FIGURES

FIGURE LIST
(LISTE DES FIGURES)

Tableau 5-1 LISTE DES TROUS DE FORAGE

Hole No.	Location	Co-ordination X Y	Top Elevation (m)	Length of Hole (m)	Direction of Hole	Thickness of Overburden (m)	El. of Bed-rock Surface (m)	Length of Casing Pipe (m)	Core Recovery (%)	Diameter of Hole (mm)	Rock Type of Bed Rock	Commenced / Completed	Remarks
SB-1	Dam, left bank.	X 87,028.91 Y 78,642.17	420.77	35.0	Vertical					NX(0m~35.0m)		24-Jan.-1975 / 27-Feb.- 〃	
SB-2	Dam, river bed.	X 87,10806 Y 78,642.00	393.00	35.0	do.					NX(0m~35.0m)		6-Feb.- 〃 / 1-Mar.- 〃	
SB-3	Dam, right bank.	X 87,268.78 Y 78,643.46	422.82	35.0	do.					NX(0m~35.0m)		12-Apr.- 〃 / 8-May- 〃	
SB-4	Dam, right bank.	X 87,184.80 Y 78,759.93	419.61	35.0	do.					NX(0m~35.0m)		2-Mar.- 〃 / 4-Apr.- 〃	
SB-5	Dam, river bed.	X 87,103.80 Y 78,736.94	393.99	35.0	do.					NX(0m~35.0m)		16-Mar.- 〃 / 6-Apr.- 〃	
SB-7	Dam, left bank.	X 87,015.88 Y 78,543.96	407.54	30.0	do.					NX(0m~30.0m)		23-Nov.-1974 / 19-Dec.- 〃	
SB-8	Intake. (left bank)	X 87,184.70 Y 78,642.94	404.94	35.0	do.					NX(0m~35.0m)		29-Dec.- 〃 / 27-Jan-1975	
			Sub-total	240.0									
SU-1	Lower reservoir side(outlet)	X 86,022.03 Y 79,644.05	298.57	70.0	Vertical					NX(0m-48.65m) BX(48.65m-70.0m)		27-Nov.-1974 / 13-Feb.-1975	
SU-2	Lower reservoir side(outlet)	X 85,985.16 Y 79,429.74	339.79	38.5	do.					NX(0m~38.5m)		25-Jan.- 〃 / 11-Mar.- 〃	
SU-4	Lower reservoir side(outlet)	X 86,242.47 Y 79,516.81	310.22	100.0	do.					(mm) ø107.95(0m~1.6m) ø147.00(6m~8.5m) ø110.0 (8.5m-28m) NX(28m~100m)		15-Mar.-1975 / 16-Jun.- 〃	
SU-5	Lower reservoir side(water way)	X 86,319.87 Y 79,400.52	330.00	100.0	do.					NX(0m~100.0m)			
SU-6	Lower reservoir side(water way)	X 86,413.12 Y 79,260.43	350.14	125.0	do.					NX(0m~122m) BX(122m~125m)		6-Jun.- 〃 / 19-Aug- 〃	
SU-7	Lower reservoir side(powerhouse)	X 86,502.77 Y 79,125.87	380.24	75.0	do.					NX(0m~75.0m)		1-Jul.- 〃 / 14-Aug.- 〃	
			Total	748.5									

Tableau 5-2 LISTE DES PUITS DE SONDAGE (1-2)

Pit No.	Top Elevation(m)	Depth (m)	Location	Geological Log (0m — 2 — 3 — 4 — 5 — 6m — Depth)	Remarks
P 2	421.47	5.20	Upper dam site, right bank	Small gravel in MLY. soil 1.0 / Small gravel in gry. yel. or wht. MLY. soil 3.0 / Boulders (ø 0.5m) with clay and flat LS. frgs. 5.2m	
P 3	433.11	4.30	do.	LS. gravel in clay 0.5 / Blk. or brn. MLY. soil with gravel (ø 5~20cm) 2.6 / Small LS. gravel in brn. clay 4.3m	
P 4	426.25	5.60	do.	Compacted clay with LS. fragments 4.2m / Compacted fine-grained clay 5.6m	
P 5	420.10	6.00	do.	Black compacted clay with small gravel / Compacted clay 2.5 with LS. frgs. / LS. boulders (ø 0.5~1m) 3.8 with brn. clay mortar 6.0m	
P 6	412.50	5.50	do.	Farming soil with small LS. gravel 2.0 / Weathered, disturbed and schistosed 5.0 / ML. — pale blue, schistosed 5.5m	
P 7			do.		No data
P 8	426.25	5.60	do.	Forming soil 0.5 / Weathered, schistosed ML. 2.2 / Pale blue ML. with cemented calc-part 5.6m	Water table at 4.2m
A 1/2	468.95	3.65	South-east of upper reservoir	Ts. and slope wash 1.0 / Yel. fine grained sand and brn clay with soft LS. gravel 3.2 / ML. — weathered and friable yel-brn. 3.65m	Ts.=0.2m Water table at 3.3m
A 3/2	449.81	3.50	do.	Ts and brn. organic plastic clay 1.4 / Yel.-brn. ML. with some joints 3.5m	Ts.=0.2m Water table at 3.2m
A 5/2	431.50	2.00	do.	Ts and brn. organic plastic clay 1.2 / Gry. ML. — with speckles 2.0m	Ts.=0.2m Wet at bottom
A 1/4	459.93	4.30	do.	Ts and gry organic plastic clay 1.2 / Yel. speckled, plastic clay with calc-part 3.5 / Stratified gry. ML. 4.3m	Ts.=0.2m
A 3/4	444.94	4.00	do.	Ts. and brn. organic, plastic clay 2.0 / Gry. speckled ML. 4.0m	Ts.=0.2m Wet at bottom
B 1	426.74	3.80	Upper dam site and reservoir, right bank	Ts. and yel. sandy clay with gravel and breccia 2.35 / Co. deposits, clayey in lower part 3.8m	Ts.=0.25m
B 2	426.71	2.25	do.	Ts. and yel. clay with calc-part, and weathered yel ML. 2.25m	Ts.=0.2m
B 3	432.57	2.00	do.	Ts. and organic plastic clay with gravel 1.4 / Yel. ML. — calcite veins along joints 2.0m	Ts.=0.2m Wet at bottom
B 4	454.16	2.00	do.	Ts. and yel.-brn. organic, plastic clay 1.4 / Brn. ML. — weathered but not clayey 2.0m	Ts.=0.2m
C 1	459.68	2.00	North-east of upper reservoir	Ts. and organic plastic clay 1.0 / Gry ML. with calcite veins 2.0m	Ts.=0.2m
C 2	437.48	2.30	do.	Ts. and organic, plastic clay 1.4 / Brn. ML. not clayey 2.3m	Ts.=0.2m
C 3	442.11	1.70	do.	Ts. and compact ML. 1.0 / Calc-ML. — with many calcite veins 1.7m	Ts.=0.2m
C 4	444.81	2.70	do.	Ts. and organic plastic clay 1.2 / Yel.-brn. MLY. clay 2.0 / Brn. ML. — with calcite veins along joints 2.7m	Ts.=0.2m
C 5	450.60	1.40	do.	Ts. and plastic clay 0.8 / Yel.-brn. ML. 1.4m	Ts.=0.2m
D 1	442.42	2.00	South of upper reservoir, saddle part	Ts. and organic clay, wet 1.0 / Weathered gry. ML. 2.0m	Ts.=0.2m Wet at bottom
D 2	436.74	1.60	do.	Ts. and organic plastic clay 1.2 / ML. — yel.-brn. speckled and with calcite veins 1.6m	Ts.=0.2m
D 3	431.57	2.00	do.	Ts. and organic clay 0.8 / Yel.-gry. clayey ML. — with calc-nodules, LS. gravel and boulders 2.0m	Ts.=0.2m
D 4	436.36	3.20	do.	Ts. and organic, wet, plastic clay 1.8 / Weathered, blk, ML. — with calcite veins 3.2m	Ts.=0.2m

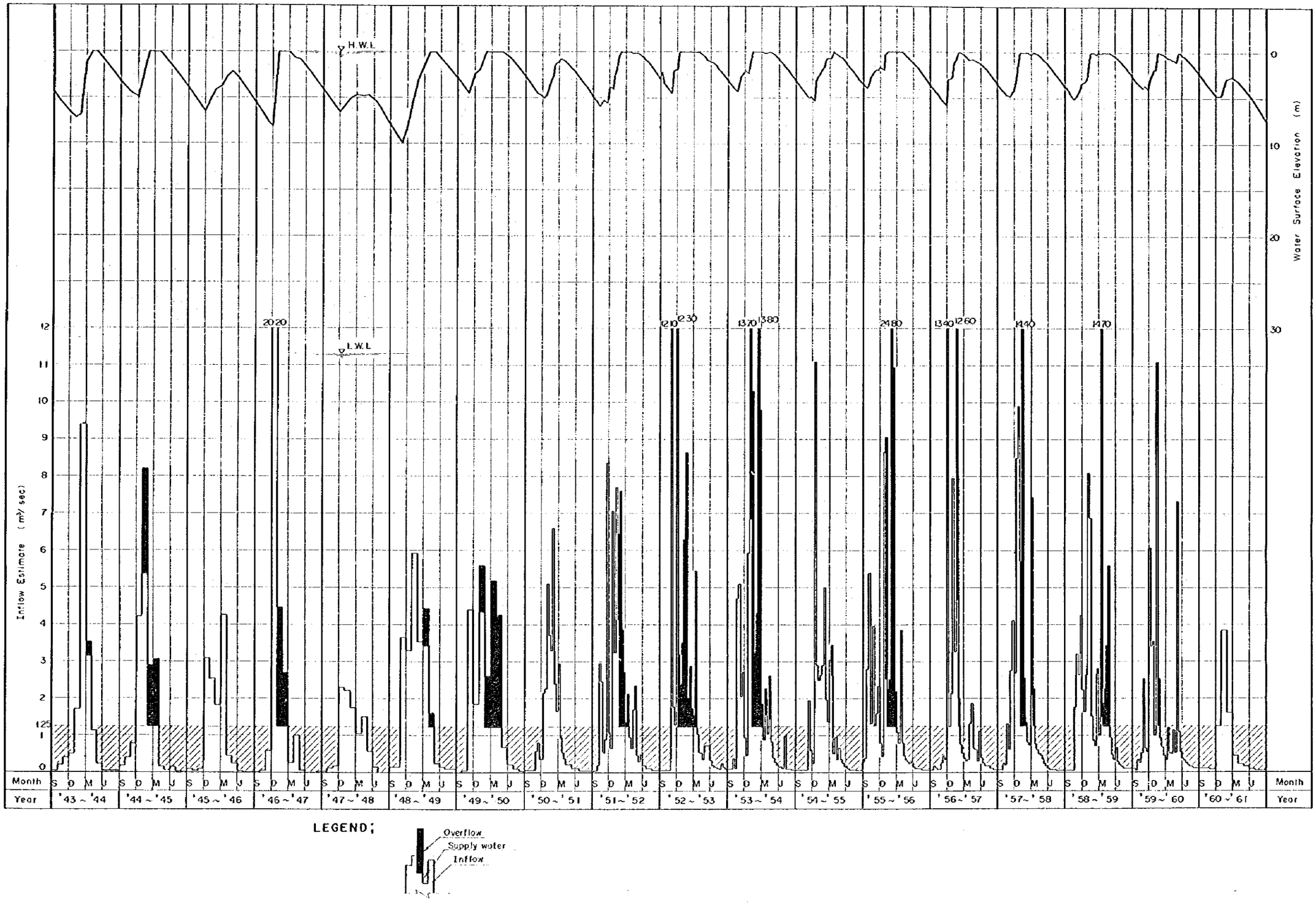
Abbreviations	
Ts.	Topsoil
LS.	Limestone
ML.	Marl
MLS.	Marly limestone
SLS.	Sandy limestone
MLY.	marly
frgs.	frogments
Yel.,yel	yellow
Brn.,brn.	brown
Gry.,gry	grey
Blk.,blk	black
Wht.,wht.	white
Co.	colluvial

Tableau 5-2 LISTE DES PUITS DE SONDAGE (2 - 2)

Pit No.	Top Elevation (m)	Depth (m)	Location	Geological Log — Depth (0m – 6m)	Remarks
D 5	435.38	2.50	South of upper reservoir, saddle part	Ts. and wet MLY. clay; Clayey ML. 1.5 wet; with calc-nodules; 2.5m	Ts.=0.2m
D 6	433.72	1.45	do.	Ts. and Clay 0.65; Wet ML.; with calcite veins along joints; 1.45m	Ts.=0.2m
H 1		5.00	Upper reservoir, intake site	Ts. and blk. clay with rubble; Light brn. clay 1.2 with calc-port; MLS. rubble 2.6; Hard gry. MLS. rubble 3.4; 5.0m	Ts.=0.3m
H 2		5.00	do.	Ts. and blk clay with LS. rubble 1.2; "Slide" clay with Helix 3.3 clay; Yel-brn. Weathered 4.1 MLS.; 5.0m	Ts.=0.3m
H 3		5.70	do.	Ts. and "Slide" clay; Weathered 4.2 clay; Weathered 4.9 MLS.; 5.7m	Ts.=0.3m
H 4		5.90	do.	Ts. and blk. clay with rubble 1.5; Compacted "slide" clay soft clay at 5.2m; MLY. 5.3 clay; weathered; 5.8m	Ts.=0.3m
H 5		6.30	do.	Ts and organic clay with LS. rubble; Weathered "slide clay with brn. LS gravel 3.0; 6.3m	Ts.=0.3m
H 6		6.80	do.	Ts. and blk. clay with LS. rubble; "Slide" clay 2.4 with potholes; "Slide" clay 3.4; 6.8m	Ts.=0.3m
H 7		4.80	do.	Ts and slightly or moderately weathered LS.; Alternation of hard layer and soft layer; 4.8m	Ts.=0.1m
H 8		4.00	do.	Ts. and gry. clay with Helix, "slide" clay; Weathered MLS. clayey 2.2 with hard SLS. beds; 4.0m	Ts.=0.1m
H 9		3.80	do.	Ts. and blk. clay with rubble; Weather MLS. 2.6 with slip plane; 3.8m	Ts.=0.1m
H 10		2.00	do.	Ts. and light brn. "slide" clay; 2.0m	Ts.=0.2m
H 11		2.80	do.	Ts. and clay with rubble; Light brn clay with lots of with 0.9 shell frgs. (Helix); 2.8m	Ts.=0.4m
H 12		3.50	do.	Ts and clay with rubble 1.1; Clay with calc-nodules 2.0 clay; Gry-brn. 2.7 MLS.; Weathered; 3.5m	Ts.=0.4m
H 13		2.80	do.	Ts. and "slide" clayey ML. 1.1; Yel-gry "slide" clay; 2.8m	Ts.=0.3m
H 14		3.00	do.	Ts. and "slide" clay with rubble 1.3; Plastic weathered substratum; 3.0m	Ts.=0.3m
H 15		4.00	do.	Ts. and "slide" Clayey ML. 1.4 clay; Yel.-gry. Weathered 2.1 substratum; Gry. 3.2 substratum; slightly weathered; 4.0m	Ts.=0.4m
K 1		0.70	Upper dam site, right bank	Ts. and substratum 0.7m; weathered	Ts.=0.2m
K 2	420.20	2.70	do.	Ts. and organic clay with rubble; Gry.-brn. 1.7 substratum; weathered; 2.7m	Ts.=0.3m
K 3	420.18	1.50	do.	Ts. and organic clay with rubble 1.4; Weathered substratum, clayey; 1.5m	Ts.=0.3m
K 4	428.63	0.60	do.	Ts. and blk. rubble 0.6m; Clay	Ts.=0.3m
K 5	429.08	1.90	do.	Ts. and blk. clay with rubble 1.2 1.5; Gry-brn MLS; 1.9m	Ts.=0.3m
K 6	429.81	2.30	do.	Ts. and clay with rubble Clay rich in lower part 1.9; Weathered substratum; 2.3m	Ts.=0.3m
L 1		4.90	Lower reservoir outlet site	Ts. and "slide", weathered substratum generally compact; Weathered MLS. with glauconitic sandstone; 4.9m	Ts.=0.3m
L 2		5.00	do.	Ts. and MLY. soil; Weathered substratum 1.1 (MLS.); Slightly weatheyed substratum 2.6; 5.0m	
L 3		2.00	do.	Ts and MLY. soil 0.9; Yel.-brn. clay; 2.0m	

