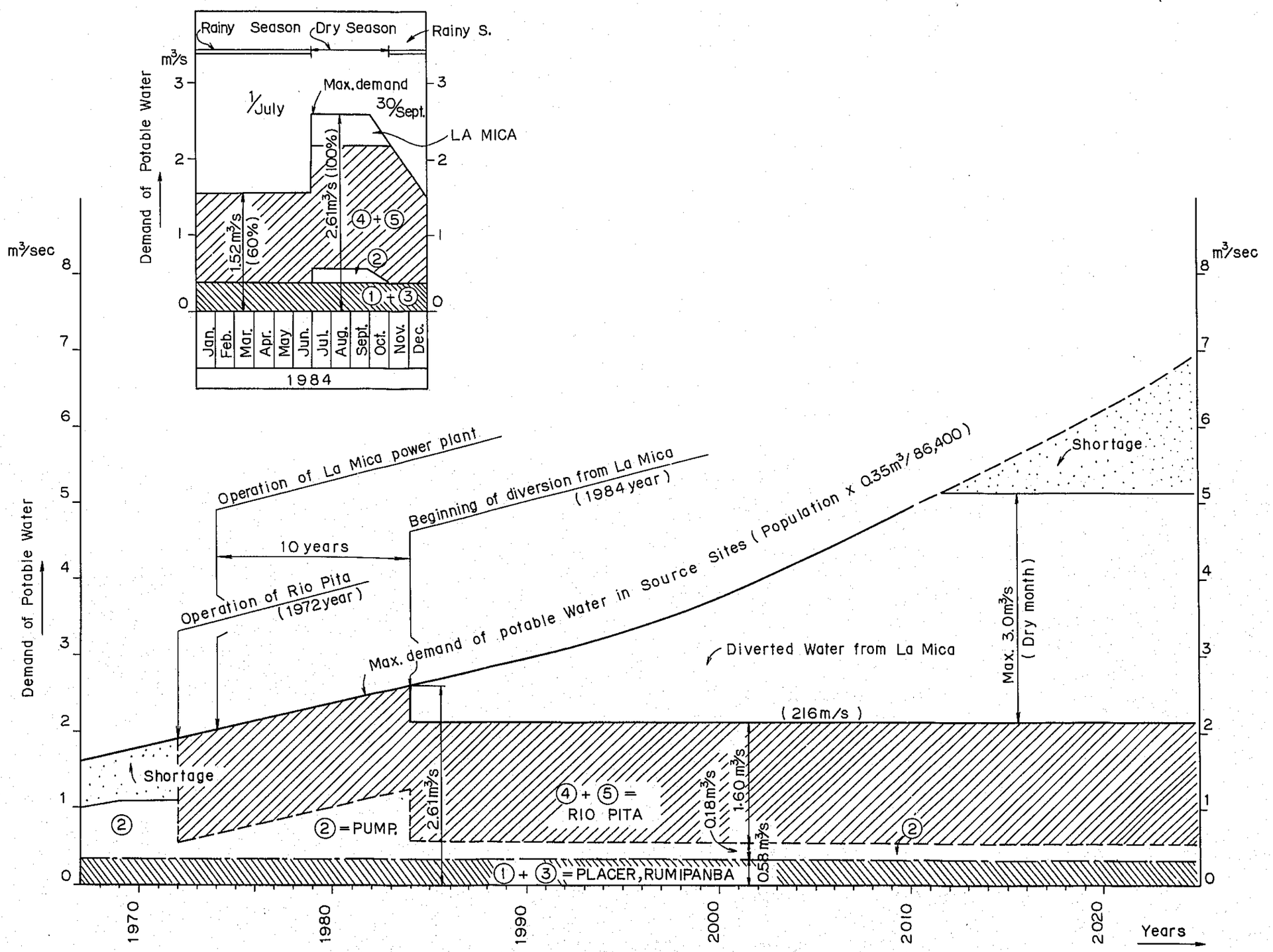


Fig. A-II-4 Diagram of Potable Water Demand and Supply
(in case of La Mica Project Diverted in 1999)

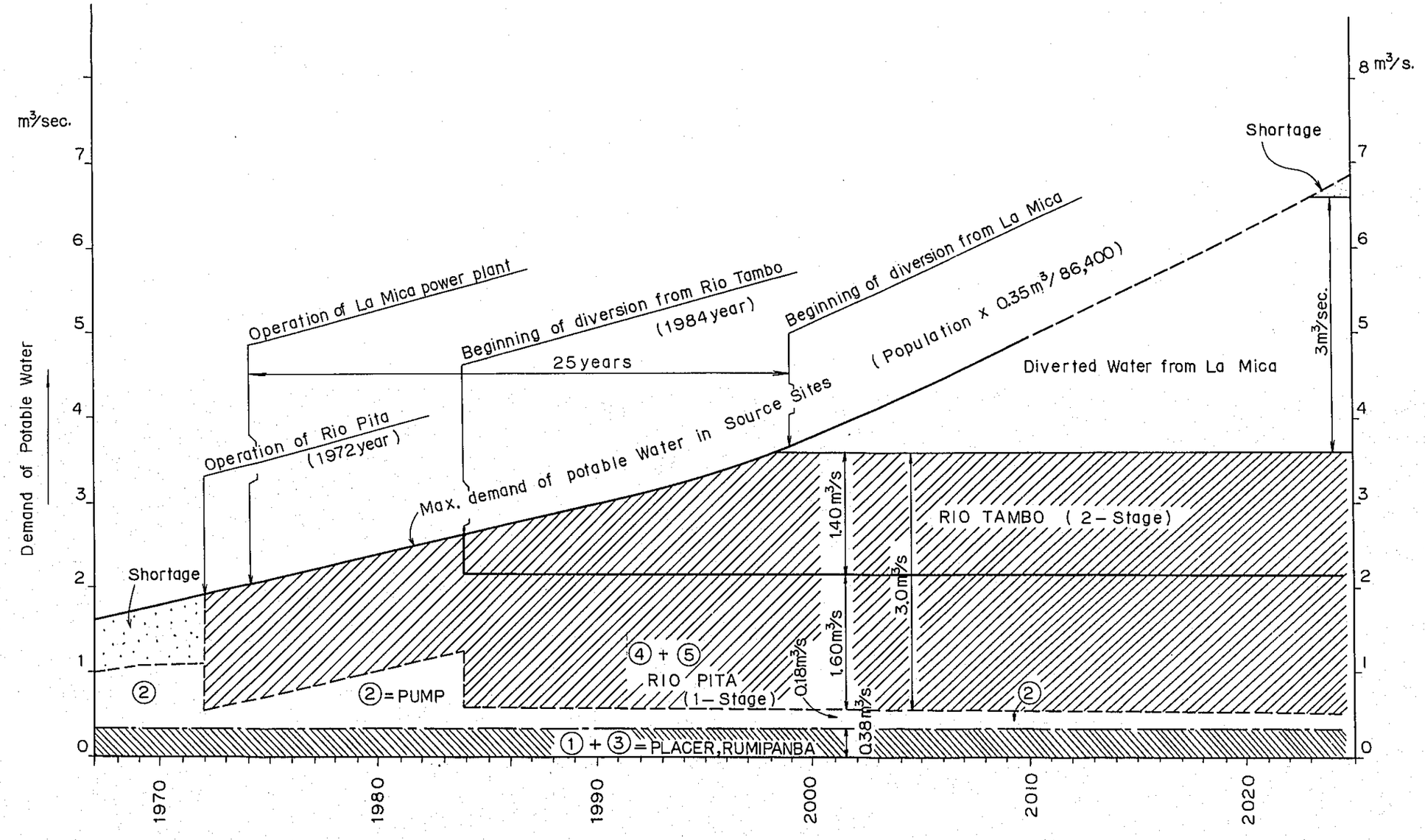


Fig. A-II-5 Diagram of Potable Water Demand and Supply in case of La Mica Project Diverted in 1997 (Second Stage: Pita Reservoir)

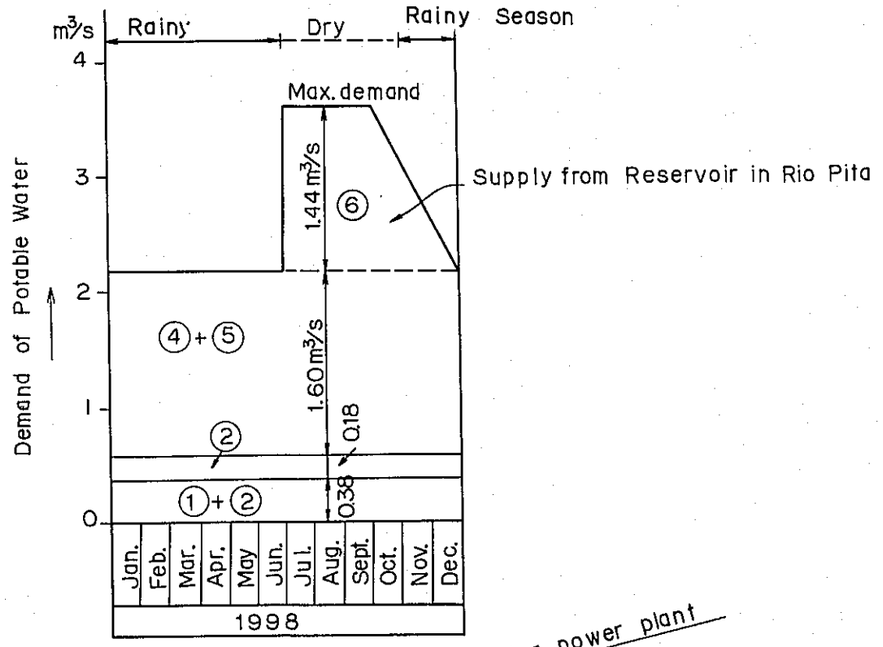
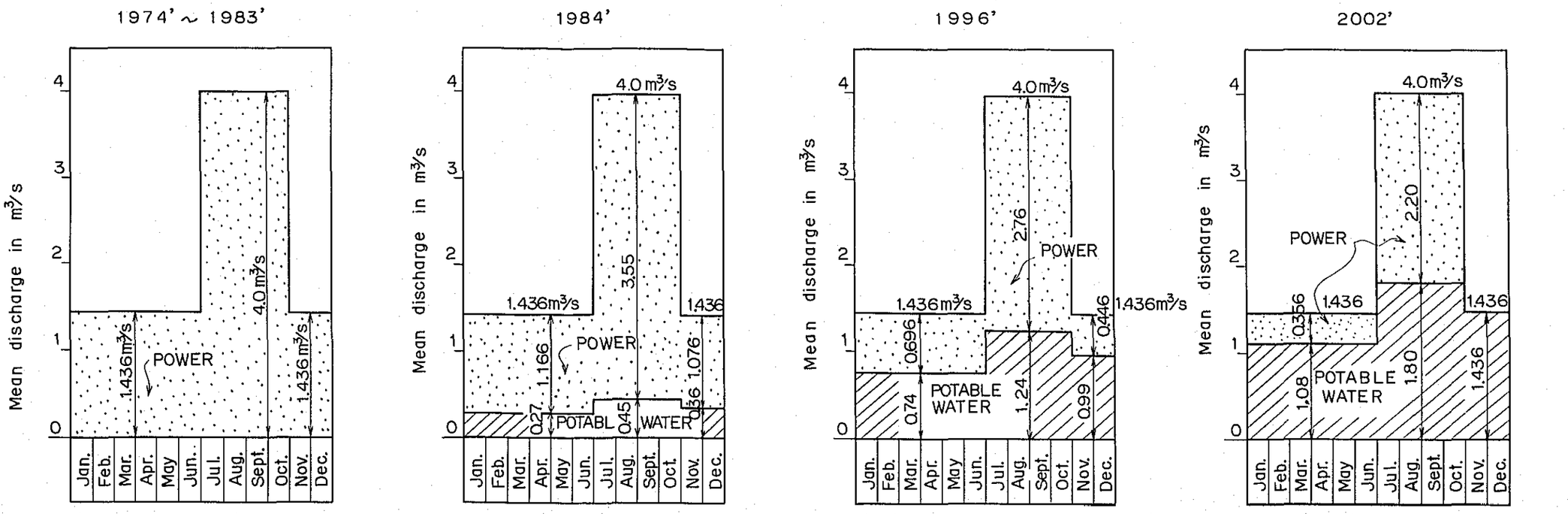
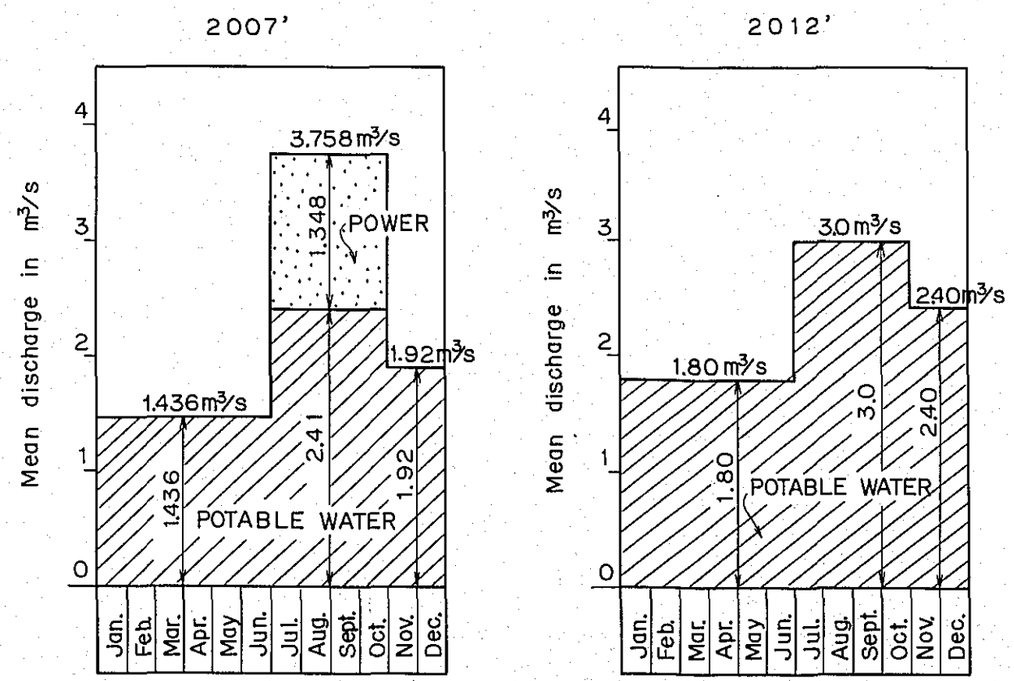


Fig. A-II-6 Allocation for Power and Potable Water in "A" Case





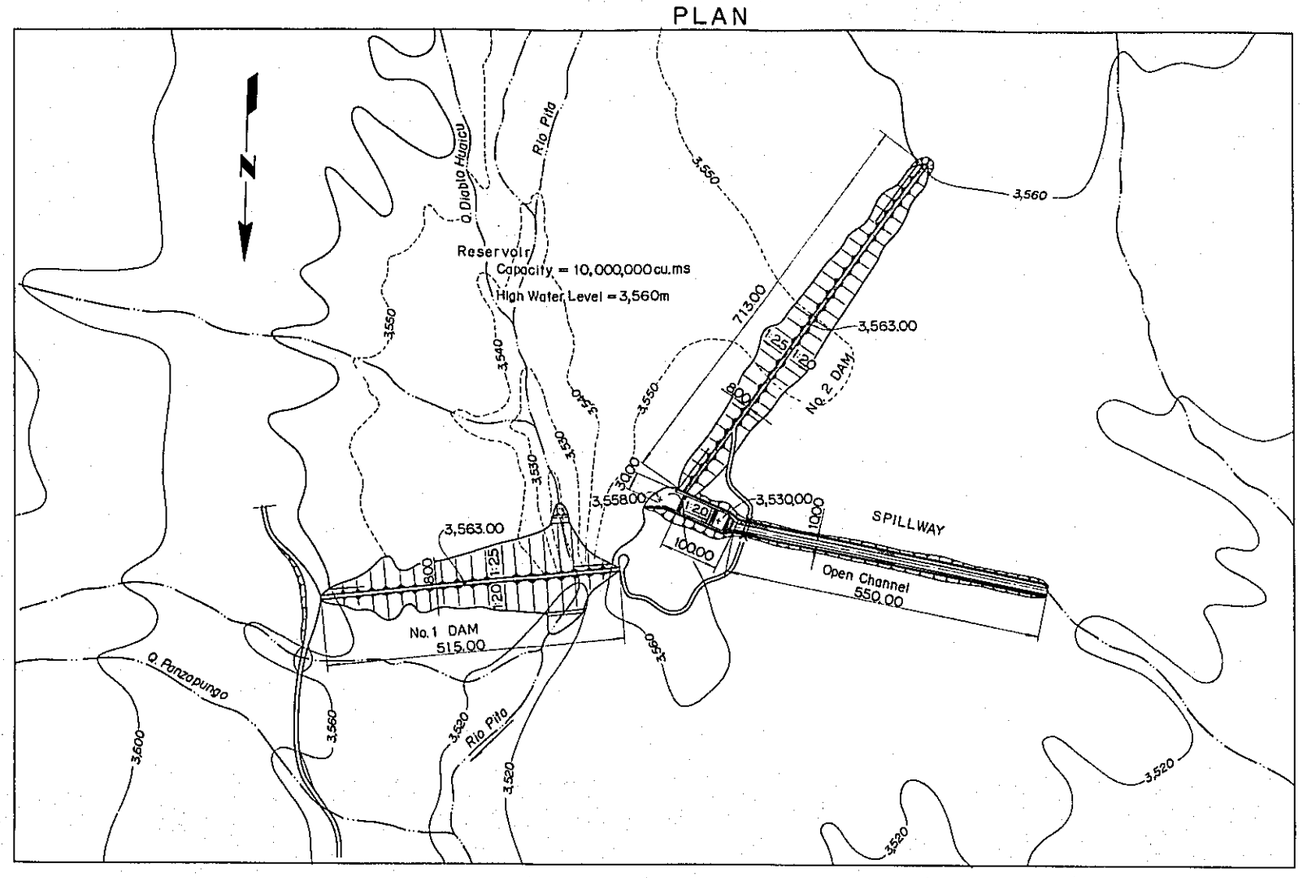
Max. Demand of Potable Water in LA MICA Project	
1984'	0.45 m³/s
1996'	1.24 m³/s
2002'	1.80 m³/s
2007'	2.41 m³/s
2012'	3.00 m³/s
	300 m³/s

LEGEND

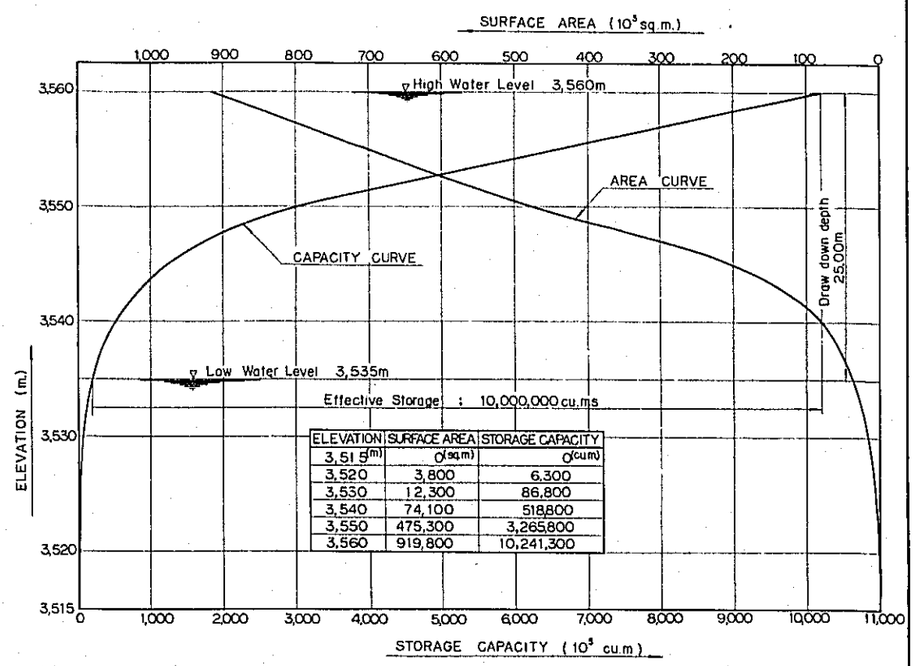
: Discharge for power to SAN PEDRO Power System

: Discharge for Potable Water

PLAN

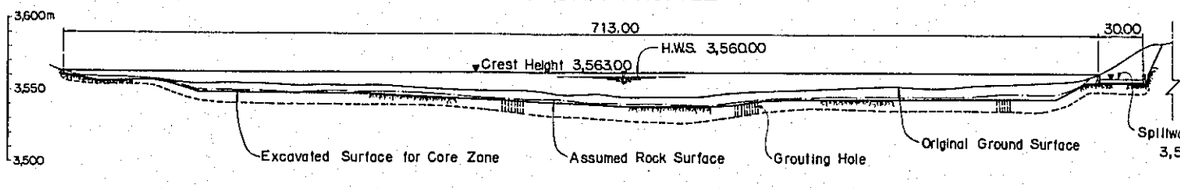


AREA CAPACITY CURVE

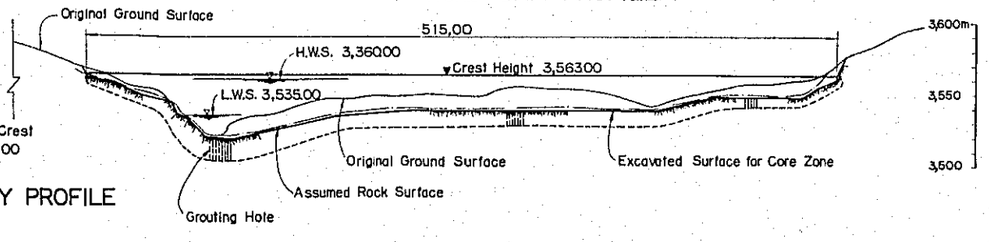


ELEVATION (m)	SURFACE AREA (sq.m)	STORAGE CAPACITY (cu.m)
3,515	0	0
3,520	3,800	6,300
3,530	12,300	86,800
3,540	74,100	518,800
3,550	475,300	3,265,800
3,560	919,800	10,241,300

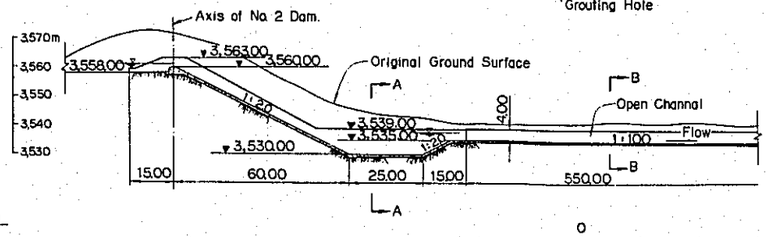
No. 1 DAM PROFILE



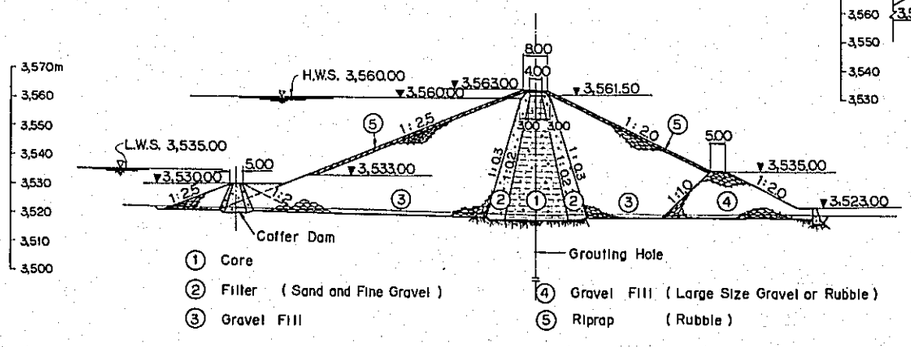
No. 2 DAM PROFILE



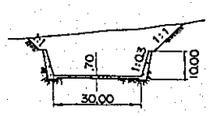
SPILLWAY PROFILE



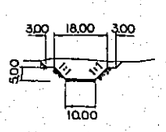
TYPICAL CROSS SECTION OF DAM

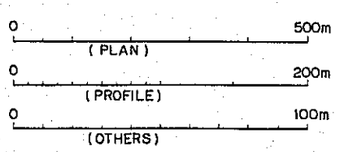


A–A



B–B





LOCATION	DATE	DESCRIPTION	BY
		REVISION	

OVERSEAS TECHNICAL COOPERATION AGENCY
JAPAN
ECUADOR
EMPRESA ELECTRICA "QUITO" S. A.

LA MICA PROJECT (RIO PITA)

RESERVOIR FOR AGUA POTABLE IN RIO PITA

ELECTRIC POWER DEVELOPMENT CO., LTD.
(E P D Consultants) TOKYO JAPAN

D. R.: SUBMITTED:
T. P.: RECOMMENDED:
C. K.: APPROVED:

I3 – 01 – 02 – 001 A

Appendix-III

CAPACITY OF REGULATING RESERVOIR (HEAD TANK)

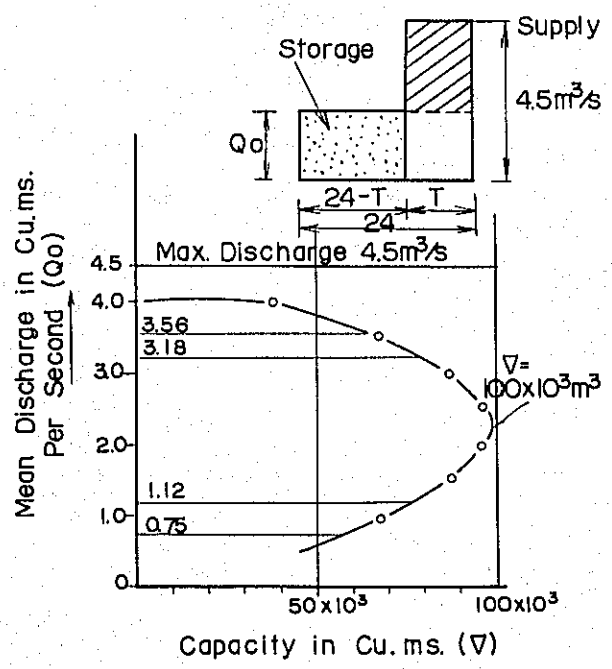
Appendix-III. CAPACITY OF REGULATING RESERVOIR (HEAD TANK)

The length of the waterway from La Mica Reservoir to the regulating reservoir (to be commonly used as head tank) is 27.4 km long. About 8 hours will be required for the water to reach the head tank flowing at a velocity of 1 m/sec. In order to improve the operating performance of La Mica Power Plant, the head tank should be made as large as possible to have the function of a regulating reservoir.

(1) In case the average daily discharge of La Mica Power Plant is released evenly from Lake La Mica.