Abbreviations	
Ts.	Topsoil
LS.	Limestone
ML.	Marl
MLS.	Marly limestone
SLS.	Sandy limestone
MLY.	marly
frgs.	fragments
Yel., yel.	yellow
Brn., brn.	brown
Gry., gry.	grey
Blk., blk.	black
Wht., wht.	white
Co.	colluvial

Figure 7-1 WATER LEVEL OF THE LOWER RESERVOIR
– Discharge : 1.25 m³/sec –



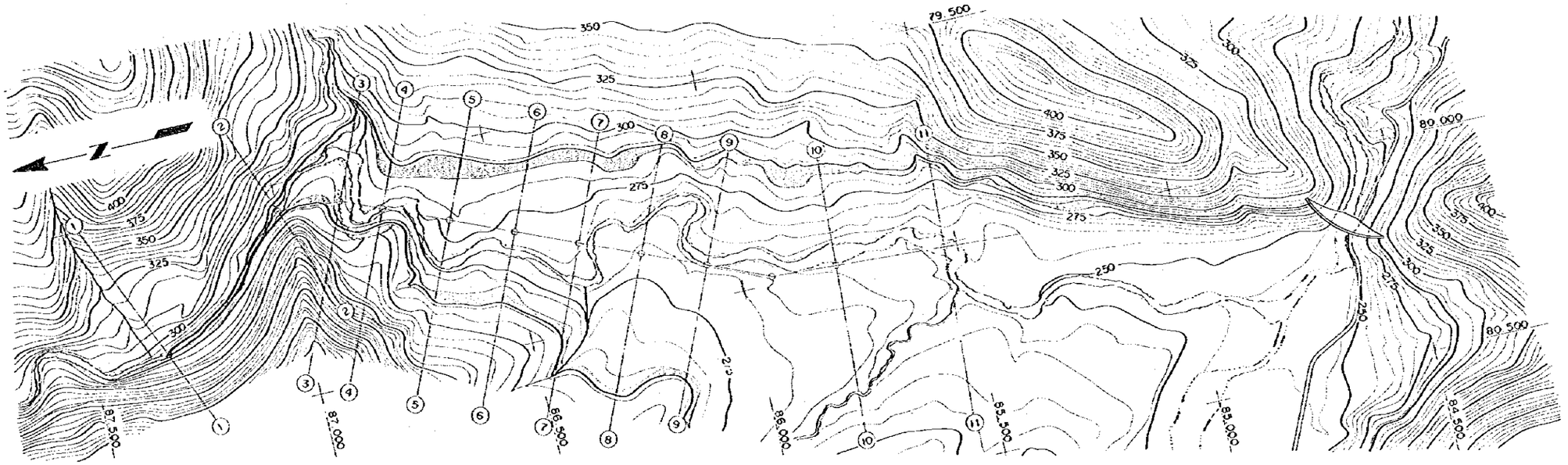
LEGEND;

Figure 7-2 WATER LEVEL OF THE LOWER RESERVOIR

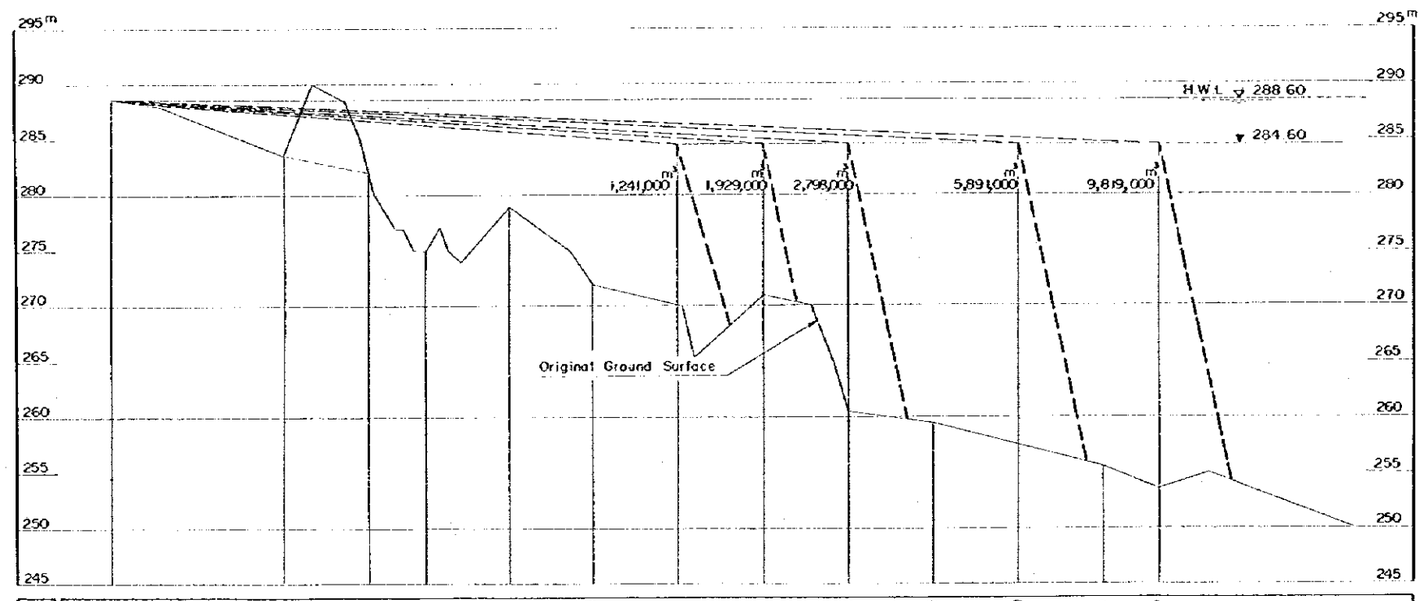
– Discharge : 1.40 m^3/sec –

LEGEND ;

PLAN



PROFILE



Station	Section Distance	Accumulative Distance	Original Ground Le
—	0	0	288.60
2	308.00	308.00	283.50
3	150.00	458.00	281.50
4	100.00	558.00	275.00
5	150.00	708.00	279.00
6	150.00	858.00	272.00
7	150.00	1008.00	270.10
8	150.00	1158.00	271.00
9	150.00	1308.00	260.40
10	150.00	1458.00	259.50
11	150.00	1608.00	257.50
	150.00	1758.00	255.50
	100.00	1858.00	253.50

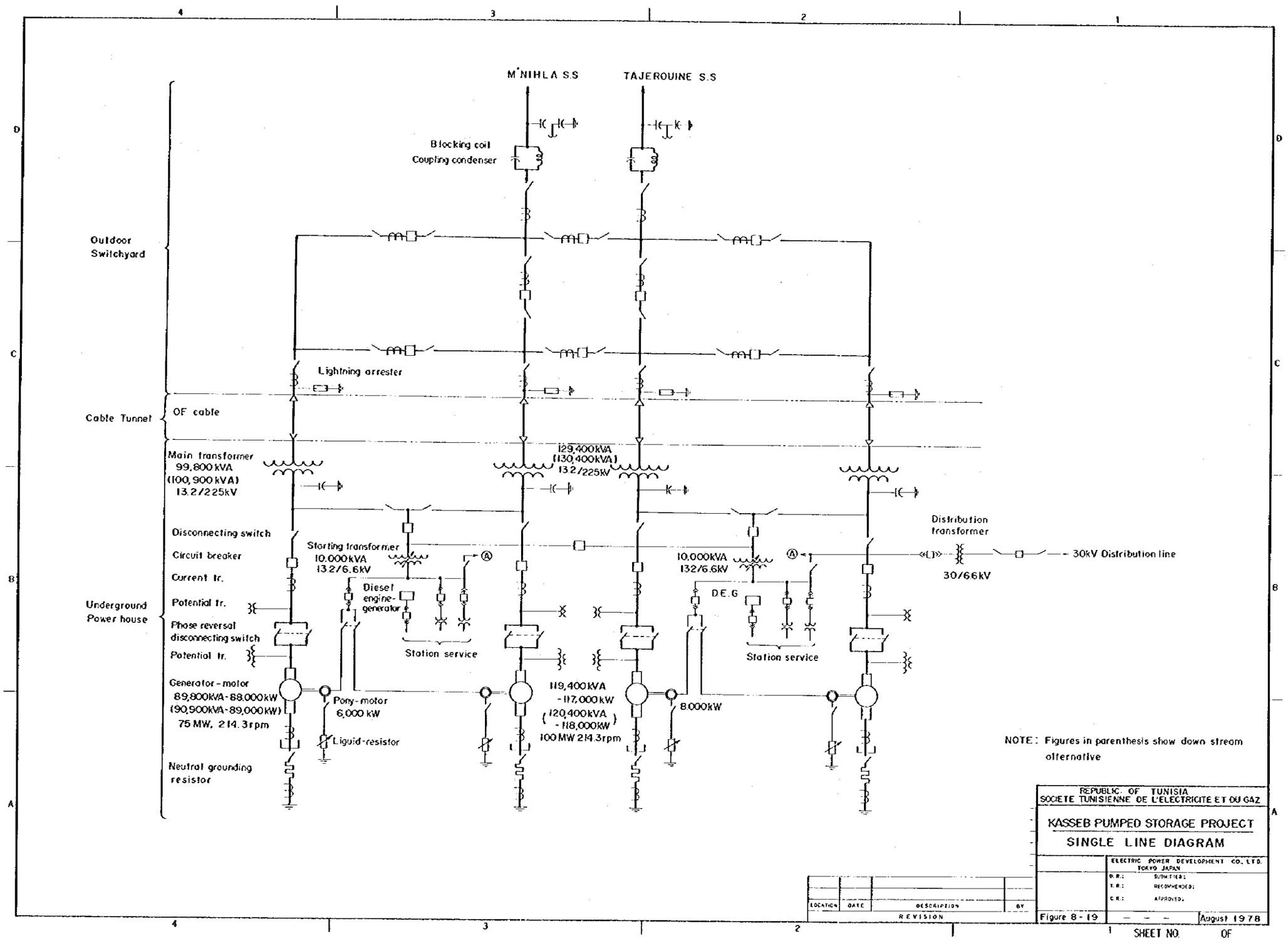
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

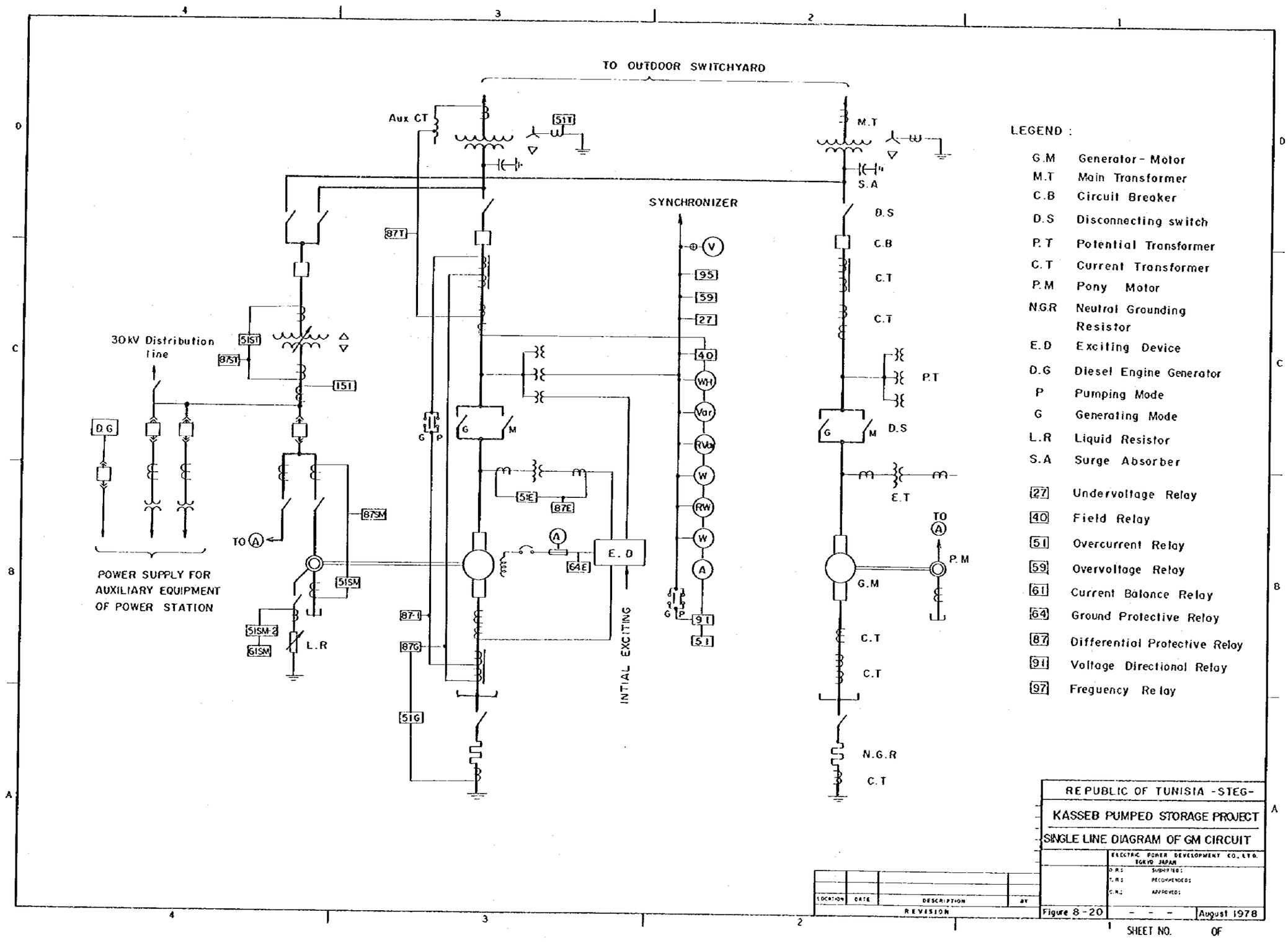
KASSEB PUMPED STORAGE PROJECT

STUDY OF SEDIMENTATION (1-2)

— Lower Kasseb Reservoir —

Figure.- 7.5 | August 1978


M'NIHLA S.S
TAJEROUINE S.S
Blocking coil
Coupling condenser
Outdoor Switchyard
Lightning arrester
Cable Tunnel
OF cable
129,400kVA
(130,400kVA)
13.2/225kV
Main transformer
99,800 kVA
(100,900 kVA)
13.2/225kV
Disconnecting switch
Circuit breaker
Current tr.
Potential tr.
Underground Power house
Phase reversal disconnecting switch
Potential tr.
Generator-motor
89,800kVA-88,000kW
(90,900kVA-89,000kW)
75 MW, 214.3rpm
Neutral grounding resistor
Starting transformer
10,000kVA
13.2/6.6kV
Diesel engine-generator
Station service
Pony-motor
6,000 kW
Liquid-resistor
119,400kVA
-117,000kW
(120,400kVA
-118,000kW)
100 MW 214.3rpm
10,000kVA
132/6.6kV
D.E.G
Station service
8,000kW
Distribution transformer
30/66kV
30kV Distribution line
NOTE: Figures in parenthesis show down stream alternative
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ
KASSEB PUMPED STORAGE PROJECT
SINGLE LINE DIAGRAM
ELECTRIC POWER DEVELOPMENT CO., LTD. TOKYO JAPAN
D.R.: SUBMITTED:
T.R.: RECOMMENDED:
C.R.: APPROVED:
Figure 8-19
August 1978
SHEET NO. OF
LOCATION DATE DESCRIPTION BY
REVISION