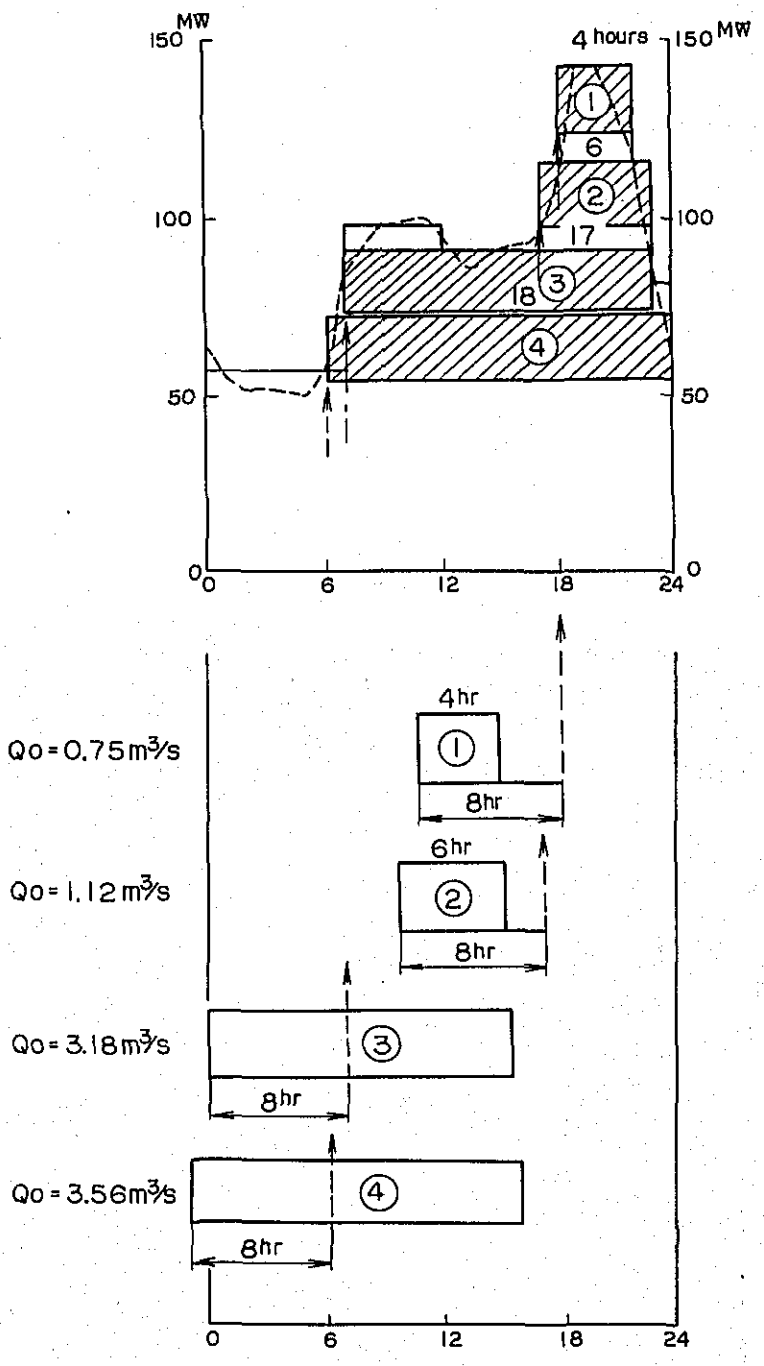
As shown on Fig. A-III-1, a storage capacity of 100,000 m^3 is necessary for an average release of 2.25 m^3/sec. from the lake so that the water can be regulated for peak load operation. A storage capacity of 25,000 m^3 and 86,000 m^3 is necessary for an average released from the lake of 4.00 m^3/sec. and 3.00 m^3/sec., respectively. Lake La Mica has sufficient daily regulating capacity, and in view of the maximum capacity of the waterway which is 4.5 m^3/sec., it is possible to reduce the storage capacityof the regulating reservoir depending on the operating pattern of the powerhouse.

Fig. A-III-1 Operation Diagram for Regulating Reservoir in case of Average Release from La Mica Lake



(2) In case 4.5 m^3/sec. of water is released from Lake La Mica

Fig. A-III-2 Operating Diagram of Regulating Reservoir in case of Maximum Release from La Mica Lake



Release of 4.5 m^3/sec. of water from Lake La Mica has to start 8 hours before the scheduled time of operation of La Mica Power Station. The duration time of release of water from the lake will depend on which part of the load configuration La Mica Power Station will supply.

Therefore, the load condition of "EEQ" S.A. power system was studied. (See Fig. A-III-2). As shown on Fig. A-III-2, it was found that La Mica Project should be able to supply four parts in the load configuration.

① – is the maximum peak load and starts from 18:00 and the duration time is 4 hours. To meet this load, the release from the lake should start from 10:00 AM as shown on the figure.

② – the peak load starts from 17:00 and the duration time is 6 hours. In order to operate the powerhouse according to this load pattern, release of water from the lake should start at 9:00 AM.

③ – and ④ – are the intermediate peak load. Operation of the power station starts between 6 and 7 AM. Release from La Mica should start between 0:00 and 1:00 AM.

By operation pattern ① to ④ almost all the loads can be met. Judging from the load configuration, however, an error of 1 to 1.5 hours may arise in the load build-up, or an error of about 1 hour may arise until the load is reached. Sometimes during starting-up, only partial load may be supplied against an inflow of 4.5 m^3/sec. Therefore, in order to cope with this situation, the regulating reservoir is necessary.

The capacity of 4.5 m^3/sec. x 5,400 sec. = 25,000 m^3 should be enough to store the inflow of 4.5 m^3/sec., for 1.5 hours and for supplemental supply.

In the cases of ① – ②, the load may sometimes have to be limited to 75% unexpectedly. All the excess water can be stored in the reservoir in such cases without spilling the spillway.

In consideration of the above, the capacity of the regulating reservoir has been determined to be 25,000 m^3.

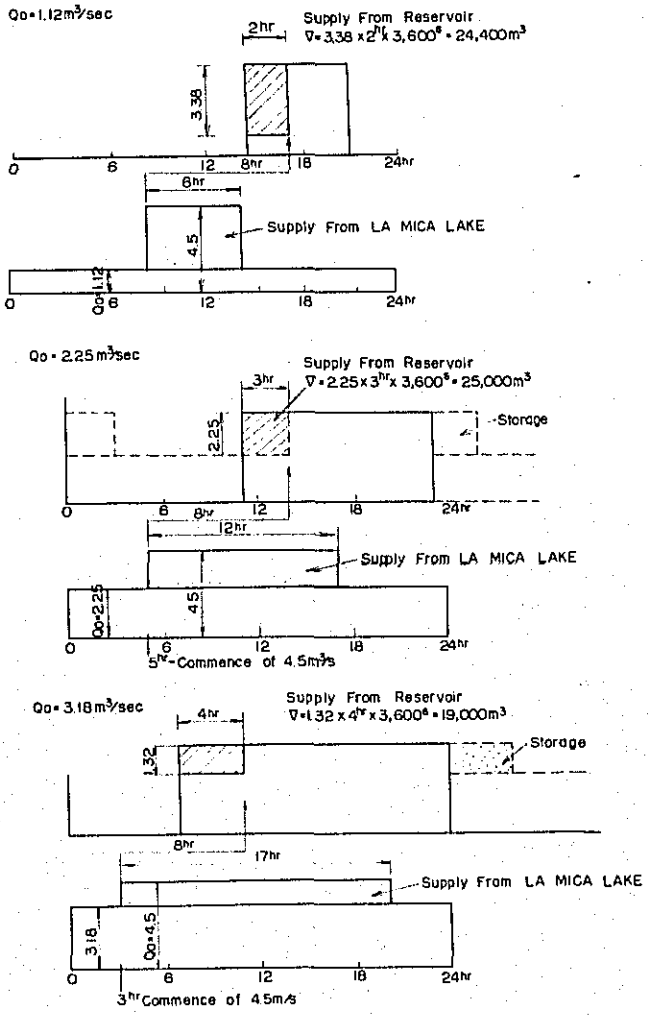
(3) In case, peak-load operation is suddenly required with the average release of Qo from Lake La Mica:

Sometimes it may be necessary to operate La Mica Power Station to supply peak load to meet system demand with an average release of Qo = 1.12 m^3/sec., Qo = 2.25 m^3/sec. or Qo = 3.18 m^3/sec. from Lake La Mica.

If the regulating reservoir (25,000 m^3) is not provided, the release from Lake La Mica has to be started 8 hours before the commencement of peak-load operation. In case this requirement becomes known 6 to 4 hours in advance as shown in Fig. A-III-3, the water can be supplied from the reservoir for 2 to 4 hours, during which time, the required water

released from the lake will reach the regulating reservoir. Thus, the reservoir will be very effective in the operation of the powerhouse.

Fig. A-III-3 Operation diagram of regulating reservoir in case of maximum release from Lake La Mica



Appendix-IV

DATA OF METEOROLOGY AND HYDROLOGY

Appendix-IV DATA OF METEOROLOGY AND HYDROLOGY

1. Monthly Max. Med. and Min. Temperature
2. Monthly Rainfall in La Mica Cocha
3. Daily Rainfall in La Mica Cocha
4. Monthly Rainfall in La Mica Project Area
5. Gaged Discharge in ANTIZANA Gaging Station (from 1960 to 1966)

1. Monthly Max. Med. and Min. Temperature

1-1 Temperature STATION (7) Uyumbicho CATCHMENT AREA ____ sq-km

Rio Pita RIVER IN THE BASIN OF Rio Esmeraldas ELEVATION 2,725 m UNIT °C S 00 • 24' W 78 • 32'

YEAR	Ene.	Feb.	Mar.	Abr.	May.	Jun.	Jul.	Ago.	Sep.	Oct.	Nov.	Dic.	ANNUAL
1963													
Max.	23.9	21.4	21.8	22.4	23.4	24.6	23.6	24.6	24.6	24.8	24.0	24.2	24.8
Med.	13.6	13.7	14.1	13.7	14.0	14.4	14.2	14.6	14.5	13.9	13.6	14.3	14.1
Min.	5.9	4.5	7.0	4.0	5.0	5.0	3.5	4.0	3.5	4.5	4.5	5.5	3.5
1964													
Max.	25.0	20.2	24.2	22.6	23.0	22.4	24.0	23.0	23.8	24.0	22.6	22.8	25.0
Med.	14.7	14.4	14.4	13.3	13.8	13.1	13.4	13.5	13.4	13.4	14.1	13.9	13.8
Min.	4.5	4.5	4.0	6.5	5.5	3.5	4.0	4.5	3.5	3.5	4.0	2.4	2.4
1965													
Max.	23.2	23.0	22.2	21.4	22.4	22.8	23.6	22.8	23.6	23.8	22.8	22.6	23.8
Med.	13.8	14.1	13.9	13.4	14.1	14.5	14.3	13.8	13.8	13.4	12.7	13.6	13.8
Min.	2.0	2.0	4.0	4.5	5.5	6.0	4.5	5.0	5.5	5.5	2.5	5.5	2.0
1966													
Max.	22.8	25.4	23.6	23.2	23.8	23.4	23.4	23.8	23.8	24.2	23.2	22.2	25.4
Med.	14.1	14.0	13.9	13.8	13.8	13.4	13.8	14.0	14.3	13.7	13.4	13.2	13.8
Min.	6.0	3.0	5.5	3.0	5.0	2.0	2.5	5.5	5.0	4.0	3.0	5.0	2.0
Average													
Max.	23.7	22.5	23.0	22.4	23.2	23.3	23.7	23.6	24.0	24.2	23.2	23.0	23.3
Med.	14.1	14.1	14.1	16.1	13.9	13.9	13.9	14.0	14.0	13.6	13.5	13.8	15.1
Min.	4.5	3.5	5.1	4.5	5.3	4.1	3.6	4.8	4.4	4.4	3.5	4.6	4.4

1-2 Temperature STATION (9) Machachi CATCHMENT AREA ____ sq-km

Rio San Pedro RIVER IN THE BASIN OF Rio Esmeraldas ELEVATION 2,950 m UNIT °C S 00 • 31' W 78 • 34'

YEAR	Ene.	Feb.	Mar.	Abr.	May.	Jun.	Jul.	Ago.	Sep.	Oct.	Nov.	Dic.	ANNUAL
1963													
Max.					22.5	21.6	21.6	22.8	22.4	23.0	22.0	23.0	
Med.					13.1	13.0	12.3	13.5	13.1	12.8	11.5	12.9	
Min.					4.4	3.3	4.4	1.0	3.5	4.0	1.0	2.6	
1964													
Max.	22.5	21.8	21.8	20.8	20.8	19.8	19.8	20.6	22.0	20.6	20.8	20.6	22.5
Med.	13.0	12.7	12.6	11.9	12.8	11.7	11.7	11.7	11.9	11.3	12.0	11.3	12.0
Min.	1.5	2.4	1.8	5.8	3.4	3.5	2.4	3.5	3.0	0.1	2.2	0.2	0.1
1965													
1965													
Max.	21.2	20.8	22.0	19.6	21.8	21.6	22.6	22.2	21.8	22.8	20.6	20.6	22.8
Med.	11.8	12.5	12.2	11.5	12.5	13.2	13.2	13.4	13.0	12.7	12.3	13.0	12.6
Min.	1.4	1.2	4.4	3.6	3.2	4.8	3.4	1.2	2.8	0.2	1.2	1.6	0.2
1966													
Max.	21.6	23.6	21.8	21.8	22.0	22.2	22.8	23.4	22.6	22.0	20.6	20.6	23.6
Med.	13.4	13.1	12.6	12.4	13.2	12.7	12.8	13.2	13.0	12.7	12.4	12.1	12.8
Min.	2.8	0.4	1.4	1.6	1.4	0.1	2.2	1.8	-	0.1	0.0	1.4	-
Average													
Max.	21.8	22.1	21.9	21.7	21.8	21.3	21.7	22.3	22.2	22.1	21.0	21.2	21.8
Med.	12.7	12.8	12.5	11.9	12.9	12.7	12.5	13.0	12.8	12.4	12.1	12.3	12.6
Min.	1.9	1.3	2.5	3.7	3.1	2.9	3.1	1.9	3.1	1.1	1.1	1.5	2.3

1-3 Temperature STATION (10) Río Pita CATCHMENT AREA ____ sq.km

Río Pita RIVER IN THE BASIN OF Río Esmeraldas ELEVATION 3,860 m UNIT °C S 00 ° 36' W 78 ° 28'

YEAR	Ene.	Feb.	Mar.	Abr.	May.	Jun.	Jul.	Ago.	Sep.	Oct.	Nov.	Dic.	ANNUAL
1965													
Max.	-	-	-	-	-	-	-	-	14.2	15.0	13.5	12.5	
Med.	-	-	-	-	-	-	-	-	6.6	6.9	6.9	6.1	
Min.	-	-	-	-	-	-	-	-	-1.5	-1.0	-3.5	-0.5	
1966													
Max.	15.0	15.0	13.0	13.7	13.4	14.0	11.7	11.7	12.7	13.8	14.5	13.7	15.0
Med.	6.7	6.4	6.1	6.0	6.6	5.3	4.6	4.9	5.3	5.8	6.0	5.9	5.8
Min.	-0.7	0.3	-0.8	-2.3	1.0	-5.4	-3.0	0.5	-3.0	-6.1	-3.2	-3.1	-6.1
Average													
Max.	15.0	15.0	13.0	13.7	13.4	14.0	11.7	11.7	13.5	14.4	14.0	13.1	13.5
Med.	6.7	6.4	6.1	6.0	6.6	5.3	4.6	4.9	6.0	6.4	6.5	6.0	6.0
Min.	-0.7	0.3	-0.8	-2.3	1.0	-5.4	-3.0	0.5	-2.3	-3.6	-3.4	-1.8	-1.8

1-4 Temperature STATION (15) Papallacta CATCHMENT AREA ____ sq.km

Río Papallacta RIVER IN THE BASIN OF Río Napo ELEVATION 3,160 m UNIT °C S 00 ° 23' W 78 ° 08'

YEAR	Ene.	Feb.	Mar.	Abr.	May.	Jun.	Jul.	Ago.	Sep.	Oct.	Nov.	Dic.	ANNUAL
1963													
Max.								15.6	17.3	17.1	18.0	17.6	
Med.								8.9	9.8	9.8	10.2	10.3	
Min.								3.0	2.6	3.2	1.2	4.8	
1964													
Max.	18.4	18.8	18.2	16.8	16.2	15.3	15.0	15.2	16.0	18.2	16.6	18.6	18.8
Med.	10.8	10.1	9.6	10.2	10.2	8.7	8.7	8.3	8.9	9.6	9.1	9.4	9.5
Min.	1.2	4.8	0.3	3.0	-	-	2.5	3.0	3.0	0.0	3.3	2.0	-
1965													
Max.	17.6	17.9	16.6	16.4	17.4	15.0	14.2	14.6	16.2		19.6	18.0	19.2
Med.	9.6	10.4	9.2	9.7	10.1	8.8	8.5	8.4	9.1	-	10.7	9.8	9.5
Min.	2.8	2.2	3.5	4.5	5.5	4.0	2.0	2.5	3.9	-	4.0	3.9	0.8
1966													
Max.	16.6	18.4	17.4	16.6	17.5	17.6	16.2	16.4	16.2	19.0	19.2	18.3	
Med.	9.6	9.6	9.7	9.6	10.3	9.1	8.7	8.8	8.7	9.8	10.6	10.0	
Min.	4.6	2.0	4.4	3.5	4.0	1.0	1.6	3.0	0.8	3.0	2.5	1.0	
Average													
Max.	17.5	18.4	17.4	16.6	17.0	16.0	15.1	15.5	16.4	18.1	18.4	18.1	17.0
Med.	10.0	10.0	9.5	9.8	10.2	8.9	8.6	8.6	9.1	9.7	10.2	9.9	9.5
Min.	2.9	3.0	2.7	3.7	4.8	2.5	2.0	2.9	2.6	2.1	2.8	2.9	2.9

1-5 Temperature STATION (17) Cotopaxi CATCHMENT AREA ____ sq-km

Rio San Pedro RIVER IN THE BASIN OF Rio Esmeraldas ELEVATION 3,560 m UNIT °C S 00 ° 37' W 78 ° 34'

YEAR	Ene.	Feb.	Mar.	Abr.	May.	Jun.	Jul.	Ago.	Sept.	Oct.	Nov.	Dic.	ANNUAL
1963													
Max.	16.0	14.5	14.0	16.0	16.0	15.5	14.5	16.5	17.5	17.0	15.0	16.5	17.5
Med.	7.7	7.0	7.6	8.1	8.0	7.4	6.8	7.8	8.0	8.0	7.5	8.4	7.7
Min.	0.0	0.0	2.0	1.0	1.6	0.0	0.5	0.0	0.0	0.0	0.0	3.0	0.0
1964													
Max.	17.0	17.5	17.8	16.0	15.5	14.0	15.0	15.5	16.0	15.5	16.5	15.5	17.8
Med.	8.7	8.6	8.4	7.5	8.1	6.8	6.5	6.8	7.1	7.1	7.3	6.9	7.5
Min.	0.5	3.0	0.0	3.5	1.5	2.5	0.0	1.0	1.0	1.0	0.0	0.0	0.0
1965													
Max.	16.5	16.0	15.5	15.0	16.4	15.1	16.2	16.0	16.5	16.0	16.5	15.5	16.5
Med.	7.5	7.7	7.6	7.4	7.6	7.1	7.3	7.1	8.0	8.0	7.8	8.1	7.6
Min.	1.5	0.0	1.0	1.0	3.2	0.5	0.4	0.2	0.4	1.5	-0.5	1.5	-0.5
1966													
Max.	16.5	16.4	17.5	15.5	16.0	15.5	17.0	15.5	16.5	16.4	16.5	16.5	17.5
Med.	8.4	8.3	8.3	7.8	8.3	7.7	7.3	7.7	7.6	7.9	8.1	7.9	7.9
Min.	2.5	0.0	2.5	1.5	2.0	-1.0	-0.5	0.5	-1.5	0.0	0.5	1.5	1.5
Average													
Max.	16.5	16.1	17.2	15.6	16.0	15.0	15.7	15.9	16.6	16.2	16.1	16.3	16.1
Med.	8.1	7.9	8.0	7.7	8.0	7.3	7.0	7.4	7.7	7.8	7.8	7.8	7.7
Min.	1.1	0.8	1.4	1.8	2.1	1.0	0.1	0.4	0	0.4	0	1.5	0.9

2. Monthly Rainfall in La Mica Cocha

2 Monthly Rainfall STATION La Mica Cocha CATCHMENT AREA ____ sq-km Quito, Ecuador

RIVER IN THE BASIN OF ____ ELEVATION ____ m UNIT mm S ° W °

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1959				42.3	137.9	105.6	188.0	64.8	68.2	71.1	89.3	36.6	803.80
1960	20.0	45.4	66.5	42.2	73.4	37.7	69.4	53.5	57.6	49.0	24.5	37.7	576.90
1961	36.1	27.9	92.5	90.9	53.7	83.0	58.8	51.1	58.1	91.7	45.9	25.3	715.00
1962	31.5	64.1	62.0	44.5	110.0	123.4	101.7	65.1	63.3	91.2	50.1	49.1	856.00
1963	48.7	63.6	38.1	55.1	76.1	96.8	59.6	43.6	23.3	52.0	113.3	51.7	721.90
1964	8.6	15.6	43.6	133.7	67.1	156.5	56.7	95.7	124.1	52.5	32.6	57.3	844.00
1965	20.8	13.6	35.7	86.2	141.2	65.8	65.3	56.0	40.1	90.4	139.6	76.2	830.90
1966	39.6	67.8	139.2	73.6	25.8	64.5	111.8	77.5	88.9	61.7			750.40
Total	205.3	298.0	477.6	568.5	685.2	733.3	711.3	507.3	523.6	559.6	495.3	333.9	6,098.90
Average	29.3	42.6	68.2	71.1	85.7	91.7	88.9	63.4	65.5	70.0	70.8	47.7	794.90

3. Daily Rainfall in La Mica Cocha

3-1 Daily Rainfall — STATION: La Mica Cocha — Quito, Ecuador
RIVER, IN THE BASIN OF — ELEVATION — UNIT: mm — YEAR: 1959

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1					9.9	0.0	1.4	0.0	9.1	4.5	3.3	0.2	1
2					3.3	0.0	20.4	0.0	0.8	1.2	6.7	0.0	2
3					1.9	1.0	37.0	1.8	2.7	0.0	0.9	0.0	3
4					0.9	1.7	20.0	5.5	1.5	0.0	1.1	0.9	4
5					5.9	0.3	5.1	3.6	0.0	0.2	0.0	0.0	5
6					51.0	0.8	11.1	0.0	0.7	0.1	0.0	0.0	6
7					15.0	4.4	4.2	0.0	3.8	1.1	1.0	4.0	7
8					1.4	0.5	2.0	0.0	1.7	0.0	2.0	0.0	8
9				0.0	8.3	1.8	2.3	0.8	0.7	0.0	0.0	3.0	9
10				0.0	1.5	4.9	3.8	7.8	0.5	0.0	0.3	1.2	10
11				0.8	5.4	14.6	1.8	0.1	1.6	0.0	10.5	0.2	11
12				0.0	0.3	0.0	2.8	2.4	0.5	0.0	20.5	14.2	12
13				0.0	2.8	12.6	0.1	0.0	8.9	15.0	2.9	0.1	13
14				0.0	0.3	3.8	0.0	0.3	5.7	3.4	5.0	7.2	14
15				3.4	1.1	0.2	4.4	0.7	0.3	2.9	6.0	0.0	15
16				14.2	5.5	1.6	18.3	2.3	0.0	2.1	0.0	0.2	16
17				4.2	2.7	7.3	20.3	3.4	0.0	0.0	0.0	0.0	17
18				0.8	0.7	4.1	8.3	3.0	1.1	0.0	0.0	0.2	18
19				0.5	0.0	0.0	1.0	1.9	0.0	10.2	0.0	0.0	19
20				0.4	0.0	1.6	5.9	0.3	10.4	0.0	0.0	0.3	20
21				2.6	0.0	6.9	9.9	0.7	0.0	0.0	0.0	0.4	21
22				1.4	6.3	5.7	2.8	0.7	0.8	0.0	0.0	0.1	22
23				2.4	10.9	2.9	0.0	0.0	0.6	11.1	4.5	0.3	23
24				8.1	0.6	0.0	0.0	1.9	0.5	0.5	0.3	0.2	24
25				0.0	0.0	0.0	2.3	5.1	0.0	1.5	6.8	0.6	25
26				1.1	0.0	2.6	0.0	11.0	8.7	12.4	0.0	0.2	26
27				0.8	0.3	16.4	2.8	6.8	1.7	0.0	10.4	0.4	27
28				0.2	0.3	6.7	0.0	2.0	0.0	3.6	0.3	0.6	28
29				0.0	0.0	0.0	0.0	0.2	5.5	0.0	4.7	0.0	29
30				1.4	1.2	3.2	0.0	1.3	0.4	0.0	2.1	0.0	30
31					0.4		0.0	1.2		1.3		2.1	31
Total				42.3	137.9	105.6	188.0	64.8	68.2	71.1	89.3	36.6	

Annual Total (mm) 803.80

3-2 Daily Rainfall — STATION: La Mica Cocha — Quito, Ecuador
RIVER, IN THE BASIN OF — ELEVATION — UNIT: mm — YEAR: 1960

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.3	0.3	0.6	0.0	0.0	3.7	4.3	0.1	0.4	0.0	9.0	3.0	1
2	0.0	0.0	1.6	0.0	1.3	0.0	2.6	0.3	10.5	0.0	0.2	0.8	2
3	0.5	0.0	0.0	0.0	5.2	0.0	7.8	0.0	11.4	1.0	0.0	0.0	3
4	0.4	0.0	0.9	1.6	4.1	1.1	0.4	13.2	1.4	1.1	0.8	0.0	4
5	1.2	0.0	0.0	1.2		0.2	0.8	4.3	1.7	0.5	1.0	0.9	5
6	0.6	4.2	0.0	2.4		1.9	1.3	0.0	0.0	0.0	0.0	0.4	6
7	1.4	1.6	2.5	0.0	0.3	4.5	2.7	0.0	0.3	0.5	0.0	0.0	7
8	1.3	0.8	3.6	0.0	3.8	0.1	1.2	0.0	0.0	0.2	5.4	0.0	8
9	1.7	0.6	0.7	0.0	0.0	0.1	0.4	1.0	2.7	0.0	0.4	1.1	9
10	0.0	12.3	0.0	0.4	2.2	0.0	2.5	2.8	2.2	0.4	1.1	0.2	10
11	0.0	2.4	0.4	0.5	0.0	0.0	5.3	6.8	0.8	0.0	1.9	5.0	11
12	0.2	0.0	11.2	0.3	0.4	0.0	0.0	3.0	0.4	0.3	1.9	1.4	12
13	0.7	0.0	0.0	0.2	0.2	0.0	0.3	1.3	2.8	0.0	0.0	2.6	13
14	3.4	7.6	0.4	2.7	0.0	0.3	0.0	0.1	2.6	0.5	0.0	1.2	14
15	0.9	0.0	0.0	0.8	0.2	1.4	0.3	0.0	1.3	1.0	0.0	0.6	15
16	0.6	0.2	0.0	8.2	0.0	0.2	0.0	0.1	0.1	0.2	0.0	0.0	16
17	0.0	0.5	1.6	0.0	0.0	0.0	0.0	0.0	0.2	0.8	0.7	2.2	17
18	0.0	2.7	0.3	6.8	1.3	0.0	0.0	0.0	1.3	0.0	0.0	12.0	18
19	0.0	5.5	0.5	0.0	0.3	5.2	0.5	0.3	1.9	6.0	0.0	1.2	19
20	0.0	1.0	7.3	1.3	1.4	0.0	6.1	1.3	2.5	0.4	0.0	0.0	20
21	0.5	1.7	8.6	7.4	0.2	4.5	1.7	4.0	0.6	0.4	0.5	0.0	21
22	0.0	0.0	4.3	0.9	0.5	0.0	0.1	1.5	0.0	5.5	1.1	0.0	22
23	0.1	0.0	0.0	0.0	3.8	0.0	3.9	0.4	0.0	0.0	0.0	3.0	23
24	0.2	0.8	9.4	0.0		0.0	3.2	0.0	0.0	0.0	0.0	1.2	24
25	0.0	0.4	0.2	0.1		5.7	10.0	0.0	0.0	0.0	0.0	0.0	25
26	0.0	1.5	0.0	0.1		0.1	0.6	0.0	10.1	0.0	0.0	0.0	26
27	0.0	0.0	5.8	0.1		0.0	0.7	1.7	1.4	0.8	0.0	0.9	27
28	0.0	0.7	0.3	6.2		3.2	3.6	0.0	0.3	1.2	0.5	0.0	28
29	4.7	0.6	0.0	1.0	3.9	4.1	8.7	1.2	0.0	7.5	0.0	0.0	29
30	0.3		6.3	0.0	21.3	1.4	0.0	10.0	0.7	17.9	0.0	0.0	30
31	0.0		0.0		21.0		0.4	0.1		2.8		0.0	31
Total	20.0	45.4	66.5	42.2	73.4	37.7	69.4	53.5	57.6	49.0	24.5	37.7	

Annual Total (mm) 576.90

3-3 Daily Rainfall STATION La Mica Cocha Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION UNIT mm YEAR 1961