LEGEND :

G.M	Generator - Motor
M.T	Main Transformer
C.B	Circuit Breaker
D.S	Disconnecting switch
P.T	Potential Transformer
C.T	Current Transformer
P.M	Pony Motor
N.G.R	Neutral Grounding Resistor
E.D	Exciting Device
D.G	Diesel Engine Generator
P	Pumping Mode
G	Generating Mode
L.R	Liquid Resistor
S.A	Surge Absorber
27	Undervoltage Relay
40	Field Relay
51	Overcurrent Relay
59	Overvoltage Relay
61	Current Balance Relay
64	Ground Protective Relay
87	Differential Protective Relay
91	Voltage Directional Relay
97	Freguency Relay

REPUBLIC OF TUNISIA -STEG-

KASSEB PUMPED STORAGE PROJECT

SINGLE LINE DIAGRAM OF GM CIRCUIT

ELECTRIC POWER DEVELOPMENT CO., LTD. TOKYO JAPAN

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

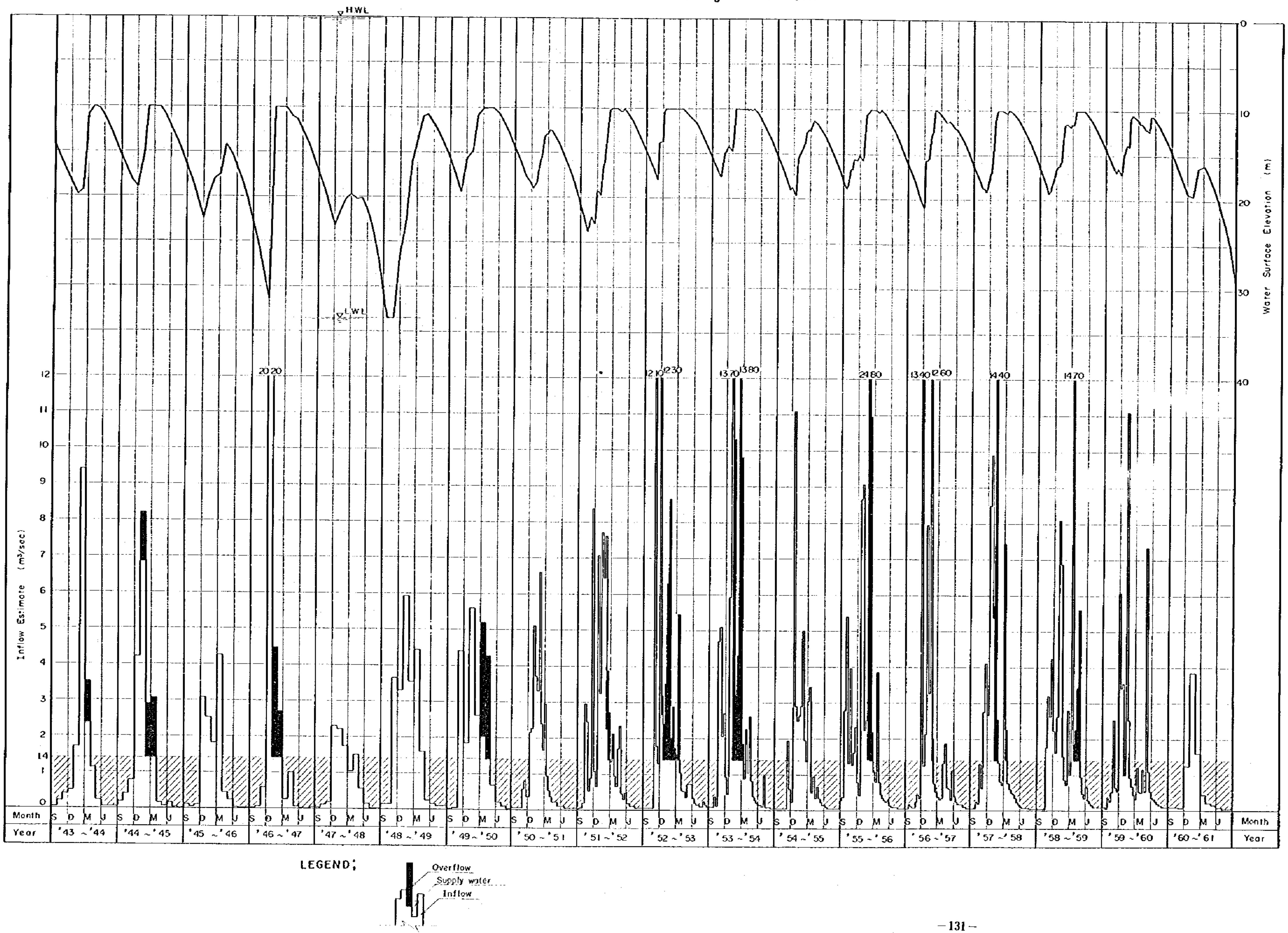
LOCATION	DATE	DESCRIPTION	BY
REVISION			

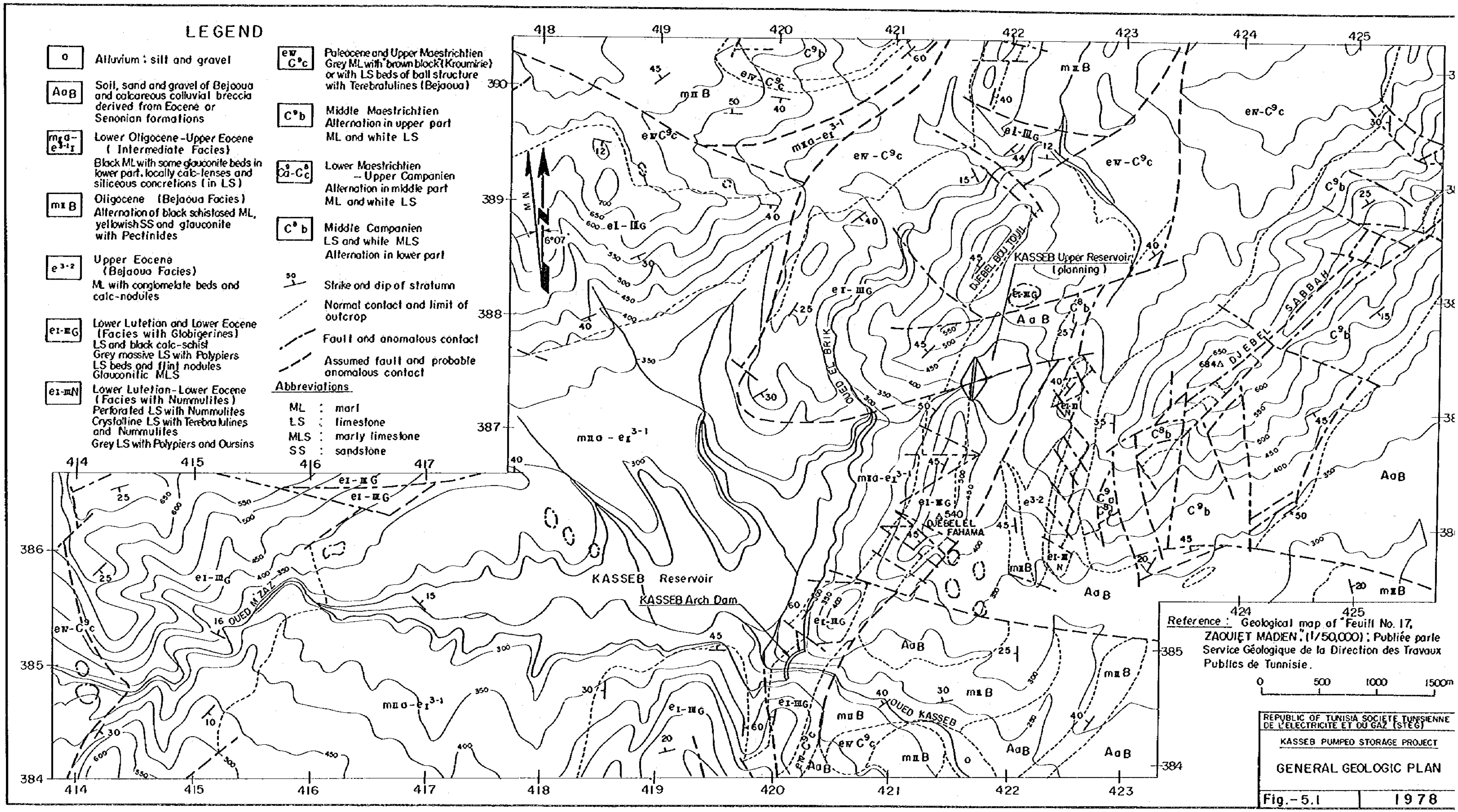
Figure 8-20 — August 1978

SHEET NO. OF

Figure 8-24 WATER LEVEL OF LOWER RESERVOIR DURING CONSTRUCTION

-- Discharge : 1.40 m³/sec --




LEGEND
o Alluvium : silt and gravel
AaB Soil, sand and gravel of Bejaoua and calcareous colluvial breccia derived from Eocene or Senonian formations
mIa-e^{3-1}_I Lower Oligocene-Upper Eocene (Intermediate Facies)
Black ML with some glauconite beds in lower part, locally calc-lenses and siliceous concretions (in LS)
mI B Oligocene (Bejaoua Facies)
Alternation of black schistosed ML, yellowish SS and glauconite with Pectinides
e^{3-2} Upper Eocene (Bejaoua Facies)
ML with conglomelate beds and calc-nodules
eI-IIIG Lower Lutetian and Lower Eocene (Facies with Globigerines)
LS and black calc-schist
Grey massive LS with Polypiers
LS beds and flint nodules
Glauconitic MLS
eI-IIIN Lower Lutetian-Lower Eocene (Facies with Nummulites)
Perforated LS with Nummulites
Crystalline LS with Terebratulines and Nummulites
Grey LS with Polypiers and Oursins
eIV C^9c Paleocene and Upper Maestrichtien
Grey ML with "brown block" (Kroumirie) or with LS beds of ball structure with Terebratulines (Bejaoua)
C^9b Middle Maestrichtien
Alternation in upper part
ML and white LS
C^9a-C^8c Lower Maestrichtien – Upper Companien
Alternation in middle part
ML and white LS
C^8b Middle Companien
LS and white MLS
Alternation in lower part
Strike and dip of stratumn
Normal contact and limit of outcrop
Fault and anomalous contact
Assumed fault and probable anomalous contact
Abbreviations
ML : marl
LS : limestone
MLS : marly limestone
SS : sandstone
DJEBEL BOU TOUIL
KASSEB Upper Reservoir (planning)
OUED EL BRIK
DJEBEL SABBAH
DJEBEL EL FAHAMA
KASSEB Reservoir
KASSEB Arch Dam
OUED M'ZAZ
OUED KASSEB
6°07
Reference : Geological map of "Feuill No. 17, ZAOUIȚET MADIEN." (1/50,000) : Publiée parle Service Géologique de la Direction des Travaux Publics de Tunnisie.
0 500 1000 1500m
REPUBLIC OF TUNISIA SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)
KASSEB PUMPED STORAGE PROJECT
GENERAL GEOLOGIC PLAN
Fig.-5.1
1978

LEGEND

Quaternary

- Ts — Topsoil ; mainly forming or grass land
- To — Talus and cliff debris
- Co — Colluvial deposit ; containing large blocks of breccia cemented with calcareous matter.

Tertiary (Paleogene)

- GS — Glauconitic sandstone ; partially interbedded with thin marl
- MLS/LS — Alternation of marly limestone and limestone ; partially interbedded with marl
- LS — Limestone ; partially interbedded with thin marly limestone

- Strike and dip of stratum (measured with clinometer)
- Strike and dip direction of stratum (by photogeological interpretation)
- Geologic boundary
- Fault confirmed at field and its strike and dip ; sh = width of sheared zone
- Fault by photogeological interpretation
- Assumed fault
- Spring
- Seepage spot of ground water
- Geological profile.
- Drill hole (completed)
- Test pit (completed)

Notes

1. This geologic plan is mainly based on the latest information from the field and the photogeological interpretation (photo 1/12500 in scale) by the Japanese Survey Team.
2. Locations of the completed borings and pits are cited from the STEG'S data; "Amenagement du kasseb" (1/5000 in scale).

0 500

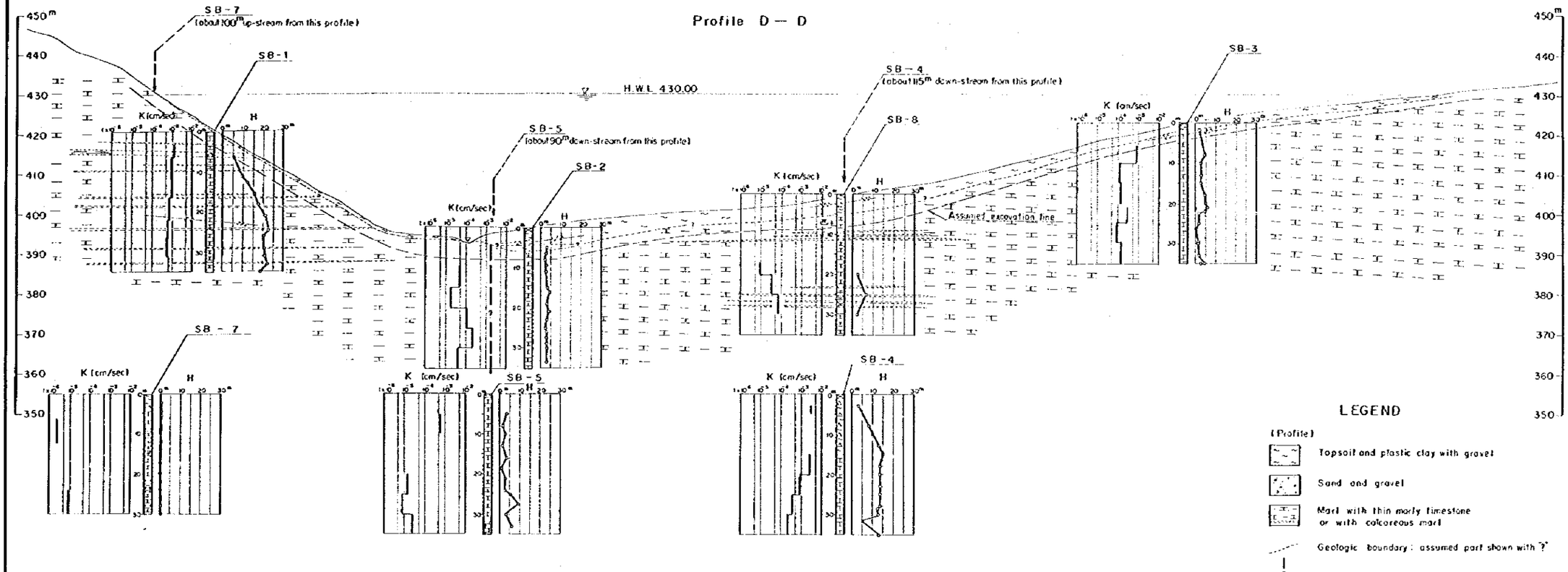
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ(S