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	0.6	1.9	1.4	0.5	3.9	2.4	0.4	5.9	0.0	1.4	4.5	0.9	1
2	0.3	6.0	0.3	0.0	1.0	1.6	3.6	2.5	0.0	3.1	0.0	0.1	2
3	0.1	2.5	2.1	1.1	0.5	2.4	1.1	0.0	0.0	0.4	0.6	0.0	3
4	0.0	0.0	2.0	8.8	2.1	1.9	4.8	0.0	0.4	3.1	0.6	0.0	4
5	0.0	1.4	0.4	4.1	0.0	1.2	7.2	0.2	0.0	0.2	7.2	0.1	5
6	0.0	0.0	1.3	0.6	0.0	8.1	2.1	2.4	0.4	0.8	2.0	0.0	6
7	0.0	0.0	9.2	0.0	0.0	4.7	0.9	6.7	8.1	1.1	0.0	0.0	7
8	0.0	6.3	0.6	0.0	0.0	0.1	0.3	7.1	7.1	0.2	0.0	0.0	8
9	0.3	0.0	2.1	0.0	0.0	0.2	1.8	6.4	2.1	2.6	0.0	2.7	9
10	0.0	0.0	15.4	3.3	0.0	1.8	0.1	2.6	0.1	4.6	0.0	1.3	10
11	1.4	2.9	17.0	0.0	4.1	4.2	0.6	0.2	0.0	1.1	0.0	3.5	11
12	0.1	1.6	0.1	0.0	7.3	1.3	1.6	0.4	0.1	11.5	0.0	0.3	12
13	0.0	0.8	1.6	0.0	1.2	5.4	6.0	0.1	0.0	7.3	0.0	4.3	13
14	0.0	0.0	5.3	0.5	0.1	5.1	0.5	0.8	0.2	10.9	15.0	0.7	14
15	0.0	0.0	4.2	0.0	4.7	1.4	1.9	0.1	2.5	4.8	0.0	0.0	15
16	8.4	0.1	6.1	1.1	0.7	14.8	1.9	2.4	14.9	1.3	0.1	5.2	16
17	9.0	0.0	0.0	0.3	0.0	5.9	0.1	0.0	0.9	9.2	0.4	0.3	17
18	0.5	0.2	0.0	0.0	0.3	0.0	0.3	3.0	0.0	0.7	3.1	2.1	18
19	0.0	3.9	2.5	0.0	0.0	0.0	1.4	1.5	0.1	0.0	1.1	0.7	19
20	0.3	0.1	4.8	0.2	0.0	0.3	0.8	0.8	0.0	0.0	3.7	0.7	20
21	0.3	0.0	0.9	0.2	0.4	0.4	0.1	2.2	8.5	1.3	3.0	0.0	21
22	0.0	0.0	1.5	0.0	0.0	0.4	4.9	1.0	2.8	8.2	0.0	0.0	22
23	0.5	0.0	1.9	24.5	2.7	1.7	0.4	0.0	0.7	0.6	0.0	0.0	23
24	0.2	0.0	3.1	15.3	3.1	1.4	0.0	0.3	0.1	0.1	0.9	0.0	24
25	0.2	0.0	1.9	6.7	13.9	0.6	0.5	1.1	0.7	4.4	0.7	0.4	25
26	0.0	0.0	0.6	1.7	2.7	0.0	0.1	0.3	0.0	1.0	0.8	0.4	26
27	0.0	0.0	0.9	0.2	3.4	1.3	7.4	1.0	0.0	2.5	1.3	0.0	27
28	0.0	0.2	0.0	0.4	0.3	0.0	6.7	0.0	0.1	0.0	0.0	0.0	28
29	1.6		4.2	5.7	0.0	2.3	0.5	0.8	2.7	0.0	0.9	0.0	29
30	3.0		0.9	15.7	0.6	10.1	0.0	0.8	5.6	0.0	0.0	1.3	30
31	9.3		0.2		0.7		0.8	0.5		9.3		0.3	31
Total	36.1	27.9	92.5	90.9	53.7	83.0	58.8	51.1	58.1	91.7	45.9	25.3	

Annual Total (mm) 715.00

3-4 Daily Rainfall STATION La Mica Cocha Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION UNIT mm YEAR 1962

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	0.0	0.0	2.0	0.4	2.4	0.0	0.0	1.3	3.2	14.0	5.4	0.0	1
2	0.4	0.0	0.0	1.1	0.7		6.4	3.3	2.4	1.2	0.8	4.0	2
3	0.4	0.0	0.0	0.4	0.1		7.6	6.5	2.8	1.5	6.3	0.7	3
4	0.0	0.0	0.0	1.2	2.7		0.2	3.0	2.7	10.0	0.7	0.1	4
5	0.0	0.0	0.0	1.8	2.2	53.6	1.6	1.6	2.9	1.8	3.8	0.6	5
6	0.0	8.3	0.6	2.5	0.8	0.2	6.4	0.4	4.9	2.0	0.4	1.0	6
7	0.0	1.2	5.8	0.5		0.1	3.2	1.7	1.8	0.0	0.0	0.9	7
8	0.0	2.4	6.3	0.0	11.2	1.0	0.0	0.1	0.2	1.3	0.0	0.4	8
9	0.0	9.5	8.6	0.5	1.6	0.2	0.6	3.1	0.1	9.8	0.3	0.0	9
10	3.7	0.0	1.0	6.0	1.2	13.8	0.5	0.6	0.0	4.7	0.3	0.7	10
11	2.9	4.8	3.4	0.1	11.8	2.3	1.0	0.0	0.2	5.6	0.2	4.5	11
12	7.1	0.0	0.0	0.4	0.4	9.8	0.0	0.0	3.1	4.1	0.7	4.6	12
13	4.2	0.4	0.0	0.0	1.4	0.3	0.3	0.0	0.1	2.6	0.3	2.2	13
14	4.4	2.7	2.5	0.4	4.0	0.1	0.7	3.9	1.4	1.5	4.5	2.3	14
15	0.0	0.1	0.8	0.0	2.1	0.1	2.0	0.7	4.7	3.4	0.0	1.7	15
16	0.0	6.3	0.7	0.0	6.7	2.9	0.5	2.3	0.8	3.8	0.2	1.6	16
17	1.7	2.5	2.8	0.0	25.7	8.9	0.7	1.2	1.2	0.0	0.4	0.0	17
18	0.5	3.4	0.7	0.8	2.8	0.0	0.0	2.6	0.0	0.0	12.6	0.0	18
19	0.0	7.0	0.9	0.4	14.0	0.0	0.0	0.5	0.3	0.0	0.0	0.0	19
20	0.1	9.6	0.1	3.1	3.8		9.4	0.4	1.1	6.8	0.8	0.8	20
21	0.0	1.4	0.6	3.6	0.8	6.1	0.0	0.3	3.0	7.2	4.8	19.2	21
22	0.0	0.5	3.8	2.2	1.0	2.5	0.6	0.0	5.7	2.2	2.1	2.5	22
23	0.1	0.8	2.0	0.0	0.0	5.8	6.5	0.0	4.3	0.3	0.5	0.0	23
24	4.6	0.8	5.9	0.5	2.5	0.0	9.7	8.3	0.1	0.2	0.7	0.0	24
25	0.0	0.3	12.5	11.7	5.6	0.5	11.4	6.5	0.0	0.0	0.0	0.0	25
26	0.2	1.9	0.8	1.4	1.7	8.6	1.3	1.3	4.2	0.0	1.5	1.4	26
27	0.1	0.2	0.0	0.3	0.0	2.6	0.0	2.4	0.0	0.0	0.2	0.0	27
28	1.0	0.0	0.0	0.1	0.0	1.8	0.0	8.7	0.0	0.0	0 0	0.0	28
29	0.1		0.0	0.4	0.0	2.2	7.8	0.5	0.3	5.4	2.6	0.0	29
30	0.0		0.1	4.7	0.2	0.0	20.9	0.0	11.8	0.6	0.0	0.5	30
31	0.0		0.1		2.6		2.4	3.9		0.6		0.0	31
Total	31.5	64.1	62.0	44.5	110.0	123.4	101.7	65.1	63.3	91.2	50.1	49.1	

Annual Total (mm) 856

3-5 Daily Rainfall STATION La Mica Cocha Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION UNIT mm YEAR 1963

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	0.0	0.0	1.7	3.6	0.0	0.0	2.2	1.5	0.0	5.7	7.4	0.0	1
2	0.0	14.4	0.4	0.0	0.4	0.8	1.2	0.4	0.0	4.2	4.0	0.3	2
3	6.9	7.5	0.3	5.8	4.3	0.0	0.4	0.2	0.0	0.0	4.0	0.0	3
4	1.3	0.0	0.4	6.9	0.0	0.1	2.0	0.0	0.0	0.1	0.0	2.1	4
5	2.7	9.1	1.3	9.6	0.0	0.0	0.9	0.0	0.0	1.3	4.8	0.0	5
6	0.8	0.1	0.0	1.4	3.5	0.0	0.0	7.1	0.0	0.0	9.2	0.0	6
7	0.1	3.7	0.0	0.3	0.8	0.0	0.0	4.8	0.0	0.1	3.6	1.3	7
8	0.0	1.7	0.5	1.3	0.0	0.0	0.0	0.8	0.0	0.2	0.0	2.1	8
9	9.5	0.0	2.8	0.0	3.4	7.5j	0.4	1.8	1.0	0.0	0.0	2.4	9
10	0.3	0.5	0.5	0.0	8.7	15.0	0.0	0.4	0.9	0.3	0.7	1.4	10
11	0.3	1.5	1.5	0.0	19.7	1.9	1.2	0.6	1.6	0.0	8.0	0.4	11
12	0.0	0.5	0.2	0.0	2.1	4.2	3.0	0.3	1.5	0.0	7.4	0.0	12
13	0.0	0.0	1.1	0.7	0.4	1.7	0.5	0.3	0.0	0.2	0.0	0.0	13
14	5.4	0.0	1.0	1.1	0.3	16.5	0.0	1.7	0.0	0.0	0.0	0.0	14
15	0.6	2.6	0.2	0.0	2.3	0.8	0.0	3.8	0.0	0.0	11.2	0.0	15
16	1.4	0.0	0.3	0.0	12.8	0.0	4.7	1.6	2.7	0.2	1.0	0.0	16
17	1.0	0.0	0.0	0.0	3.4	3.8	0.0	4.2	10.9	0.7	0.3	0.0	17
18	0.0	2.2	0.1	0.1	5.9	19.7	0.0	5.7	0.1	4.0	0.0	3.0	18
19	0.0	1.1	3.1	0.2	0.0	16.7	0.4	0.6	0.3	0.0	0.0	5.9	19
20	0.5	0.4	0.0	8.0	0.1	5.6	0.8	0.0	0.0	0.0	0.0	2.0	20
21	2.9	0.0	0.3	1.8	0.0	0.0	0.3	0.0	1.1	0.0	0.0	0.0	21
22	0.0	1.2	0.0	0.7	0.0	0.0	4.0	0.0	2.3	0.0	13.9	5.9	22
23	0.0	8.7	0.0	1.0	0.0	0.0	5.8	0.5	0.0	0.0	14.2	6.5	23
24	0.0	4.2	0.8	4.6	0.8	0.2	0.9	0.2	0.0	2.0	21.5	3.6	24
25	0.0	0.7	3.3	0.5	4.7	0.3	4.7	0.0	0.0	0.0	1.4	1.3	25
26	0.0	0.4	12.6	2.3	2.3	0.0	0.0	4.4	0.9	6.2	0.4	5.0	26
27	9.6	2.0	0.0	0.4	0.2	0.0	0.3	1.7	0.0	0.8	0.0	1.8	27
28	3.8	1.1	0.2	2.8	0.0	0.0	5.8	0.0	0.0	4.0	0.3	0.0	28
29	0.0		2.5	1.3	0.0	0.8	8.4	0.0	0.0	2.9	0.0	0.2	29
30	1.6		2.1	0.7	0.0	1.2	8.3	0.0	0.0	9.2	0.0	3.5	30
31	0.0		0.9		0.0		2.9	1.0		9.9		3.0	31
Total	48.7	63.6	38.1	55.1	76.1	96.8	59.6	43.6	23.3	52.0	113.3	51.7	

Annual Total (mm) 721.9

3-6 Daily Rainfall STATION La Mica Cocha Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION UNIT mm YEAR 1964

DATE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	0.0	0.0	1.9	4.7	15.1	0.3	2.9	0.2	7.1	0.5	1.7	1.5	1
2	0.0	0.0	0.7	1.3	0.0	0.2	2.5	2.0	4.0	2.7	0.2	5.6	2
3	0.0	0.0	0.0	3.1	0.0	1.2	5.4	4.1	18.0	0.0	0.1	0.1	3
4	0.0	0.1	0.5	6.3	0.0	9.5	1.3	0.9	0.9	0.0	0.0	0.5	4
5	0.0	0.0	0.0	0.0	0.0	4.7	0.3	1.4	3.8	1.0	3.7	0.5	5
6	0.0	0.1	0.0	0.0	0.6	8.9	1.0	0.7	3.6	0.0	2.3	0.4	6
7	0.6	1.7	0.0	0.0	0.4	4.2	15.8	0.0	18.0	0.0	3.3	0.5	7
8	0.0	0.4	0.5	11.4	0.0	0.1	3.5	0.0	3.8	0.0	0.7	8.5	8
9	0.0	0.5	0.0	11.1	3.4	5.7	2.2	25.3	6.4	0.0	0.0	0.3	9
10	0.9	0.0	0.3	16.0	0.2	3.6	0.3	16.5	1.5	0.4	0.0	0.0	10
11	0.3	4.8	0.9	8.0	5.9	2.1	0.6	14.1	11.0	3.0	0.1	1.5	11
12	0.0	2.3	1.2	0.6	1.5	0.1	0.0	2.5	12.3	6.0	1.3	0.0	12
13	0.0	0.3	4.2	2.6	3.0	0.0	1.6	4.8	15.0	3.1	0.7	0.0	13
14	0.0	0.0	2.0	0.8	5.4	4.2	1.4	0.2	2.0	0.3	0.0	0.0	14
15	0.3	0.0	8.8	9.6	3.4	4.6	1.3	0.0	1.8	1.2	8.1	0.0	15
16	0.0	0.0	15.8	5.1	1.2	3.6	0.0	0.0	1.1	0.7	0.0	0.0	16
17	0.4	0.0	1.6	17.1	1.1	4.0	1.2	4.4	3.5	14.2	3.3	0.0	17
18	4.5	0.0	0.4	1.5	0.4	11.4	0.0	4.0	0.5	3.7	0.0	0.0	18
19	0.0	0.0	0.0	0.0	0.0	10.0	0.2	2.0	0.0	0.2	0.4	0.0	19
20	0.0	0.9	1.4	0.2	0.4	17.5	0.9	0.0	0.0	0.0	0.0	0.7	20
21	0.0	1.5	0.0	1.1	0.0	10.4	1.1	0.0	0.0	0.0	0.1	1.6	21
22	0.0	0.4	0.0	0.1	5.8	11.3	2.0	0.0	2.1	0.0	0.1	0.3	22
23	0.0	0.0	0.0	0.0	1.6	5.0	5.5	0.3	0.0	0.0	0.3	0.3	23
24	0.0	0.0	0.2	0.7	3.3	0.0	0.2	1.0	1.5	1.4	0.0	7.4	24
25	0.0	0.0	0.3	0.5	1.5	3.4	0.0	0.0	3.4	0.3	1.9	0.9	25
26	0.0	0.0	0.3	4.2	0.8	12.0	0.0	3.5	0.0	4.3	0.3	1.3	26
27	0.2	0.0	0.0	12.5	1.8	7.5	1.8	3.0	1.3	0.4	0.0	7.6	27
28	1.4	1.5	0.0	1.9	1.5	0.8	3.7	0.7	1.5	0.5	0.8	7.2	28
29	0.0	1.0	0.0	0.0	1.7	6.3	0.0	0.6	0.0	2.0	1.4	1.3	29
30	0.0		2.9	15.3	1.0	3.9	0.0	1.5	0.0	4.0	1.8	7.4	30
31	0.0		0.4		6.1		0.0	2.0		2.6		1.9	31
Total	8.6	15.6	43.6	133.7	67.1	156.5	56.7	95.7	124.1	52.5	32.6	57.3	

Annual Total (mm) 844.0

3-7 Daily Rainfall STATION La Mica Cocha Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION UNIT mm YEAR 1965

DATE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	0.1	0.5	7.6	0.8	13.9	2.3	1.8	0.1	0.0	0.5	5.1	2.5	1
2	0.3	0.0	0.7	1.1	0.7	1.2	1.0	0.0	0.2	0.2	0.1	2.4	2
3	0.0	1.2	7.2	0.7	4.1	7.6	4.4	0.3	2.0	0.1	0.0	1.9	3
4	0.0	0.0	4.2	2.4	8.8	5.0	1.5	0.0	1.3	0.0	1.0	0.0	4
5	0.5	0.0	5.4	0.0	1.0	0.2	1.2	9.0	3.2	0.0	2.0	0.0	5
6	0.2	0.3	0.0	3.2	0.5	2.9	2.5	6.4	0.0	0.0	6.0	0.0	6
7	0.0	0.0	0.1	18.0	0.0	3.0	4.1	0.0	0.2	0.0	0.1	8.6	7
8	0.0	0.0	0.0	3.3	28.4	2.0	5.6	1.3	0.8	0.0	1.7	4.2	8
9	0.0	0.0	0.0	0.5	0.6	4.6	0.3	2.8	0.4	0.4	4.3	3.7	9
10	0.0	0.0	0.0	15.1	4.4	4.9	0.0	2.4	0.3	0.5	14.6	11.5	10
11	1.3	0.0	0.0	1.6	0.4	2.8	5.1	3.0	0.2	0.0	7.6	4.7	11
12	0.0	0.0	0.9	0.9	2.1	1.9	8.2	2.9	1.4	0.0	0.0	1.2	12
13	2.1	0.0	1.3	0.0	4.2	0.3	6.6	3.0	0.5	9.7	8.3	7.2	13
14	1.0	1.4	0.4	0.0	1.8	1.4	0.0	1.2	0.0	17.3	1.2	0.0	14
15	1.0	2.0	0.0	1.8	11.0	0.9	0.0	0.4	7.4	10.0	4.1	0.3	15
16	1.4	1.0	0.0	8.0	2.2	3.0	0.5	0.0	0.0	10.8	5.5	0.0	16
17	0.5	0.0	0.0	5.5	0.0	9.9	1.0	0.2	2.6	1.2	32.0	2.3	17
18	0.0	1.0	0.0	0.2	0.5	1.1	0.3	0.0	5.0	2.9	2.0	0.0	18
19	0.0	0.0	0.0	11.0	2.4	1.0	0.3	0.0	2.0	1.3	22.8	0.0	19
20	0.3	2.2	0.0	0.6	3.7	2.4	5.4	1.2	0.6	0.0	3.5	0.0	20
21	0.5	0.1	0.0	0.8	3.0	2.7	4.1	3.1	3.0	0.4	6.3	0.0	21
22	0.0	0.0	1.3	0.3	0.3	0.0	3.5	0.3	1.6	4.9	9.8	0.0	22
23	0.0	0.4	2.3	0.8	10.0	1.5	0.7	0.0	2.3	8.0	0.9	0.0	23
24	0.0	0.2	2.1	0.5	2.0	1.7	1.6	0.0	1.0	1.4	0.2	0.0	24
25	0.0	0.4	0.2	0.2	6.2	0.7	1.2	0.3	0.3	0.0	0.5	6.0	25
26	0.0	0.5	0.0	0.0	2.4	0.7	0.5	0.7	0.0	0.0	0.0	8.4	26
27	5.4	0.0	0.0	0.0	7.9	0.0	0.1	0.0	0.0	2.9	0.0	6.0	27
28	0.2	2.4	0.3	0.0	6.0	0.0	0.0	4.1	0.0	13.5	0.0	0.6	28
29	4.5		0.0	0.1	8.8	0.1	0.2	16.0	1.6	3.4	0.0	0.2	29
30	0.0		0.0	8.8	1.7	0.0	3.2	11.5	2.2	1.0	0.0	2.0	30
31	1.5		1.7		2.2		0.4	0.2		0.0		2.5	31
Total	20.8	13.6	35.7	86.2	141.2	65.8	65.3	56.0	40.1	90.4	139.6	76.2	

Annual Total (mm) 830.9

3-8 Daily Rainfall STATION La Mica Cocha Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION UNIT mm YEAR 1966

DATE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	0.0	0.0	2.1	6.5	0.5	3.7	5.6	1.7	2.8	18.3	0.2		1
2	0.0	0.0	10.7	5.6	0.0	2.8	9.5	0.5	0.6	7.4	0.2		2
3	0.0	0.0	0.2	0.0	0.0	0.0	0.6	0.0	3.1	11.0	0.0		3
4	0.0	0.2	3.0	0.0	0.0	0.4	0.0	0.0	12.5	0.3	0.4		4
5	0.0	3.6	0.1	0.0	0.0	0.1	0.0	6.9	0.0	0.7	0.4		5
6	1.7	5.7	0.2	0.3	0.0	0.0	0.2	1.5	3.1	0.0	0.0		6
7	0.0	3.0	13.9	0.1	2.7	0.0	0.4	9.1	0.0	0.0	0.6		7
8	0.0	8.3	5.9	3.3	0.4	0.0	1.5	4.4	3.0	0.0	0.4		8
9	0.0	2.5	9.9	0.0	2.6	0.0	1.6	5.2	3.8	0.0	0.6		9
10	0.0	3.3	1.3	6.9	7.7	0.0	2.7	0.3	9.4	1.2	2.6		10
11	0.0	0.0	0.0	5.9	0.0	0.0	6.6	0.1	0.5	0.0			11
12	0.8	16.2	1.0	10.4	12.5	0.6	7.0	2.4	0.1	1.3			12
13	1.8	0.0	0.0	7.3	0.0	0.2	4.0	1.1	11.8	0.5			13
14	3.5	0.0	0.0	0.1	1.8	0.2	9.7	0.3	5.5	1.6			14
15	0.2	2.2	0.7	0.0	0.4	0.0	7.5	2.0	0.0	0.6			15
16	0.8	0.7	0.4	0.0	0.4	0.1	7.5	0.2	0.1	0.4			16
17	1.5	0.3	8.0	0.0	0.0	8.0	0.4	0.0	0.4	0.7			17
18	3.0	0.0	4.2	0.0	0.0	20.0	0.7	2.4	2.1	2.7			18
19	0.8	0.3	3.1	0.0	0.6	4.8	2.4	4.3	0.8	9.4			19
20	0.0	1.4	0.3	0.0	0.0	6.6	0.0	7.1	0.6	0.0			20
21	1.0	0.9	7.6	5.0	0.0	1.2	0.0	2.5	0.7	0.1			21
22	2.7	0.0	0.6	2.9	0.3	0.0	0.0	2.3	0.0	0.0			22
23	0.1	0.0	0.0	0.4	0.0	2.8	0.0	7.2	3.5	0.2			23
24	0.2	7.4	0.0	1.7	0.0	1.8	3.1	6.4	3.2	0.0			24
25	0.9	4.8	0.3	0.0	0.7	4.0	19.0	3.1	0.2	0.0			25
26	14.6	1.6	15.0	3.5	1.3	2.5	12.1	4.0	1.8	1.7			26
27	5.6	4.1	22.6	10.3	0.2	0.0	1.7	0.0	7.8	3.0			27
28	0.0	1.3	14.0	0.3	0.0	0.2	0.2	0.1	1.2	0.0			28
29	0.0		3.3	3.5	0.0	0.0	5.2	0.1	8.2	0.1			29
30	0.0		1.6	0.2	0.0	4.5	1.5	0.2	2.1	0.2			30
31	0.4		9.2		0.3		1.1	2.1		0.3			31
Total	39.6	67.8	139.2	73.6	25.8	64.5	111.8	77.5	88.9	61.7			

Annual Total (mm) 750.4

4. Monthly Rainfall in La Mica Project Area

4-1 Monthly Rainfall STATION Micaeocha CATCHMENT AREA sq.km Quito, Ecuador
RIVER, IN THE BASIN OF ELEVATION m UNIT mm S 0 • 32' W 78 • 13'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1965	19.9	20.7	28.9	99.3	129.6	65.5	59.8	70.3	40.2	95.5	137.0	73.3	840.0
1966	39.6	69.7	143.6	67.6	29.0	66.4	107.9	78.6	104.4	43.4	-	-	-

4-2 Monthly Rainfall STATION Papallacta CATCHMENT AREA sq.km Quito, Ecuador
RIVER, IN THE BASIN OF ELEVATION m UNIT mm S 0 • 22' W 78 • 08'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1963	-	-	-	-	-	-	-	60.4	43.1	23.7	58.3	53.4	-
1964	22.3	46.9	72.0	87.6	69.9	175.5	110.9	164.0	188.2	75.5	60.2	61.8	1,134.8
1965	54.1	26.6	61.7	103.5	138.0	114.1	151.1	174.1	66.6	-	144.8	66.4	-
1966	86.8	77.2	157.7	91.3	42.7	95.5	196.7	98.7	151.3	55.2	63.5	131.8	1,248.4

4-3 Monthly Rainfall STATION Borja CATCHMENT AREA ____ sq.km Quito, Ecuador

RIVER, IN THE BASIN OF ____ ELEVATION 1,500 m UNIT mm S 0 • 25' W 77 • 50'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1965	-	-	-	-	-	-	-	-	272.8	-	-	-	-
1966	296.0	-	280.4	168.9	249.0	438.0	-	-	-	-	176.7	373.8	-

4-4 Monthly Rainfall STATION Cajas Pedregal CATCHMENT AREA ____ sq.km Quito, Ecuador

RIVER, IN THE BASIN OF ____ ELEVATION 3,980 m UNIT mm S 0 • 41' W 78 • 20'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1963	-	-	-	-	74.1	135.0	95.0	88.5	73.3	72.6	165.8	121.6	-
1964	20.1	34.3	63.1	158.6	88.1	221.7	128.0	166.7	192.1	91.4	67.5	102.0	1,333.6
1965	55.9	45.2	57.6	114.3	170.4	-	147.6	124.7	112.6	120.8	143.2	101.9	-
1966	73.8	89.2	182.1	73.0	67.7	139.1	202.9	166.1	161.2	102.6	103.3	126.1	1,487.1

4-5 Monthly Rainfall STATION Tiputini CATCHMENT AREA sq.km Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION 220 m UNIT mm S 0 • 45' W 75 • 32'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1962	144.9	118.2	309.6	259.9	420.5	440.0	288.8	288.2	183.8	222.3			
1963	27.7	190.3	291.9	221.7	255.4	137.9	173.4	194.2	104.4	164.4	164.9	164.4	2,090.6
1964	17.0	98.7	187.3	197.3	270.9	444.4	275.5	-	272.2	350.9	102.6	-	-
1965	-	-	268.6	139.9	329.1	210.8	239.4	-	333.0	228.9	91.9	248.9	-
1966	183.8	79.0	28.2	105.2	88.2	99.3	118.5	87.0	158.6	215.4	54.8	95.7	1,373.7

4-6 Monthly Rainfall STATION Archidona CATCHMENT AREA sq.km Quito, Ecuador

RIVER, IN THE BASIN OF ELEVATION 600 m UNIT mm S 0 • 55' W 77 • 48'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1964	-	-	-	-	-	-	-	-	-	224.5	223.9	335.4	-
1965	250.2	156.9	351.8	428.7	416.7	511.4	442.1	351.5	418.2	283.5	460.9	244.4	4,316.3
1966	293.4	250.8	393.2	517.5	749.9	420.7	659.7	373.3	392.3	232.9	251.2	576.2	5,111.1

4-7 Monthly Rainfall STATION Tena CATCHMENT AREA ____ sq.km Quito, Ecuador

RIVER IN THE BASIN OF ____ ELEVATION 527 m UNIT mm S 0 • 59' W 77 • 49'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1964	-	-	-	-	-	-	-	-	-	350.5	130.9	518.9	-
1965	267.8	139.2	168.4	373.2	608.2	831.9	441.4	334.5	383.7	333.4	383.2	249.4	4,514.3
1966	137.4	264.4	445.8	541.0	285.2	267.0	152.6	133.2	254.9	282.5	601.1	391.8	3,756.9

4-8 Monthly Rainfall STATION Salayambo CATCHMENT AREA ____ sq.km Quito, Ecuador

RIVER IN THE BASIN OF ____ ELEVATION 3,750 m UNIT mm S 01. 02' W 78 . 20'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1965	-	-	-	-	-	-	-	-	-	-	104.0	104.6	-
1966	89.6	145.7	187.5	160.1	174.9	277.9	-	180.7	103.5	91.7	82.4	-	-

4-9 Monthly Rainfall STATION Satzayacu CATCHMENT AREA ____ sq.km Quito, Ecuador

RIVER, IN THE BASIN OF ____ ELEVATION 470 m UNIT mm S 1 ° 11' W 77 ° 52'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1964	-	-	-	-	-	-	-	-	313.3	326.0	185.7	357.7	-
1965	265.6	107.4	342.9	195.1	568.3	471.9	395.5	307.6	325.3	242.0	377.3	252.1	3,851.0
1966	306.1	257.2	411.6	470.8	399.6	325.0	393.5	233.7	458.4	251.5	274.2	296.0	4,077.3

4-10 Monthly Rainfall STATION Cururay CATCHMENT AREA ____ sq.km Quito, Ecuador

RIVER, IN THE BASIN OF ____ ELEVATION 300 m UNIT mm S 1 ° 30' W 76 ° 50'

YEAR	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	ANNUAL
1965	204.5	270.9	377.1	60.4	156.1	-	243.3	142.0	167.1	328.8	325.6	228.3	-
1966	284.5	135.7	107.9	218.3	202.7	115.6	397.2	186.5	254.6	279.2	146.9	69.2	2,398.3