KASSEB PUMPED STORAGE PROJECT

PROJECT AREA GEOLOGIC PLAN

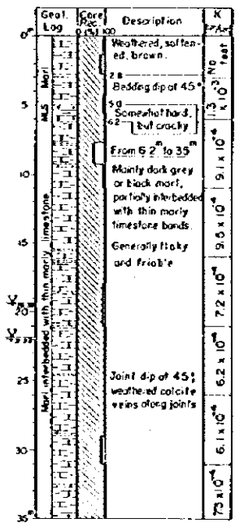
Fig. - 5.2 | 1978

Profile D — D



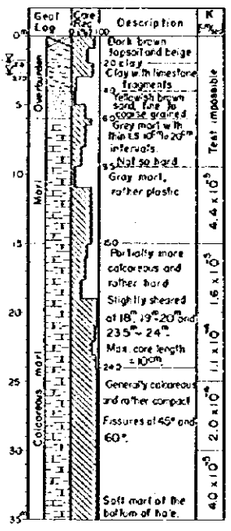
SB-1

EL. 420.77
L. 35.00
X = 87,028.91
Y = 78,642.17



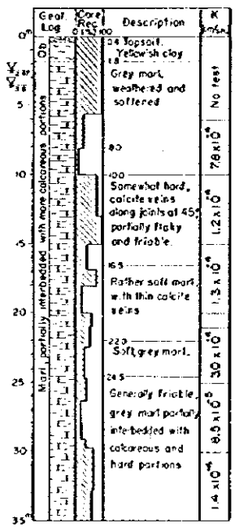
SB-2

EL. 1393001
L. 35.00
X = 87,108.06
Y = 78,642.00



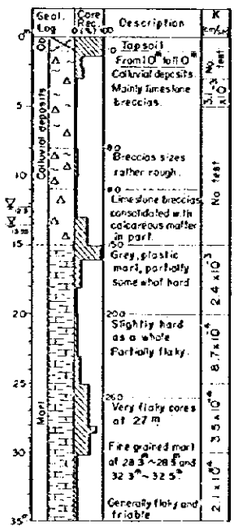
SB-3

EL. 422.82
L. 35.00
X = 87,268.78
Y = 78,643.46



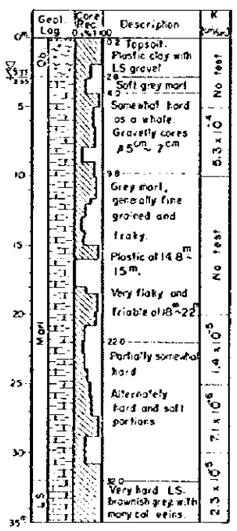
SB-4

EL. 419.61
L. 35.00
X = 87,184.80
Y = 78,759.93



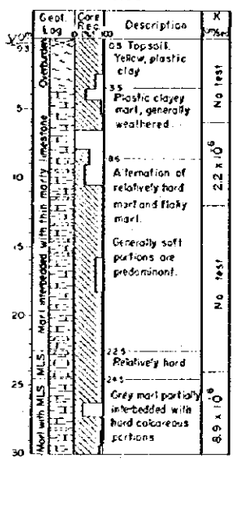
SB-5

EL. 393.99
L. 35.00
X = 87,103.80
Y = 78,736.94



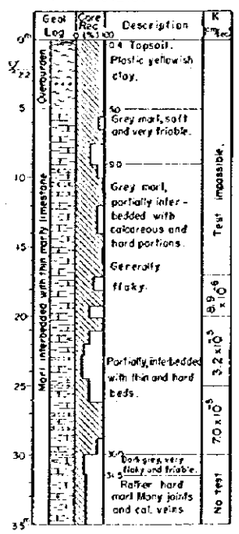
SB-7

EL. 407.54
L. 30.00
X = 87,015.88
Y = 78,543.96



SB-8

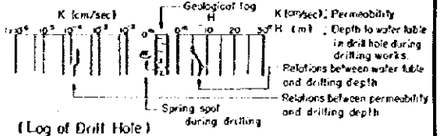
EL. 404.94
L. 35.00
X = 87,184.70
Y = 78,642.94



LEGEND

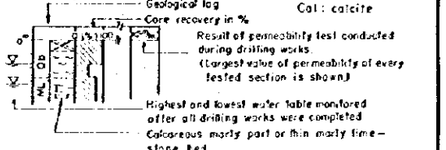
(Profile)

- Topsoil and plastic clay with gravel
- Sand and gravel
- Marl with thin marly limestone or with calcareous marl
- Geologic boundary : assumed part shown with ?
- Assumed fault
- Water table (deepest) monitored in drill hole



(Log of Drill Hole)

SB- No. of drill hole
EL. Elevation } (in meter)
L Length of hole
X = } Co-ordinates
Y =



Abbreviations
Ob : overburden
LS : limestone
ML : marl
MLS : marly limestone
Cal : calcite

0 — 50m

(Profile)

REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

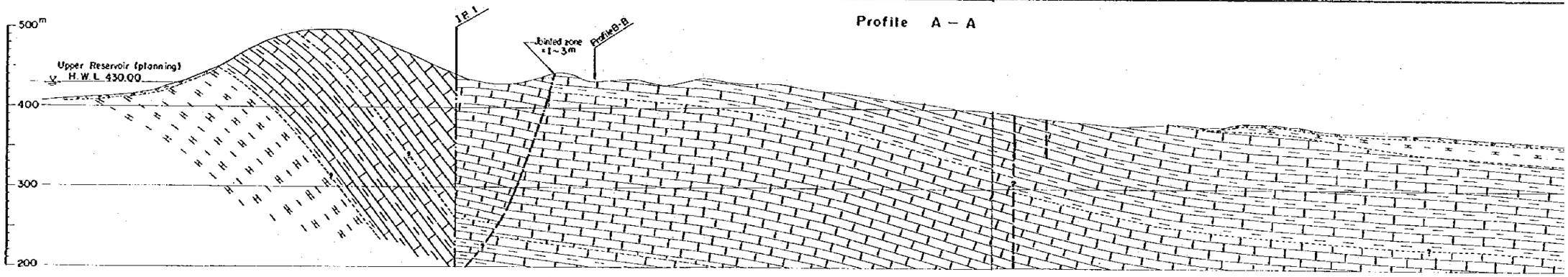
KASSEB PUMPED STORAGE PROJECT

UPPER DAM SITE

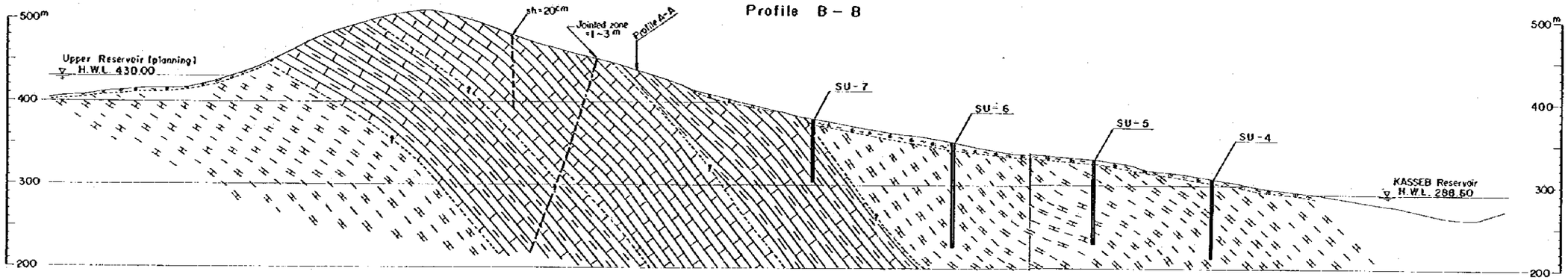
GEOLOGIC PROFILE

Fig.-5.3 | 1978

Profile A – A



Profile B – B



SU – 1

EL. 298.57
L. 70.0
X = 86,022.03
Y = 79,644.05

Description	K (cm/sec)
20 Yellow clay, plastic. Yellow sandy clay with marl gravel.	No test
60 Weathered marl, partially grey and hard. Generally softened.	6.2×10^{-5}
100	5.1×10^{-4}
110	5.7×10^{-5}
185 Mainly flaky and friable marl, partially interbedded with thin hard marl.	6.4×10^{-5}
	1.4×10^{-5}
	2.9×10^{-5}
266 Grey marl with thin glauconitic-sandy marl, somewhat friable in part.	7.6×10^{-5}
315 Glauconitic-sandy marl, rather hard and cracky.	9.4×10^{-5}
345	1.2×10^{-4}
Mainly grey marl, partially interbedded with glauconitic-sandy marl.	3.2×10^{-5}
	2.4×10^{-4}
Rather hard in glauconitic-sandy part.	2.1×10^{-5}
	3.8×10^{-6}
	No Water loss under Pa= 5 kg/cm²
Joints at 45°, calcite veins along joints, exfoliative.	1.0×10^{-4}

End of hole at 70m

SU – 2

EL. 339.79
L. 38.5
X = 85,985.16
Y = 79,429.74

Description	K (cm/sec)
10 Topsoil and yellow clay.	No test
33 Weathered marl, schistosity at 45°	
60 Mainly grey marl, partially interbedded with thin limestone and/or glauconitic-sandy marl.	
Generally rather flaky and friable.	2.0×10^{-4}
	1.3×10^{-4}
Somewhat hard in calcareous or glauconitic-sandy part.	
295 3—Disturbed and fractured, brittle, cracks at 45°	No test
368~368 – Hard limestone, crack at 60°	

End of hole at 38.5m

SU – 4

EL. 310.22
L. 100.0
X = 86,242.47
Y = 79,516.81

Description	K (cm/sec)
Yellowish grey clay with small gravel.	No test
33 Mainly grey marl, softened. Many thin calcite veins. Cores broken into fragments in general.	
170 Grey, slightly schistosed marl. Generally flaky and friable.	
265 Greyey marl, slightly weathered, generally flaky and friable. Bedding at 60°~70°	
	1.2×10^{-4}
	1.4×10^{-4}
420 Partially greenish grey and somewhat hard cores.	1.1×10^{-4}
475 Generally flaky and friable. Partially interbedded with thin glauconitic-sandy marl.	2.7×10^{-4}
	3.5×10^{-4}
620 Grey, slightly sandy marl, somewhat hard and compact. Core length 5 to 10cm in part. Bedding at 45°	2.2×10^{-4}
750 Mainly grey or dark grey marl, flaky and friable as a whole.	7.6×10^{-5}
Bedding approximately horizontal.	4.4×10^{-4}
925 Partially glauconitic marl, friable in part.	2.6×10^{-4}

End of hole at 100m

SU – 5

EL. 330.00
L. 100.0
X = 86,319.87
Y = 79,400.52

Description	K (cm/sec)
35 Topsoil and yellowish clay	
35 Grey marl, very soft, plastic.	No test
70 Grey-dark grey marl, slightly schistosed. Generally flaky and friable. Core length max 5~6cm, mainly small fragments. Weak shearing recognizable as a whole. Bedding at 20° to 30°	4.3×10^{-5}
	No test
	2.6×10^{-6}
	No test
	6.4×10^{-5}
	2.1×10^{-4}
365 Dark grey marl, mainly flaky cores with some flat cores like coin.	2.3×10^{-5}
430 445 Bedding approximately horizontal.	4.0×10^{-5}
Very flaky or clayey at 430~445m and 48.0~55m	No test
480 55 Dark grey marl, with thin glauconitic marl in part. Core length 5 to 20cm somewhat exfoliative and friable as a whole.	3.1×10^{-5}
	1.4×10^{-5}
	1.2×10^{-5}
675 Dark grey marl, with glauconitic and sandy marl in part. Core length 5cm~10cm and the rest gravelish cores. Generally exfoliative, partially very flaky and friable.	No water-loss under Pa=4 kg/cm²
	5.6×10^{-5}
Bedding at 0°~20° in 67.5~78m and at 20°~30° in 78~100m	6.1×10^{-5}

End of hole at 100m

SU – 6

EL. 350.14
L. 125.0
X = 86,413.12
Y = 79,260.43

Description	K (cm/sec)
Topsoil and yellowish sandy clay with a few gravels.	
92 Weathered marl softened and brittle, partially clayey.	
175 Dark grey marl, mostly gravelfish cores, partially very flaky.	No test
Some long cores (max 30cm) in part. Generally rather weathered and brittle. Many thin calcite veins as a whole.	(Test impossible)
500 512~522 Sheared and brittle.	1.1×10^{-4}
Partially flaky and brittle. Horizontal bedding at 50.5m. Dip 45° bedding at 52.5m.	1.2×10^{-4}
650 Dark grey marl, somewhat hard as a whole. Core length 20cm to 30cm, partially gravelish cores.	No test
	5.4×10^{-4}
750 Core broken into small pieces, rather brittle. From 78.5m to 102.0m Mainly marl, partially with thin glauconitic and sandy marl. Core length 20cm to 30cm somewhat hard but exfoliative in general. Partially sheared and clayey. At 85m bedding about 60°.	4.1×10^{-4}
	7.6×10^{-5}
	2.8×10^{-4}

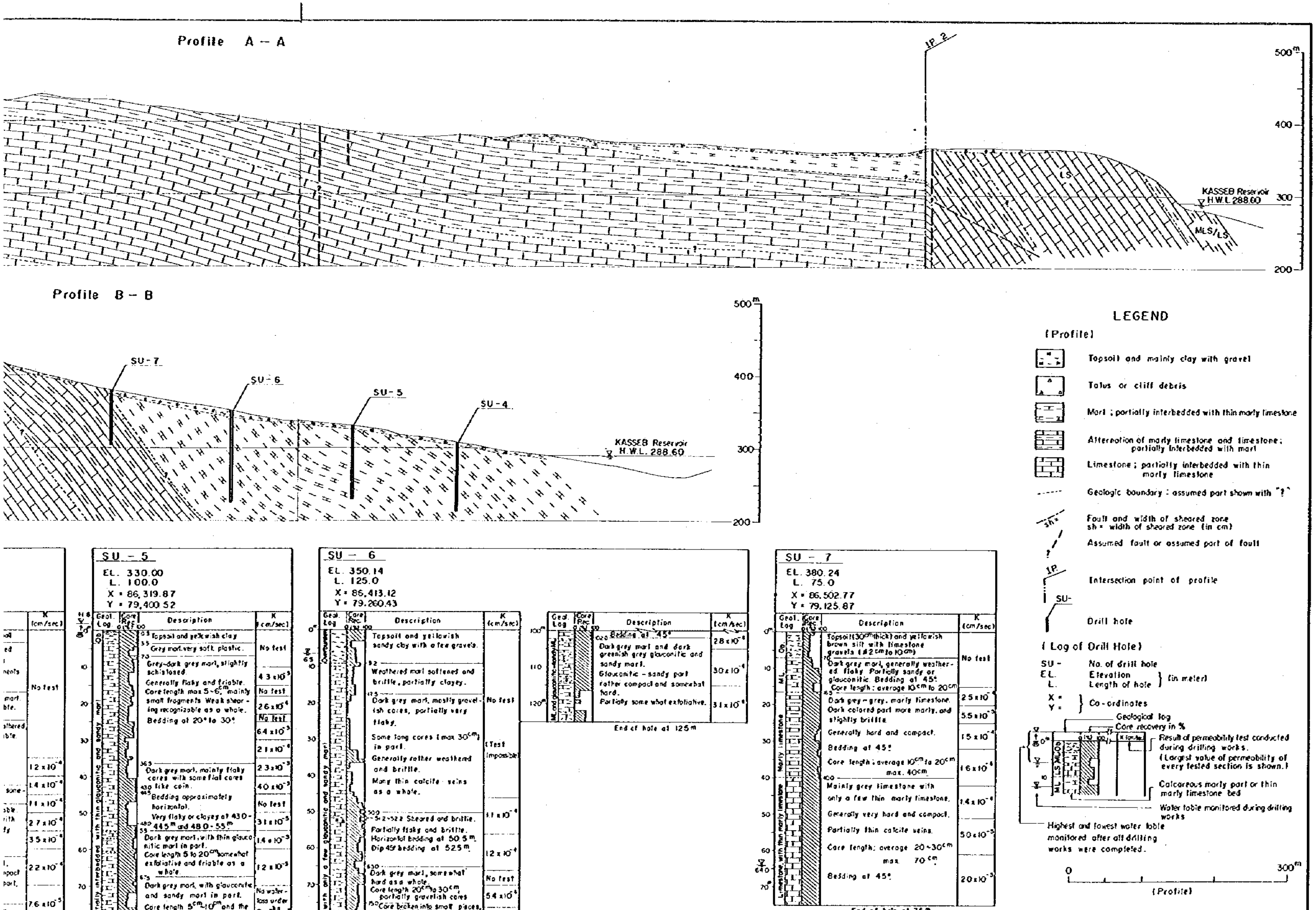
End of hole at 125m

SU –

EL. 38
L. 7
X = 8
Y = 7

Description	K (cm/sec)
620 Bedding at 45°	
Dark grey marl and dark greenish grey glauconitic and sandy marl. Glauconitic-sandy part rather compact and somewhat hard. Partially some what exfoliative.	2.8×10^{-4}
	3.0×10^{-4}
	3.1×10^{-4}

Limestone with thin marly limestone – Marly limestone

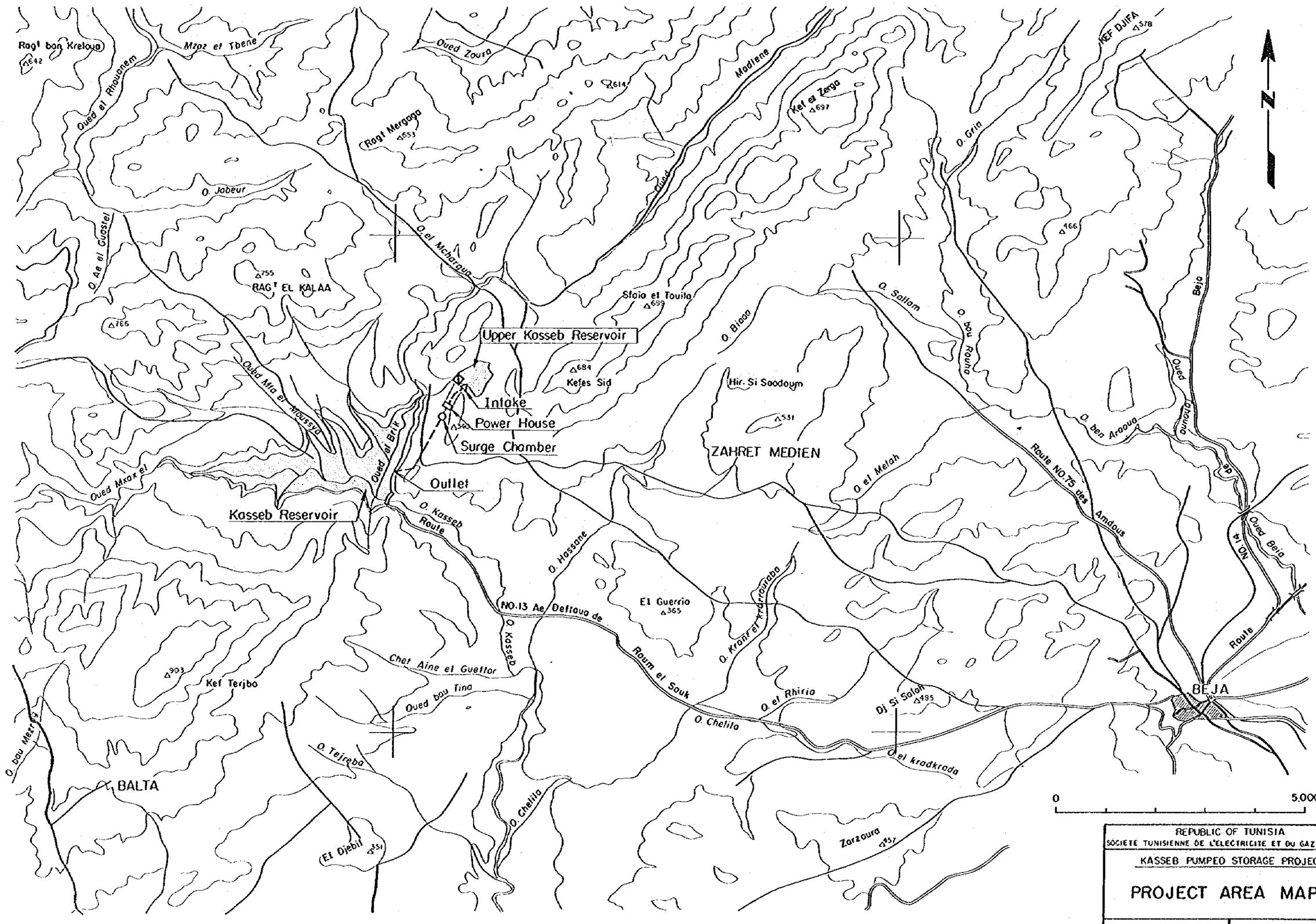


REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

WATER WAY ALIGNMENT
GEOLOGIC PROFILE

Fig. – 5.4 | 1978



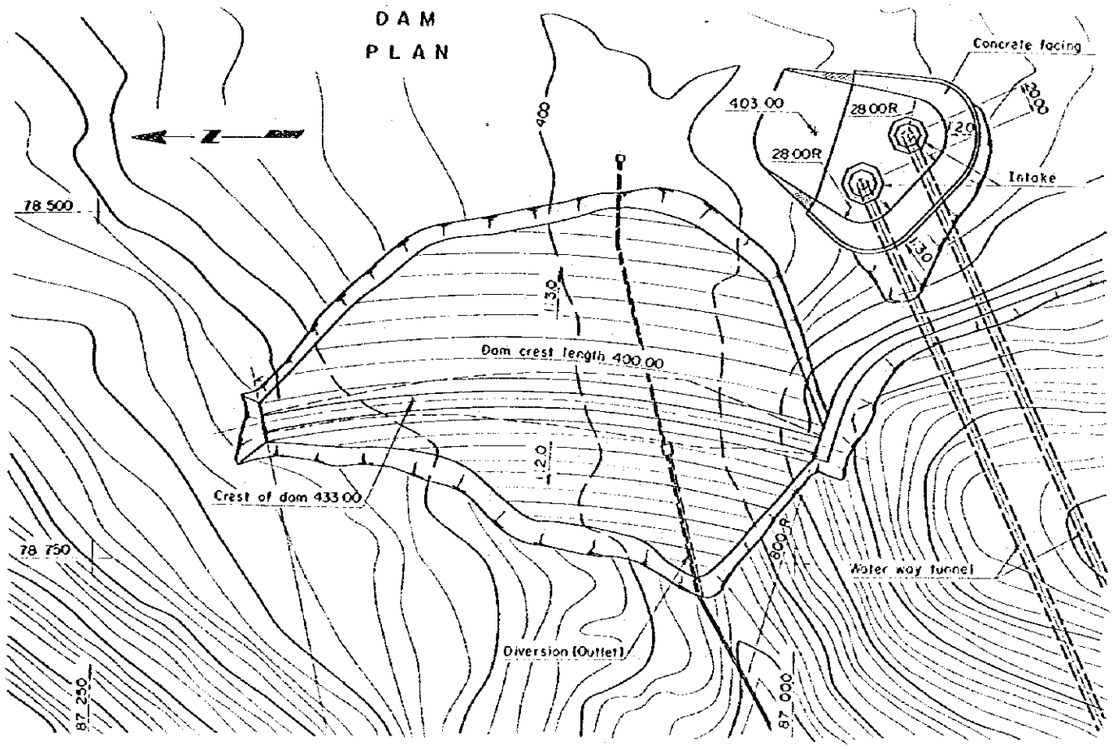
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

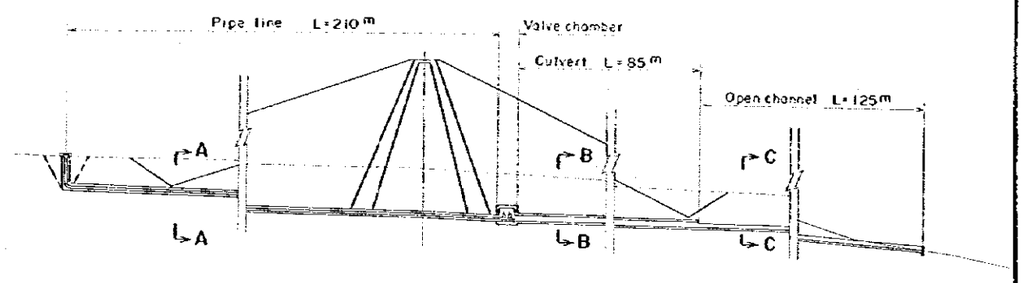
PROJECT AREA MAP

Figure - 8.2 | August, 1978

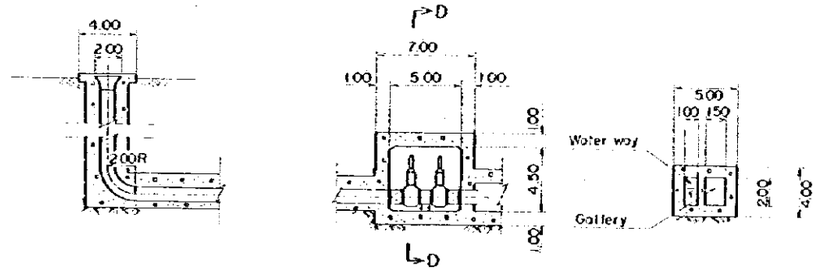
DAM PLAN



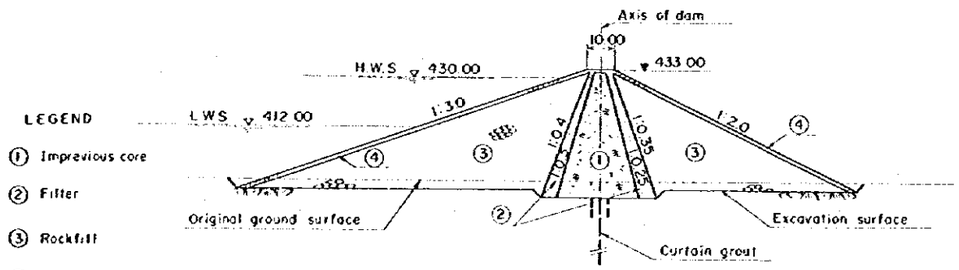
DIVERSION PROFILE



INTAKE LONGITUDINAL SECTION VALVE CHAMBER LONGITUDINAL SECTION B-B SECTION



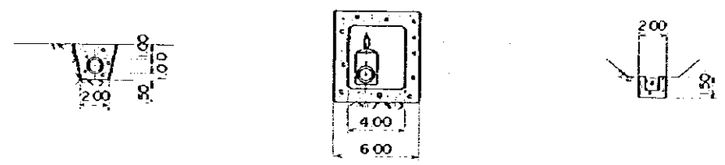
TYPICAL SECTION



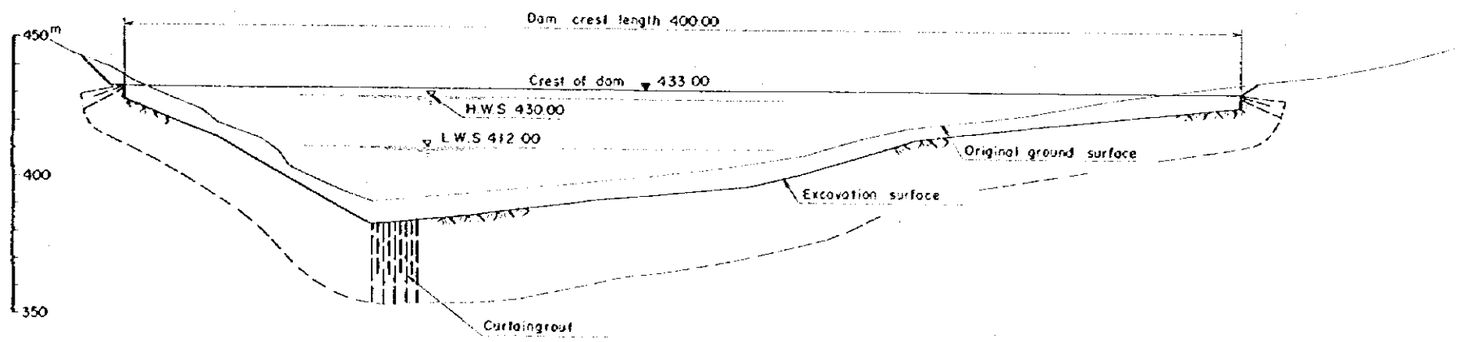
LEGEND

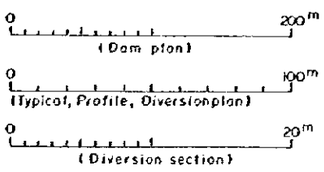
① Impervious core
② Filter
③ Rockfill
④ Rip rap

A-A SECTION D-D SECTION C-C SECTION



PROFILE





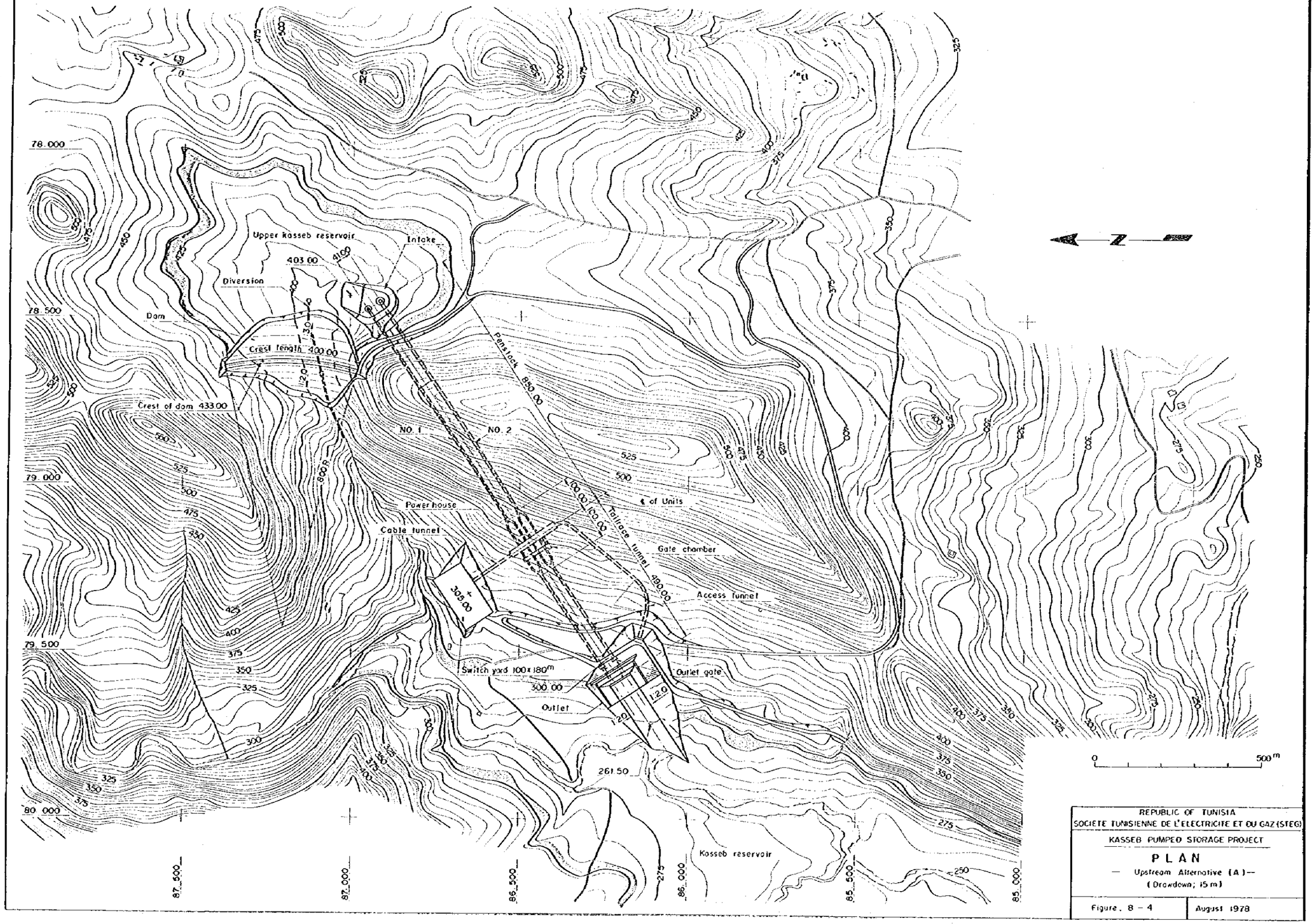
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