5. Gaged Discharge in ANTIZANA Gaging Station (from 1960 to 1966)

5-1 Gaged discharge in ANTIZANA gaging station

STATION

RIO ANTIZANA RIVER, IN THE BASIN OF ELEVATION UNIT m^3/sec YEAR 1960

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.89	1.80	1.77	2.03	2.09	6.74	2.08	2.79	2.15	2.13	2.00	1.45	1
2	1.80	1.90	1.75	1.99	2.09	4.89	2.30	2.52	3.42	2.13	1.88	1.72	2
3	1.76	1.95	1.82	2.04	2.05	3.87	2.56	2.28	5.32	2.13	1.88	1.79	3
4	1.76	1.79	1.77	1.81	2.00	3.12	2.42	3.78	4.68	2.10	1.92	1.69	4
5	1.80	1.75	2.09	1.43	1.96	2.74	2.33	4.67	3.50	2.18	1.83	1.58	5
6	1.88	1.62	2.03	1.34	1.98	2.73	2.47	3.53	2.91	2.03	1.95	1.65	6
7	1.88	1.58	2.11	1.70	2.03	2.73	2.62	2.84	2.55	2.03	1.90	2.08	7
8	1.90	1.63	2.00	2.06	2.00	2.69	2.47	2.55	2.35	1.89	1.90	1.93	8
9	1.76	1.64	2.04	2.02	1.86	2.55	2.37	2.42	2.33	1.98	1.92	1.85	9
10	1.55	1.67	1.81	2.03	1.88	2.52	2.48	2.69	2.39	1.97	1.94	2.04	10
11	1.65	1.87	1.91	1.82	1.85	2.31	2.75	3.51	2.35	1.91	1.91	1.67	11
12	1.87	1.75	1.93	1.88	2.00	2.28	2.39	3.23	2.39	1.84	1.87	1.46	12
13	1.83	1.65	1.98	1.71	1.96	2.30	2.32	2.79	2.37	1.84	2.03	1.44	13
14	1.85	1.65	1.91	1.55	1.97	2.23	2.21	2.46	2.41	1.84	1.97	1.51	14
15	1.88	1.88	2.01	1.52	1.97	2.20	2.19	2.39	2.39	1.82	1.79	1.31	15
16	1.92	1.75	2.08	1.27	1.98	2.21	2.12	2.16	2.29	1.79	1.77	1.37	16
17	1.94	1.66	2.15	1.55	1.89	2.04	2.16	2.12	2.10	1.88	1.71	1.34	17
18	1.94	1.69	2.02	1.77	o.91	2.03	2.09	2.04	2.15	1.93	1.73	1.44	18
19	1.94	1.74	1.98	1.88	1.91	2.01	2.19	2.00	2.20	1.90	1.75	1.47	19
20	1.90	1.86	2.08	1.78	1.93	2.00	2.39	2.03	2.30	1.99	1.72	1.57	20
21	1.92	2.27	1.99	1.72	2.03	1.91	2.31	2.33	2.36	1.77	1.72	1.59	21
22	1.92	2.32	2.72	1.85	1.99	1.90	2.12	2.43	2.26	1.69	1.77	1.53	22
23	1.95	2.26	2.24	2.00	2.09	1.91	2.19	2.20	2.19	1.57	1.74	1.63	23
24	2.02	2.20	1.83	1.96	2.21	1.89	2.23	2.08	2.17	1.55	1.79	1.69	24
25	1.96	2.03	2.04	2.01	2.29	1.90	2.39	2.03	2.14	1.63	1.42	1.60	25
26	1.99	1.87	1.83	1.97	2.32	1.90	2.39	1.97	2.31	1.60	1.75	1.30	26
27	2.00	1.98	1.73	1.94	2.30	1.90	2.23	2.03	2.44	1.59	1.51	1.69	27
28	1.93	2.00	2.00	1.95	2.24	1.90	2.12	2.02	2.29	1.61	1.64	1.77	28
29	1.96	1.87	1.90	2.07	2.20	1.90	2.42	2.17	2.16	1.74	1.78	1.78	29
30	1.96		2.22	2.08	2.95	1.82	3.23	2.39	2.18	1.79	1.73	1.80	30
31	1.95		1.98		7.67		2.88	2.29		1.78		1.74	31
Average	1.88	1.85	1.99	1.82	2.255	2.50	2.37	2.54	2.57	1.859	1.807	1.628	

Annual Total (Average) 2.089

5-2 Gaged discharge in ANTIZANA gaging station

STATION

RIO ANTIZANA RIVER, IN THE BASIN OF ELEVATION UNIT m^3/sec YEAR 1961

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.69	1.57	1.83	1.58	3.76	2.12	2.93	2.36	1.73	2.40	2.50	1.79	1
2	1.64	1.48	2.11	1.67	3.23	2.38	2.76	2.37	1.66	2.55	2.26	1.90	2
3	1.64	1.41	2.11	1.62	2.90	2.35	2.57	2.18	1.63	2.47	2.18	1.79	3
4	1.70	1.31	2.41	1.67	2.43	2.15	2.76	2.02	1.59	2.52	2.28	1.66	4
5	1.75	1.36	2.52	o.76	2.10	2.19	3.04	1.89	1.55	2.66	2.31	1.61	5
6	1.80	1.38	2.55	1.85	1.98	2.90	2.87	1.93	1.58	3.30	2.12	1.83	6
7	1.85	1.47	2.95	1.81	1.89	3.91	2.69	2.28	1.72	3.02	2.00	1.95	7
8	1.78	1.50	2.59	1.74	1.91	3.45	2.58	3.23	1.97	2.83	1.95	1.94	8
9	1.57	1.50	2.28	1.80	1.94	2.70	2.54	3.70	2.12	2.75	1.89	1.81	9
10	1.79	1.54	2.57	1.70	1.91	2.48	2.27	3.30	1.99	2.81	1885	1.69	10
11	1.69	1.45	3.04	1.66	2.05	2.49	2.21	2.99	1.88	2.80	1.88	1.56	11
12	1.63	1.52	2.65	1.65	2.35	2.68	2.25	2.72	1.84	3.68	1.90	1.49	12
13	1.71	1.67	2.27	1.79	2.38	2.78	2.73	2.58	1.79	3.99	2.30	1.50	13
14	1.61	1.78	2.19	1.72	2.22	2.84	2.70	2.36	1.77	3.44	1.93	1.36	14
15	1.65	1.86	2.20	1.45	2.30	2.65	2.74	2.18	1.76	3.17	1.69	1.39	15
16	1.66	1.83	2.07	1.49	2.20	3.97	2.60	2.30	2.30	3.02	1.63	1.55	16
17	1.57	1.67	1.79	1.48	2.10	4.77	2.41	2.32	2.38	3.01	1.76	1.49	17
18	1.61	1.65	1.70	1.50	2.08	3.52	2.32	2.21	2.24	2.87	1.91	1.38	18
19	1.68	1.78	1.82	1.54	2.04	2.92	2.27	2.16	2.10	2.77	1.96	1.38	19
20	1.73	1.82	1.87	1.47	2.05	2.64	2.13	2.23	2.00	2.55	1.93	1.49	20
21	1.57	1.74	1.73	1.39	2.00	2.42	2.02	2.30	2.14	2.50	1.88	1.44	21
22	1.70	1.62	1.64	1.39	1.97	2.30	2.18	2.27	2.24	2.55	1.81	1.38	22
23	1.85	1.74	1.65	1.66	1.87	2.22	2.08	2.03	2.46	2.38	1.77	1.35	23
24	1.87	1.65	1.82	3.00	1.96	2.20	1.85	2.22	2.46	2.34	1.76	1.34	24
25	1.94	1.71	2.07	3.28	2.33	2.13	1.87	2.12	2.30	2.79	1.76	1.34	25
26	1.91	1.64	1.97	2.56	2.61	2.11	1.79	2.02	2.12	2.84	1.84	1.44	26
27	1.90	1.78	1.97	2.20	2.54	2.07	2.33	1.93	2.13	2.68	1.78	1.56	27
28	1.82	1.73	1.97	2.07	2.27	2.02	3.06	1.78	2.09	2.51	1.82	1.61	28
29	1.83		1.97	2.20	2.20	2.18	2.86	1.80	2.17	2.33	1.81	1.43	29
30	1.66		1.90	3.38	2.16	2.67	2.52	1.83	2.34	2.23	1.75	1.42	30
31	1.63		1.82		2.03		2.32	1.77		2.29		1.41	31
Average	1.723	1.613	2.131	1.869	2.260	2.675	2.461	2.304	2.003	2.777	1.941	1.558	

Annual Total (Average) 2.113

5-3 Gaged discharge in ANTIZANA gaging station

STATION

Río ANTIZANA RIVER, IN THE BASIN OF ELEVATION UNIT m^3/sec YEAR 1962

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.51	1.97	1.66	1.28	1.55	2.28	2.87	4.53	3.40	2.60	2.26	1.53	1
2	1.58	2.00	1.90	1.19	1.53	2.19	3.87	4.32	3.83	2.61	2.34	1.67	2
3	1.82	1.86	1.73	1.20	1.28	5.10	4.17	5.03	3.88	2.76	2.55	1.92	3
4	1.80	1.80	1.59	1.28	1.31	8.79	3.57	5.14	3.94	2.57	2.62	1.91	4
5	1.42	1.81	1.44	1.19	1.55	7.48	3.49	4.47	3.64	2.27	2.59	2.07	5
6	1.24	1.54	1.63	1.13	1.53	5.97	4.80	3.90	3.89	2.12	2.24	2.35	6
7	1.40	1.32	1.58	1.16	1.54	4.95	4.44	3.67	3.63	2.07	2.08	2.35	7
8	1.60	1.33	1.60	1.26	1.99	4.16	3.84	3.58	3.23	2.19	2.05	2.42	8
9	1.58	1.24	1.74	1.33	2.18	3.64	3.58	3.89	2.90	2.48	2.15	2.32	9
10	1.50	1.16	1.63	1.35	2.12	4.87	3.37	3.57	2.74	2.41	2.10	2.16	10
11	1.45	1.28	1.55	1.62	3.01	5.17	3.05	3.26	2.69	2.67	2.36	1.95	11
12	1.74	1.27	1.59	2.09	2.90	5.21	2.87	3.10	2.63	2.54	2.49	2.24	12
13	1.91	1.36	1.62	1.88	2.70	4.39	2.69	2.94	2.52	2.29	2.43	2.33	13
14	1.73	1.48	1.46	1.75	2.97	3.76	2.62	2.94	2.47	2.77	2.81	2.24	14
15	1.57	1.25	1.39	1.86	2.99	3.42	2.50	2.62	2.63	3.01	2.53	1.93	15
16	1.45	1.32	1.79	1.93	2.82	3.69	2.47	2.78	2.62	2.79	2.46	1.87	16
17	1.54	1.41	1.92	2.00	5.62	4.01	2.43	2.62	2.50	2.61	3.35	1.91	17
18	1.47	2.24	1.75	1.82	5.49	3.38	2.33	2.94	2.44	2.29	2.71	1.84	18
19	1.41	3.62	1.84	1.85	5.81	3.15	2.47	2.94	2.40	2.08	2.43	1.84	19
20	1.44	4.51	1.75	2.03	5.42	2.89	2.59	2.78	2.35	3.46	2.61	2.13	20
21	1.54	3.69	1.46	1.84	4.46	3.08	2.37	2.62	2.78	3.34	2.41	2.06	21
22	1.38	3.31	1.40	1.77	3.90	3.38	2.22	2.47	2.87	3.20	2.28	2.05	22
23	1.56	2.85	1.32	1.67	3.92	3.40	2.94	2.31	2.79	3.01	1.98	2.12	23
24	1.47	2.71	1.47	1.67	3.51	3.00	4.41	2.94	2.52	2.77	1.77	2.09	24
25	1.62	2.42	2.28	1.80	3.70	2.91	4.99	3.42	2.43	2.63	1.71	1.90	25
26	1.43	2.15	1.94	1.57	3.67	3.54	3.98	3.26	2.42	2.55	1.77	1.79	26
27	1.67	2.02	1.71	1.60	3.22	4.09	3.38	3.57	2.34	2.51	1.61	1.76	27
28	1.89	1.62	1.60	1.51	2.74	4.10	2.97	4.24	2.22	2.45	1.53	1.59	28
29	1.94		1.51	1.47	2.44	3.63	3.86	3.42	2.22	2.39	1.53	1.38	29
30	1.93		1.34	1.48	2.37	3.15	6.58	3.13	2.78	2.50	1.53	1.37	30
31	1.85		1.44		2.37		5.23	3.34		2.42		1.37	31
Average	1.596	2.019	1.633	1.587	2.989	4.094	3.45	3.411	2.856	2.592	2.242	1.95	