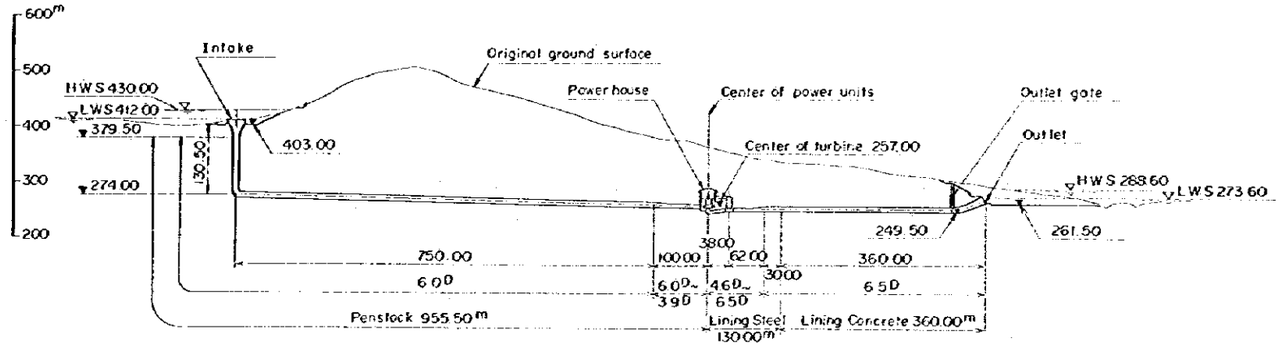
DAM AND DIVERSION (OUTLET)

— Upstream Alternative (A) —
(Drawdown; 15 m)

Figure . 8 - 3 | August 1978

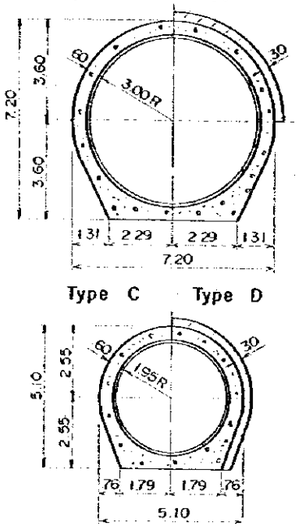

78.000
78.500
79.000
79.500
80.000
87.500
87.000
86.500
86.000
85.500
85.000
Upper kasseb reservoir
Intake
403.00
Diversion
Dam
Crest length 400.00
Crest of dam 433.00
NO. 1
NO. 2
Penstock 850.00
Power house
Cable tunnel
# of Units
Tailrace tunnel 490.00
Gate chamber
Access funnel
305.00
Switch yard 100x180m
300.00
Outlet
Outlet gate
261.50
Kasseb reservoir
0
500m
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)
KASSEB PUMPED STORAGE PROJECT
PLAN
— Upstream Alternative (A)—
(Drawdown; 15 m)
Figure. 8 – 4
August 1978

NO.1 WATERWAY TUNNEL LONGITUDINAL SECTION

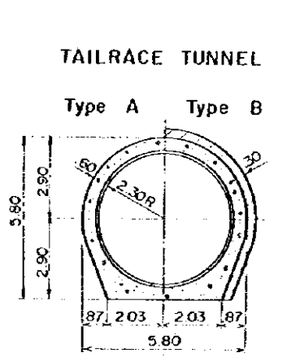


NO.1 WATERWAY TUNNEL TYPICAL SECTION

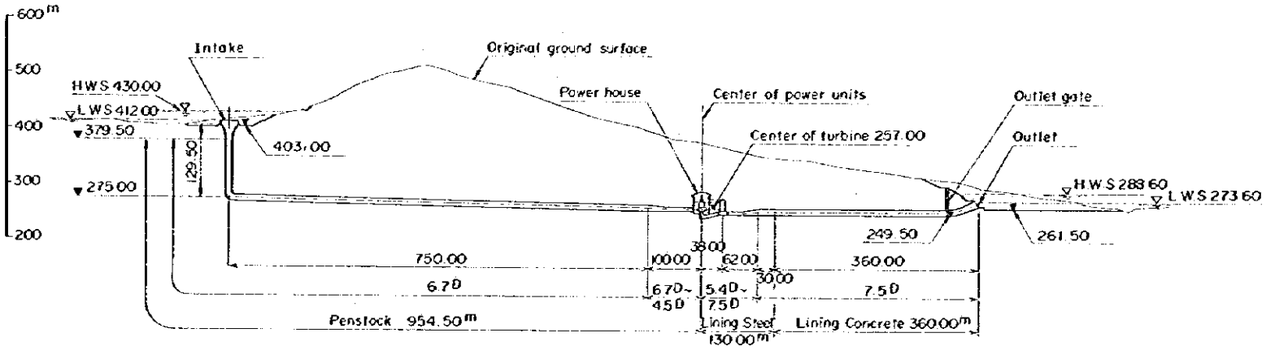
PENSTOCK



TAILRACE TUNNEL

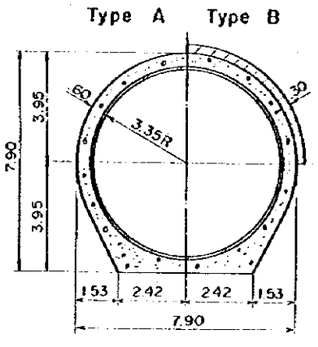


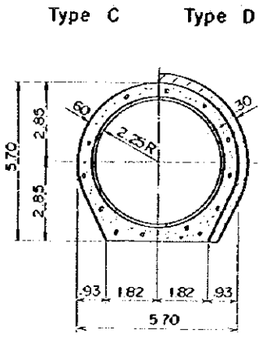
NO.2 WATERWAY TUNNEL LONGITUDINAL SECTION



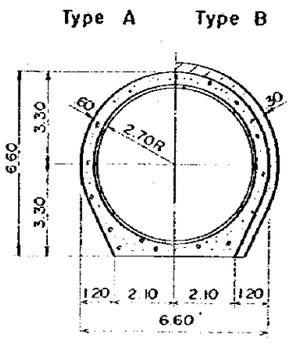
NO.2 WATERWAY TUNNEL TYPICAL SECTION

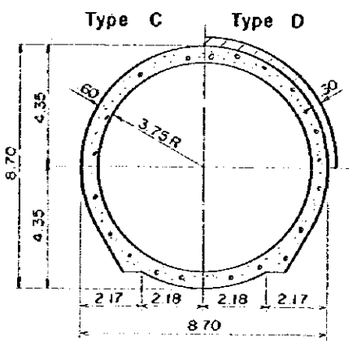
PENSTOCK





TAILRACE TUNNEL





0 500m (Longitudinal section)

0 10 (Typical section)

REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

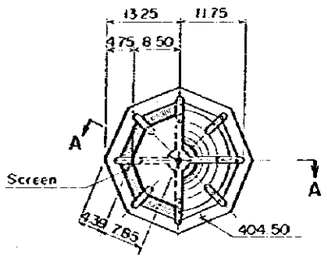
WATERWAY TUNNELS

— Upstream Alternative (A) —

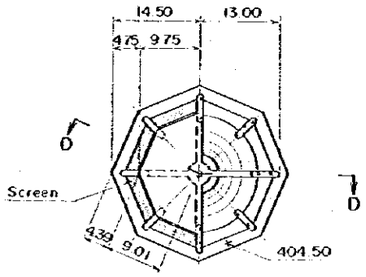
(Drawdown; 15m)

Figure. 8 – 5 | August 1978

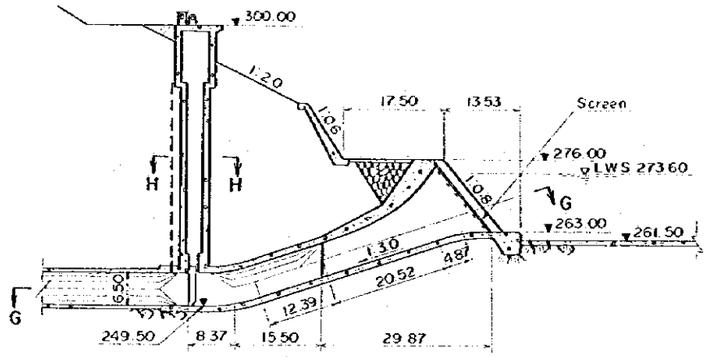
NO.1 INTAKE PLAN



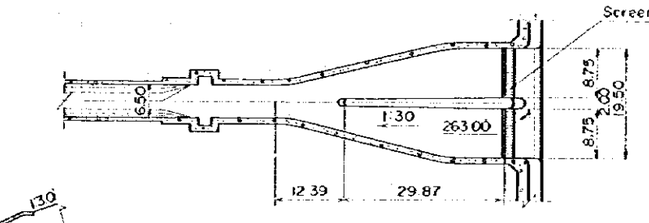
NO.2 INTAKE PLAN



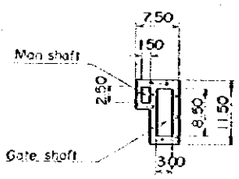
NO.1 OUTLET LONGITUDINAL SECTION



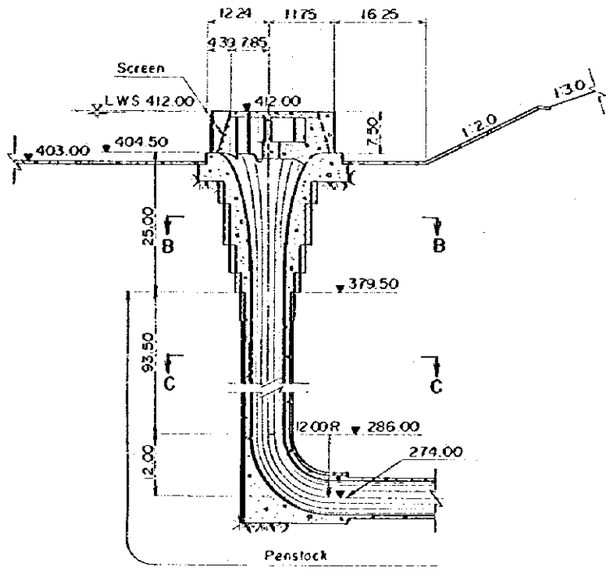
G-G SECTION



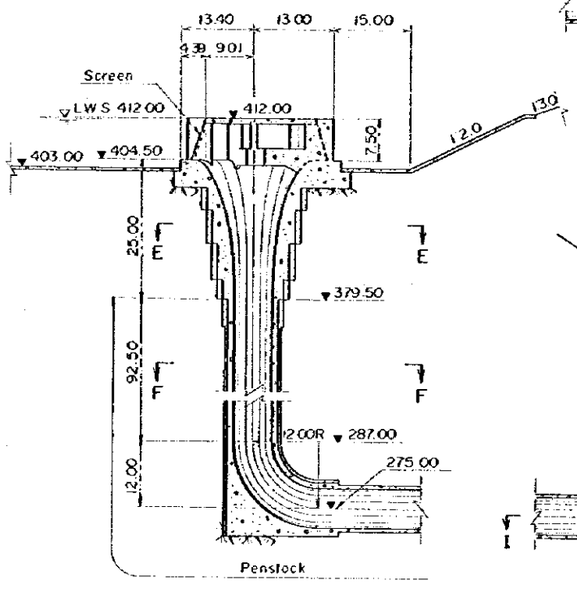
H-H SECTION



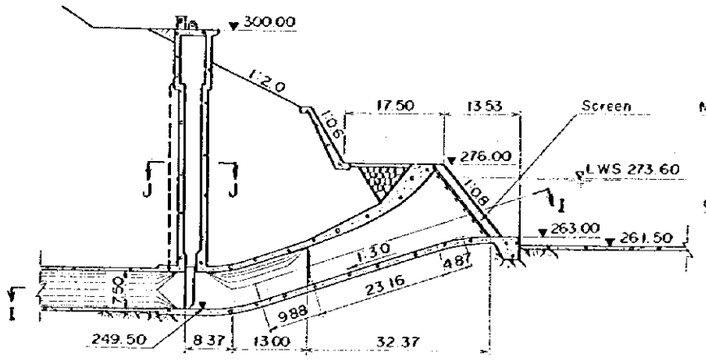
A-A SECTION



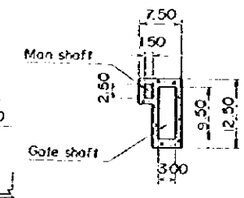
D-D SECTION



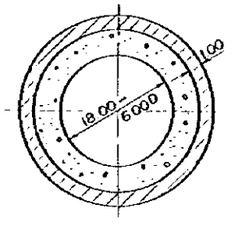
NO.2 OUTLET LONGITUDINAL SECTION



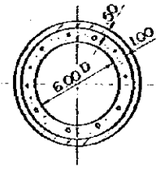
J-J SECTION



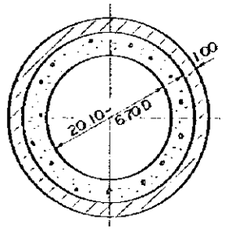
B-B SECTION



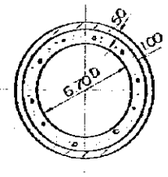
C-C SECTION



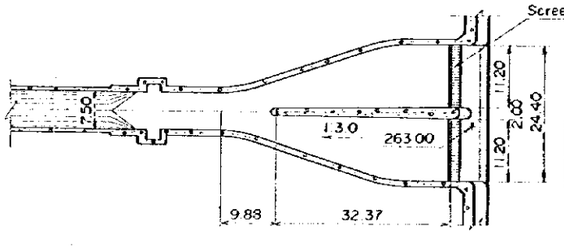
E-E SECTION



F-F SECTION



I-I SECTION



0 50m (Intake & Outlet)

0 20m (B-B, C-C, E-E & F-F section)

REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

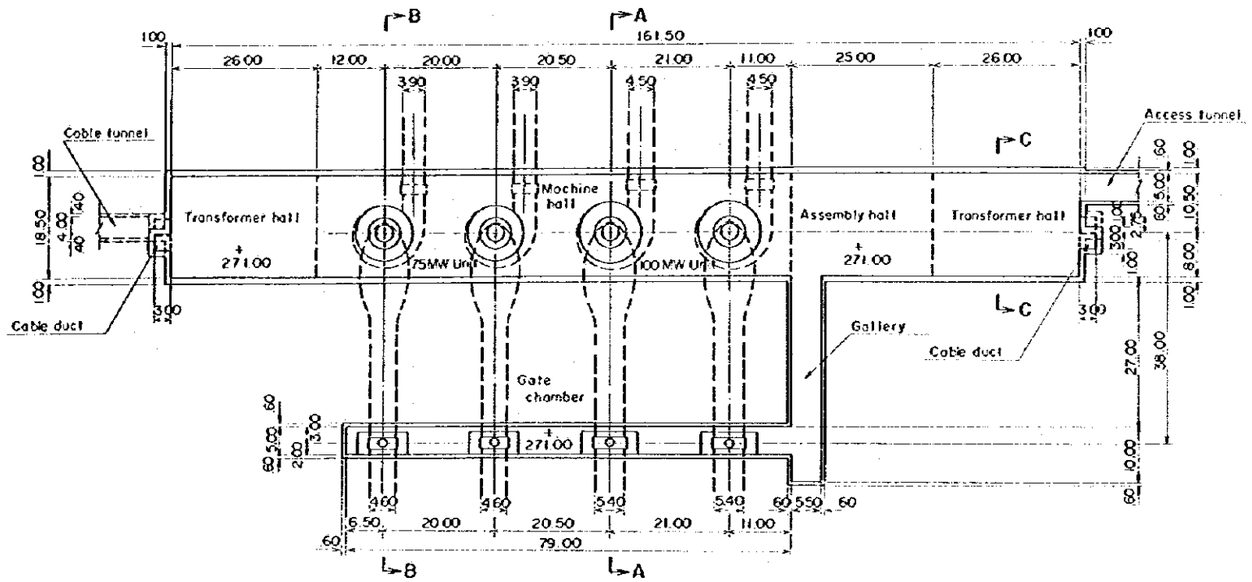
INTAKE AND OUTLET

— Upstream Alternative (A) —

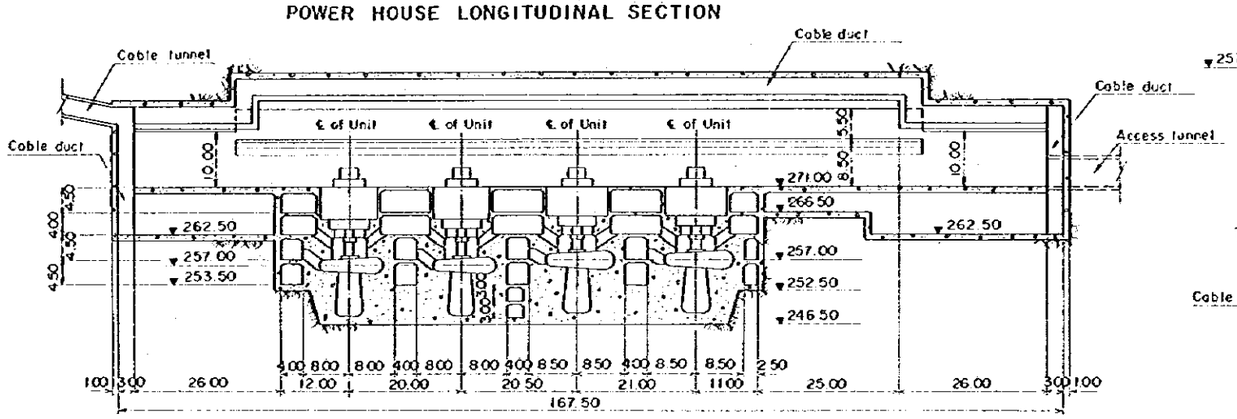
(Drawdown: 15 m)

Figure. 8 - 6 | August 1978

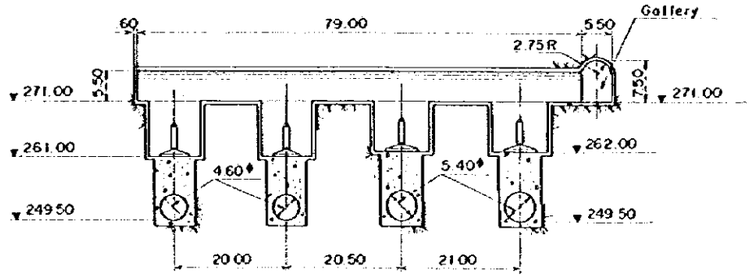
POWERPLANT PLAN



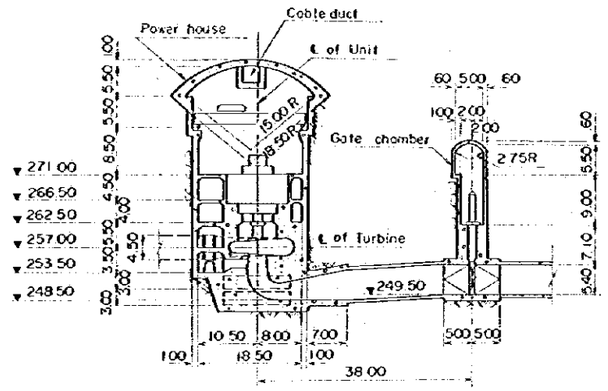
POWER HOUSE LONGITUDINAL SECTION



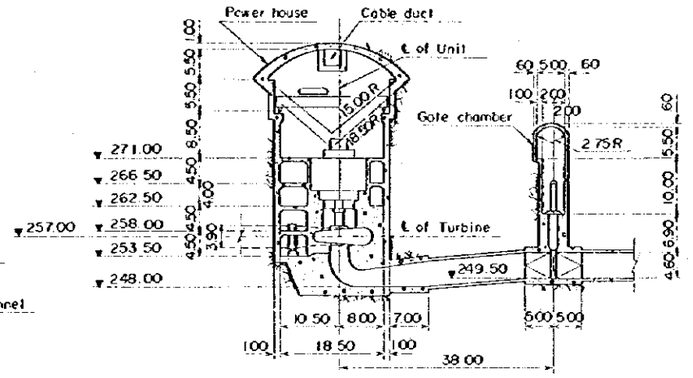
GATE CHAMBER LONGITUDINAL SECTION



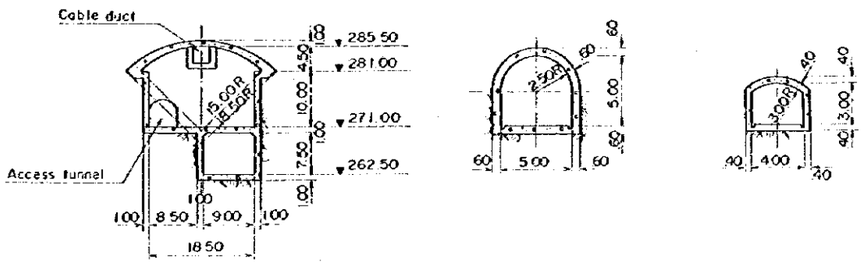
A-A SECTION (100MW SIDE)



B-B SECTION (75MW SIDE)



TRANSFORMER HALL(C-C)SECTION ACCESS TUNNEL SECTION CABLE TUNNEL SECTION



0 — 20m (Tunnel Section)

0 — 50m (Except Tunnel Section)

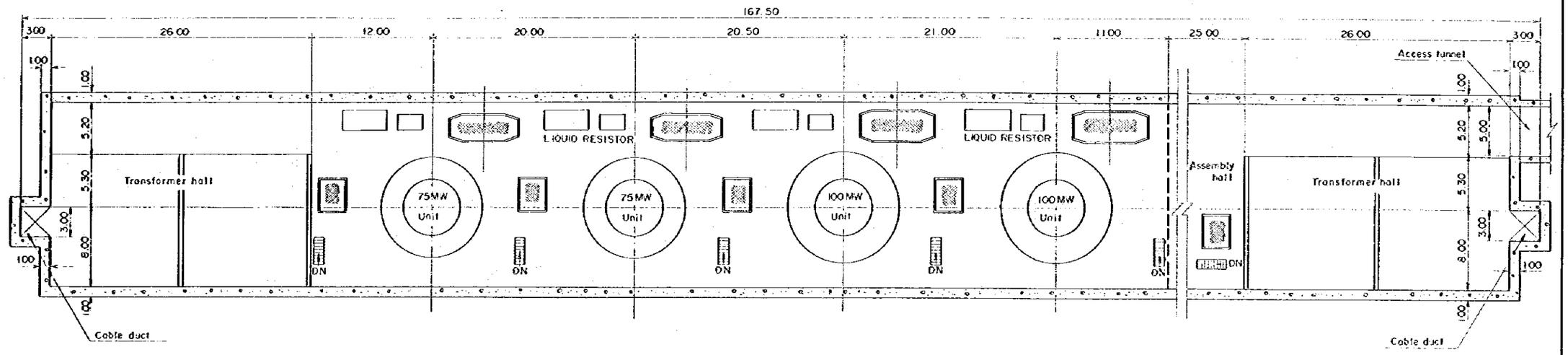
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

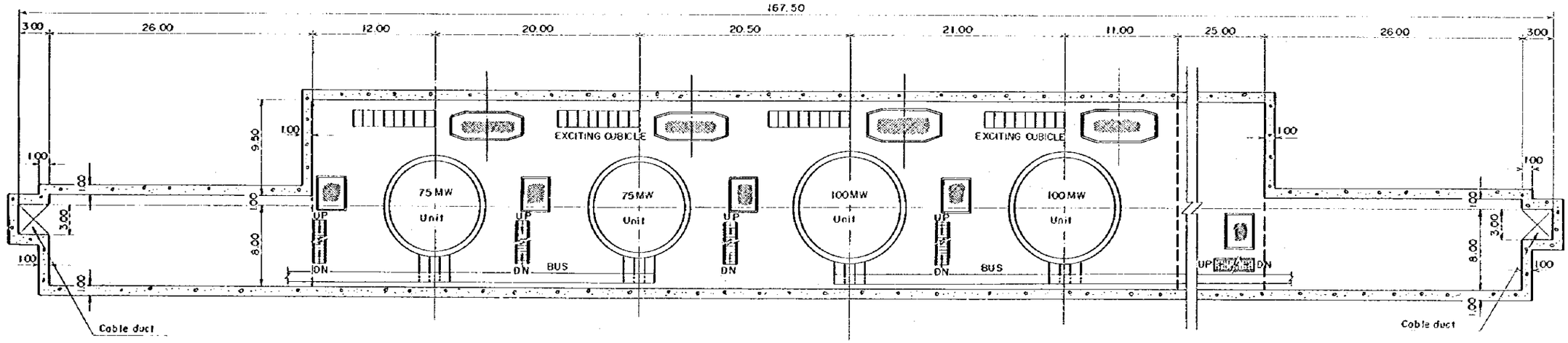
POWER HOUSE (1-3)
— Upstream Alternative (A) —
(Drawdown; 15m)

Figure. 8 - 7 | August 1978

EL. 271.00



EL. 266.50



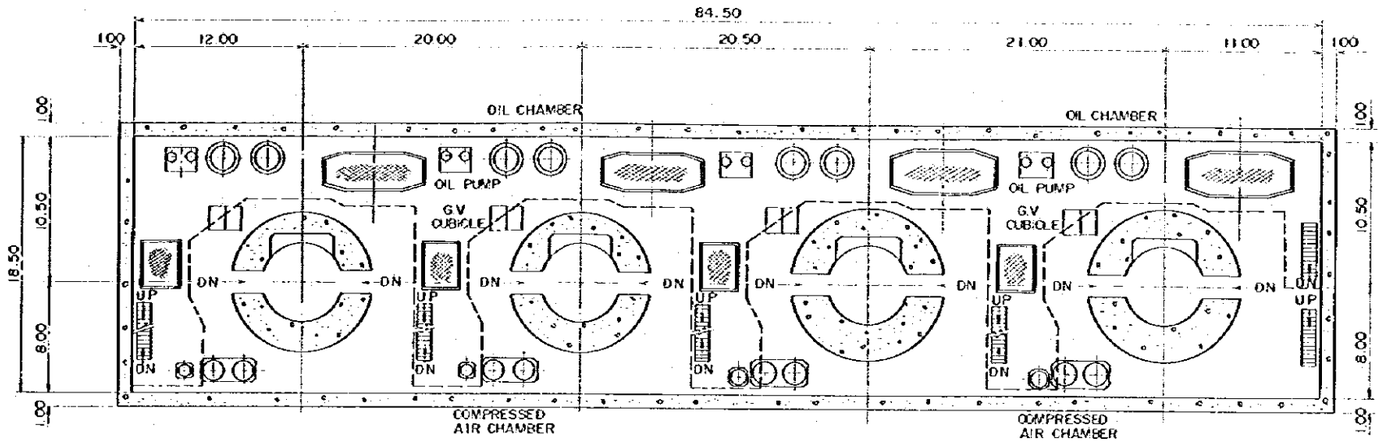
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

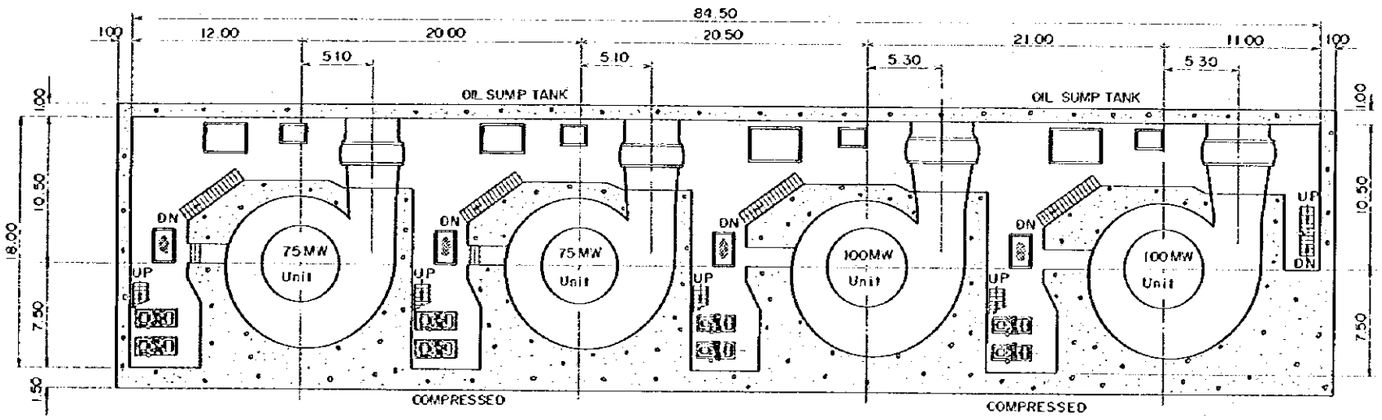
POWER HOUSE (2-3)
— Up stream Alternative (A) —
(Drawdown, 15 m)