Annual Total | Average | 2.535

5-4 Gaged discharge in ANTIZANA gaging station

STATION

Río ANTIZANA RIVER, IN THE BASIN OF ELEVATION UNIT m^3/sec YEAR 1963

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.37	1.55	1.53	1.47	1.80	1.98	1.84	3.36	1.68	1.45	1.93	1.92	1
2	1.31	1.91	1.53	1.56	1.62	2.07	1.88	2.97	1.62	1.35	2.20	1.84	2
3	1.42	1.65	1.46	1.91	1.65	2.03	1.83	2.54	1.54	1.32	2.06	1.69	3
4	1.44	1.60	1.53	2.13	1.77	1.81	1.73	2.14	1.48	1.62	2.08	1.79	4
5	1.52	1.60	1.53	1.91	1.69	1.55	1.83	2.00	1.50	1.84	1.99	1.80	5
6	1.53	1.46	1.53	1.75	1.75	1.49	1.77	2.66	1.48	1.85	2.40	1.91	6
7	1.49	1.49	1.53	1.69	1.83	1.60	1.62	3.71	1.50	1.67	2.09	1.97	7
8	1.45	1.42	1.49	1.54	1.79	1.64	1.49	3.11	1.42	1.69	1.83	1.97	8
9	1.63	1.39	1.53	1.62	1.84	1.78	1.48	2.64	1.51	1.58	1.77	2.12	9
10	1.53	1.53	1.43	1.69	2.97	3.22	1.51	2.34	1.51	1.42	1.78	2.27	10
11	1.53	1.53	1.28	1.71	2.80	3.30	1.62	2.04	1.52	1.48	2.08	2.35	11
12	1.52	1.53	1.37	1.47	2.39	3.34	1.67	2.02	1.67	1.46	1.89	2.33	12
13	1.53	1.40	1.40	1.40	1.75	3.05	1.63	1.86	1.61	1.56	1.68	2.47	13
14	1.63	1.25	1.62	1.50	1.96	3.95	1.62	2.00	1.51	1.46	1.79	2.12	14
15	1.53	1.22	1.77	1.58	3.34	3.98	1.63	2.39	1.51	1.42	2.21	1.97	15
16	1.55	1.22	1.69	1.61	4.00	3.24	1.64	2.93	1.55	1.47	1.97	1.95	16
17	1.51	1.26	1.67	1.68	3.93	3.31	1.50	3.65	1.74	1.40	1.73	1.84	17
18	1.53	1.53	1.64	1.60	3.26	6.54	1.40	3.75	1.93	1.58	1.55	1.77	18
19	1.45	1.48	1.81	1.38	2.65	8.75	1.30	3.20	1.88	1.70	1.53	1.68	19
20	1.38	1.22	1.79	1.39	2.27	6.88	1.34	2.76	1.67	1.68	1.52	1.91	20
21	1.50	1.22	1.66	1.50	2.02	5.25	1.47	2.48	1.66	1.57	1.58	2.08	21
22	1.46	1.42	1.45	1.74	1.95	4.05	1.57	2.18	1.89	1.54	1.99	2.16	22
23	1.40	1.72	1.45	1.82	1.99	3.14	1.90	2.04	1.83	1.56	2.33	2.30	23
24	1.49	1.82	1.68	1.79	2.00	2.60	2.43	1.93	1.76	1.56	4.32	2.59	24
25	1.42	1.56	1.99	1.98	2.50	2.20	2.97	1.79	1.78	1.64	3.90	2.48	25
26	1.52	1.53	1.75	2.10	2.48	1.98	2.31	1.86	1.79	1.45	3.37	2.58	26
27	1.74	1.68	1.64	2.01	2.26	1.93	1.99	2.04	1.76	1.37	2.85	2.50	27
28	1.49	1.55	1.43	1.78	2.04	1.84	2.14	1.89	1.70	1.53	2.41	2.48	28
29	1.43		1.38	1.69	1.91	1.70	2.89	1.79	1.48	1.90	1.17	2.11	29
30	1.56		1.45	1.74	1.93	1.83	3.82	1.64	1.59	2.54	1.93	1.99	30
31	1.52		1.54		2.03		3.72	1.55		2.47		1.84	31
Average	1.496	1.491	1.567	1.693	2.266	3.068	1.92	2.429	1.637	1.62	2.13	2.09	

Annual Total | Average | 1.950

5-5 Gaged discharge in ANTIZANA gaging station

STATION

RIVER IN THE BASIN OF — ELEVATION — UNIT — YEAR 1964

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.96	1.59	1.41	1.36	2.95	2.60	4.66	2.06	2.60	2.47	1.84	1.37	1
2	2.05	1.57	1.56	1.50	2.53	2.58	4.77	2.06	3.46	2.47	1.84	1.37	2
3	2.02	1.63	1.58	1.61	2.20	2.46	4.72	2.15	5.73	2.26	1.84	1.37	3
4	1.80	1.48	1.21	1.70	2.03	3.34	4.21	2.28	5.09	2.15	1.68	1.39	4
5	1.89	1.57	1.26	1.77	1.94	3.23	3.68	2.52	4.75	2.15	1.84	1.53	5
6	1.81	1.69	1.23	1.79	1.89	3.88	3.40	2.40	4.91	2.08	1.92	1.39	6
7	1.79	1.27	1.27	1.75	1.98	3.90	5.18	2.14	6.52	1.92	2.07	1.44	7
8	1.79	1.45	1.61	2.27	1.79	3.85	5.56	1.99	6.16	1.84	1.99	1.53	8
9	1.80	1.55	1.59	2.77	1.88	4.04	5.17	4.56	5.81	1.84	1.99	1.53	9
10	1.75	1.36	1.48	2.77	1.94	3.65	4.53	7.54	5.21	1.84	1.84	1.53	10
11	1.85	1.37	1.38	2.86	2.36	3.29	3.92	7.94	6.43	1.88	1.84	1.42	11
12	1.93	1.71	1.21	2.65	2.52	2.94	3.59	6.91	7.47	2.22	1.84	1.37	12
13	2.01	1.37	1.09	2.26	2.49	2.68	3.35	6.83	7.70	2.38	1.84	1.27	13
14	1.91	1.84	1.22	2.19	2.73	2.74	3.31	5.24	6.63	2.18	1.85	1.22	14
15	1.96	1.36	1.46	2.83	2.85	3.47	3.74	4.35	6.09	2.15	1.92	1.22	15
16	1.89	1.05	3.66	2.66	2.65	3.62	2.93	3.64	5.96	2.11	1.80	1.22	16
17	1.74	1.28	3.98	3.91	2.44	3.73	2.65	3.80	5.71	2.78	1.70	1.11	17
18	1.83	1.31	3.13	3.79	2.27	5.40	2.42	4.05	5.17	2.51	1.53	1.11	18
19	1.78	1.31	2.44	3.14	2.02	5.76	2.23	3.63	4.41	2.01	1.57	1.13	19
20	1.81	1.11	2.03	2.53	2.06	7.43	2.19	3.13	3.90	1.84	1.62	1.22	20
21	1.79	1.04	1.87	2.35	2.11	7.60	2.39	2.82	3.56	1.77	1.62	1.17	21
22	1.59	1.36	1.88	2.51	2.41	7.46	2.55	2.66	3.27	1.53	1.58	1.22	22
23	1.53	1.65	1.71	2.31	2.62	7.01	2.85	2.40	3.10	1.62	1.53	1.18	23
24	1.26	1.24	1.50	2.05	2.71	5.61	2.66	2.24	3.52	1.58	1.53	1.22	24
25	1.44	1.24	1.35	2.20	2.64	5.39	2.35	2.19	3.37	1.62	1.61	1.18	25
26	1.27	1.45	1.45	3.43	2.35	5.80	2.20	2.14	2.93	1.80	1.58	1.09	26
27	1.10	1.61	1.27	3.29	2.32	5.49	2.30	2.28	2.78	1.84	1.53	1.16	27
28	1.26	1.69	1.39	2.81	2.41	4.65	2.68	2.15	2.78	1.84	1.53	1.27	28
29	1.55	1.27	1.30	2.35	2.67	4.44	2.53	2.15	2.64	1.69	1.58	1.22	29
30	1.79		1.30	3.12	2.56	4.29	2.24	2.15	2.47	1.68	1.53	1.28	30
31	1.75		1.37		2.65		2.15	2.15		1.84		1.22	31
Average	1.732	1.588	1.701	2.522	2.353	4.410	3.328	3.375	4.705	1.995	1.731	1.288	

Annual Total (Average) 2.561

5-6 Gaged discharge in ANTIZANA gaging station

STATION

RIVER IN THE BASIN OF — ELEVATION — UNIT m^3/sec — YEAR 1965

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.22	1.15	1.17	0.89	1.55	2.78	1.95	2.07	3.59	1.68	1.67	2.15	1
2	1.22	1.01	1.14	1.04	1.55	2.47	2.15	1.94	3.14	1.78	1.57	2.40	2
3	1.22	0.91	1.14	1.13	1.77	3.42	2.23	1.84	2.93	1.67	1.63	2.52	3
4	1.22	1.00	1.11	1.21	2.74	4.37	2.26	1.96	2.98	1.61	1.63	2.39	4
5	1.22	1.09	1.27	1.17	2.57	3.57	2.47	2.81	2.95	1.55	1.75	2.22	5
6	1.22	1.05	1.39	1.24	2.51	3.26	3.36	3.15	2.61	1.53	2.23	2.19	6
7	1.11	1.10	1.20	1.80	2.09	3.10	3.97	2.79	2.42	1.48	1.96	2.23	7
8	1.01	1.18	1.19	1.62	4.83	3.26	3.75	2.44	2.03	1.42	2.34	2.32	8
9	1.06	1.13	1.19	1.79	4.36	3.42	3.05	2.44	1.92	1.32	3.58	2.46	9
10	1.04	1.02	1.26	2.19	3.56	4.37	2.65	2.77	1.81	1.41	3.55	2.53	10
11	1.22	0.94	1.28	1.76	3.26	4.05	3.19	2.99	1.64	1.15	2.89	2.84	11
12	1.31	0.90	1.13	1.52	2.84	4.05	5.22	3.21	1.84	1.27	3.61	2.99	12
13	1.33	1.15	1.30	1.37	2.64	3.42	5.19	3.74	1.84	1.44	2.77	2.79	13
14	1.32	1.18	1.37	1.35	2.32	3.10	4.14	3.55	1.81	2.18	2.62	2.51	14
15	1.42	1.22	1.35	1.39	2.31	2.94	3.40	3.13	1.87	2.53	3.54	2.27	15
16	1.40	1.30	1.15	1.63	2.93	3.10	3.13	2.78	1.80	3.10	4.06	2.14	16
17	1.37	1.33	1.27	1.84	2.33	5.16	3.02	2.50	2.11	2.70	6.07	2.26	17
18	1.27	1.45	1.18	1.48	2.15	4.05	2.77	2.11	2.41	2.36	6.09	2.22	18
19	1.30	1.47	1.11	1.86	2.15	3.57	2.69	1.95	2.38	1.99	6.98	1.96	19
20	1.31	1.24	0.95	1.88	2.15	3.73	2.75	2.10	2.24	1.89	6.09	1.94	20
21	1.22	1.28	0.87	1.69	2.15	3.42	3.51	2.38	2.35	1.75	6.03	1.96	21
22	1.11	1.22	0.92	1.53	2.15	2.94	3.47	2.38	2.55	1.64	5.60	1.96	22
23	1.21	1.28	0.95	1.36	2.78	2.94	3.03	2.02	2.57	1.94	4.90	1.84	23
24	1.15	1.40	1.15	1.22	3.26	3.03	2.87	1.90	2.47	1.79	4.08	1.93	24
25	1.08	1.37	1.17	1.13	3.10	2.96	2.83	2.01	2.32	1.63	3.29	2.06	25
26	1.04	1.39	1.00	1.06	2.78	2.47	2.77	2.50	2.02	1.53	2.91	2.02	26
27	1.00	1.31	0.94	1.17	2.94	2.26	2.40	2.19	1.81	1.99	2.66	2.13	27
28	0.97	1.18	0.91	1.05	3.42	2.14	2.36	3.14	1.64	2.01	2.36	2.07	28
29	0.91		0.95	1.04	3.89	1.94	2.27	5.56	1.68	2.14	2.22	2.22	29
30	1.10		1.04	1.17	3.42	1.84	2.32	4.95	1.73	1.82	2.10	2.13	30
31	1.28		0.88		3.10		2.16	4.34		1.75		1.96	31
Average	1.188	1.187	1.125	1.418	2.761	3.237	3.017	2.761	2.261	1.808	3.424	2.244	

Annual Total (Average) 2.203

5-7 Gaged discharge in ANTIZANA gaging station

STATION _____

RIVER IN THE BASIN OF _____ ELEVATION _____ m^3/sec UNIT _____ YEAR 1966

DATE	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	DATE
1	1.96	2.18	3.27	7.54	2.94	2.08	3.31	3.53	2.39	6.08	1.86		1
2	1.77	2.17	3.93	6.34	2.83	2.18	4.42	3.03	2.32	7.22	1.98		2
3	1.98	2.11	3.42	4.94	2.69	1.96	3.57	2.93	2.57	5.92	1.94		3
4	1.88	1.94	3.05	4.12	2.58	1.96	2.76	2.81	2.65	4.57	1.93		4
5	1.88	1.90	2.73	3.60	2.47	1.97	2.42	3.07	2.52	4.04	1.84		5
6	1.81	1.98	2.81	3.23	2.35	1.85	2.19	2.91	2.26	3.55	1.72		6
7	1.77	2.03	3.06	3.03	2.27	1.81	2.03	4.20	2.15	3.22	1.58		7
8	1.68	2.40	3.38	2.94	2.49	1.71	1.92	4.74	2.15	2.93	1.53		8
9	1.72	2.16	3.39	3.52	2.56	1.62	1.89	4.24	2.88	2.78	1.63		9
10	1.75	1.90	3.07	3.77	2.66	1.62	2.27	3.61	3.15	2.71	1.69		10
11	1.71	1.97	2.64	3.68	2.61	1.59	3.33	3.19	2.69	2.55			11
12	1.84	1.98	2.30	4.26	2.54	1.65	2.93	3.15	2.48	2.47			12
13	1.70	2.00	2.07	3.76	2.47	1.56	4.17	3.10	6.03	2.47			13
14	1.67	1.76	1.66	3.19	2.31	1.44	4.89	3.24	7.15	2.47			14
15	1.63	1.74	2.08	3.02	2.23	1.51	5.09	3.06	6.00	2.47			15
16	1.56	1.57	2.20	2.78	2.20	1.54	6.94	2.65	4.85	2.47			16
17	1.71	1.50	2.84	2.50	2.30	2.48	6.07	2.47	4.02	2.44			17
18	1.74	1.59	2.96	2.47	2.24	3.06	5.07	2.48	3.56	2.76			18
19	1.91	1.44	2.78	2.31	2.15	4.01	4.49	2.62	3.10	2.35			19
20	2.13	1.46	2.61	2.15	2.40	4.10	3.68	3.43	2.70	2.12			20
21	2.14	1.51	2.48	2.30	2.12	3.57	3.15	3.46	2.47	1.89			21
22	2.11	1.72	2.44	2.47	2.01	3.17	2.75	3.25	2.47	1.84			22
23	2.13	1.70	2.39	2.44	1.96	2.81	2.47	3.87	2.65	1.84			23
24	2.06	1.61	2.33	2.36	1.84	2.52	2.65	3.88	2.94	1.84			24
25	1.99	1.89	2.37	2.19	2.12	2.72	6.69	3.73	2.86	1.76			25
26	2.89	2.18	5.62	3.57	1.90	2.94	7.32	3.98	2.78	1.88			26
27	3.52	2.78	8.27	3.23	1.79	2.44	5.87	3.44	4.28	1.88			27
28	2.99	3.09	7.82	2.70	1.92	2.02	4.69	2.97	4.24	1.84			28
29	2.52		6.25	2.62	1.96	1.84	4.70	2.64	5.28	1.81			29
30	2.25		5.16	2.62	2.11	1.84	4.06	2.42	4.81	1.76			30
31	2.18		6.39		2.00		3.89	2.31		1.68			31
Average	2.018	1.937	3.472	3.321	2.291	2.251	3.924	3.238	3.412	2.825	1.770		

Annual Total (Average) 2.969