Figure - 8 - 8 | August 1978

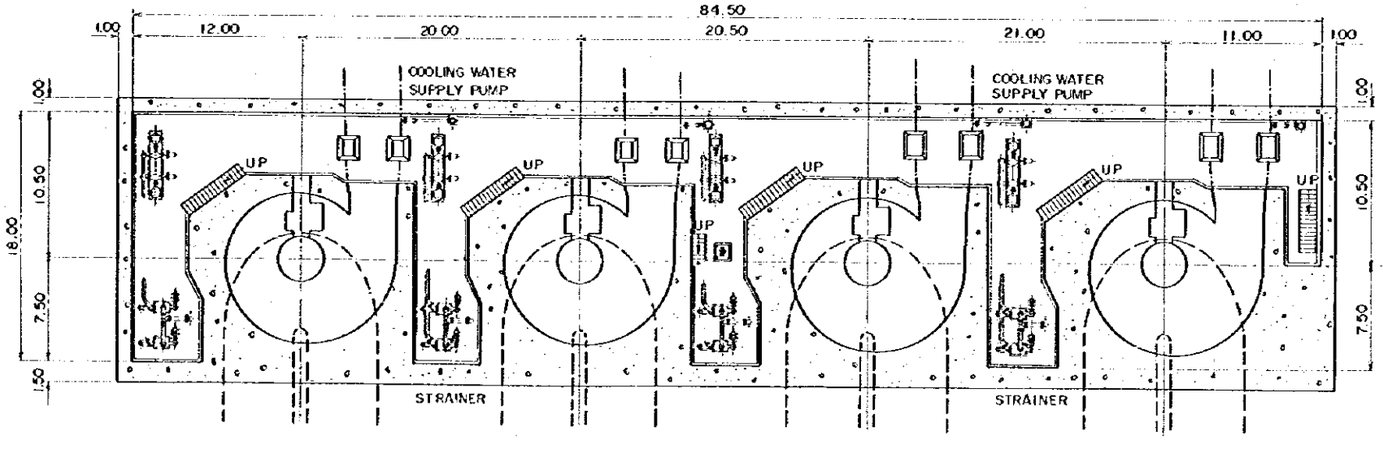
EL. 262.50



EL. 258.00



EL. 253.50

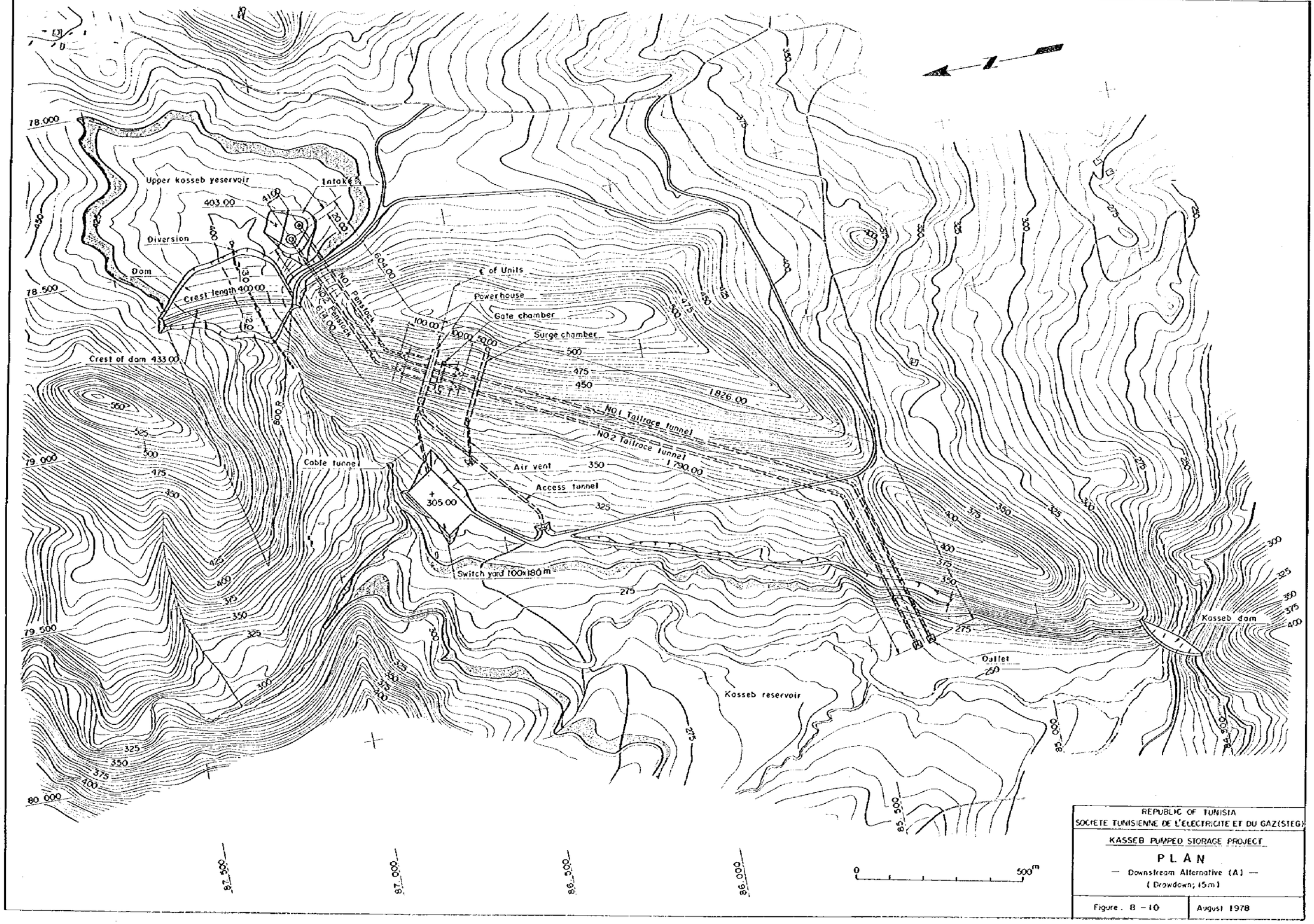


REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

POWER HOUSE (3-3)
— Up stream Alternative (A) —
(Drawdown, 15m)

Figure 8 - 9 | August 1978



REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ(STEG)

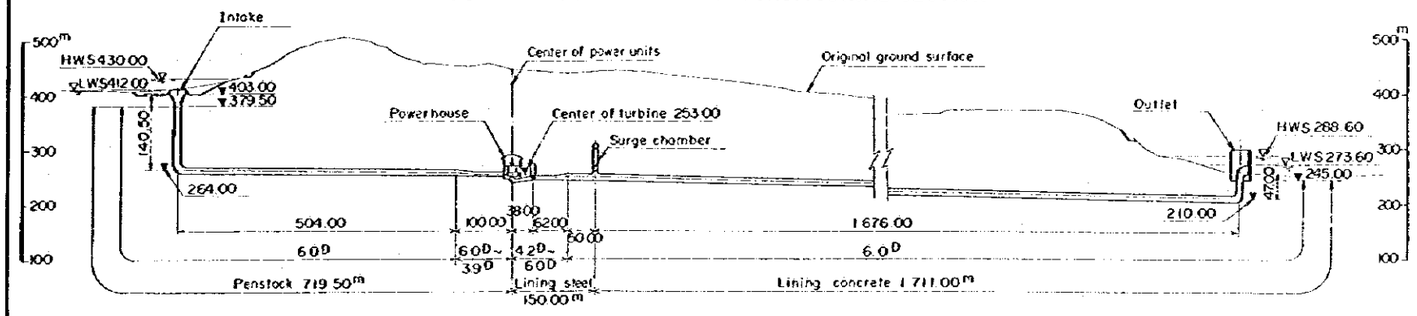
KASSEB PUMPED STORAGE PROJECT

PLAN

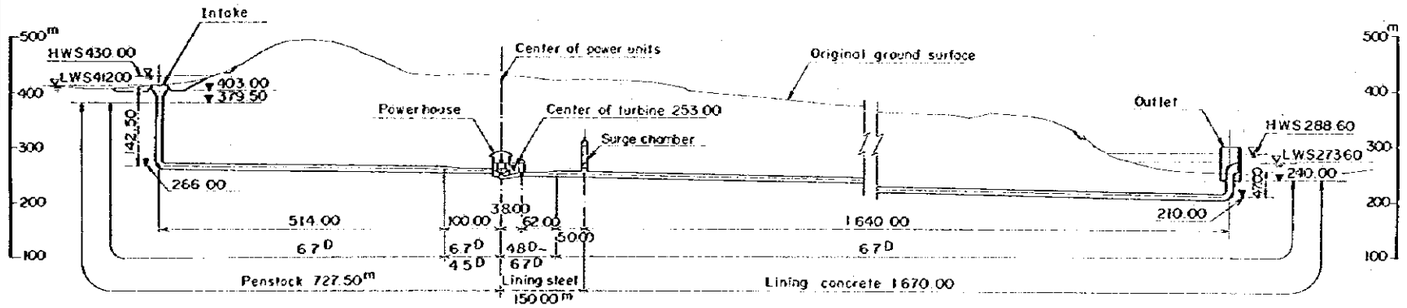
— Downstream Alternative (A) —
(Drawdown; 45m)

Figure . 8 – 10 | August 1978

NO.1 WATERWAY TUNNEL LONGITUDINAL SECTION

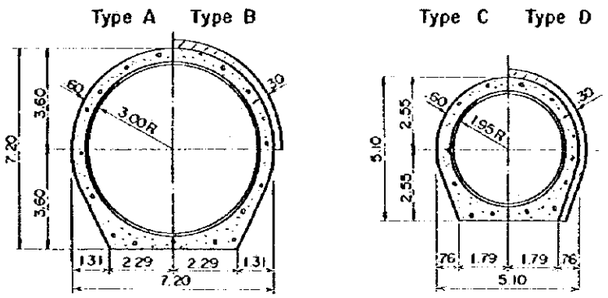


NO.2 WATERWAY TUNNEL LONGITUDINAL SECTION

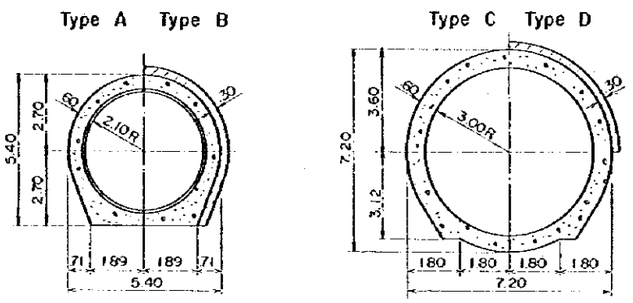


WATERWAY TUNNEL TYPICAL SECTION

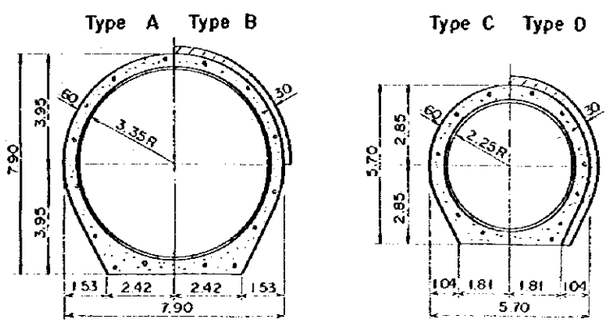
NO.1 PENSTOCK



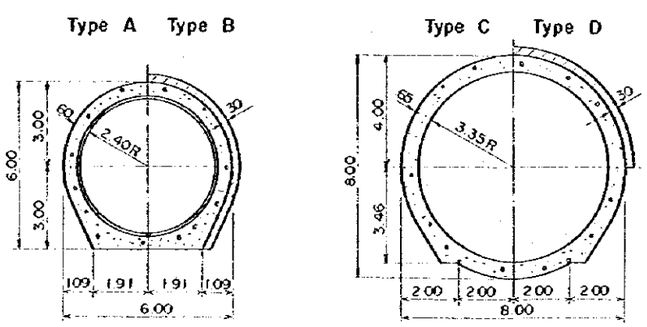
NO.1 TAILRACE TUNNEL



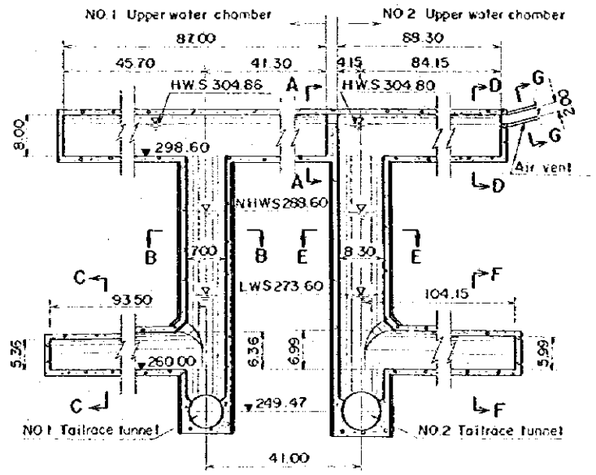
NO.2 PENSTOCK



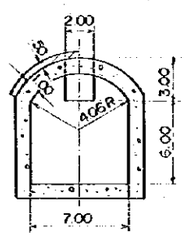
NO.2 TAILRACE TUNNEL



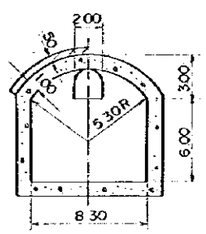
SURGE CHAMBER



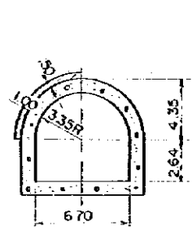
A-A SECTION



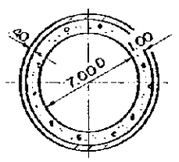
D-D SECTION



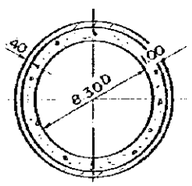
F-F SECTION



B-B SECTION

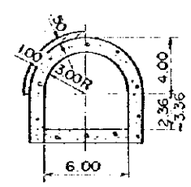


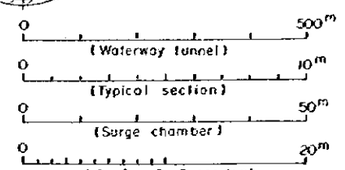
E-E SECTION



G-G SECTION

C-C SECTION





REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

WATERWAY TUNNEL AND SURGE CHAMBER

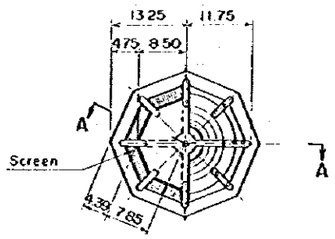
— Downstream Alternative (A) —

(Drawdown; 45m)

Figure. 8 — 11 | August 1978

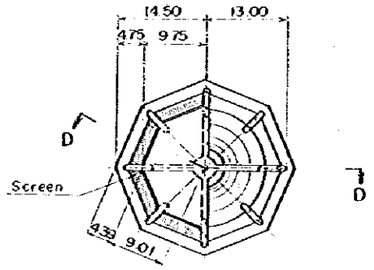
NO.1 INTAKE

PLAN



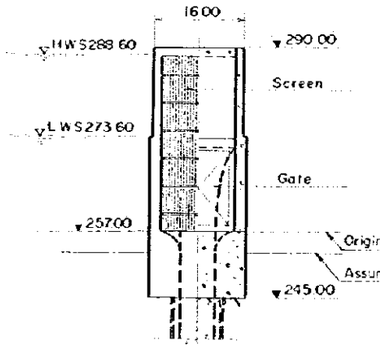
NO.2 INTAKE

PLAN



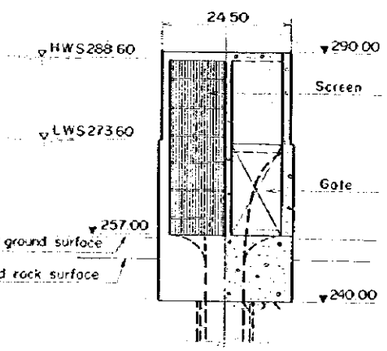
NO.1 OUTLET

G-G SECTION H-H SECTION

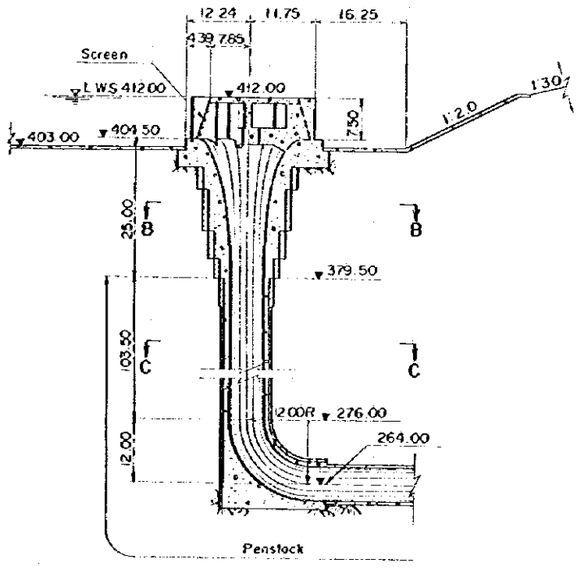


NO.2 OUTLET

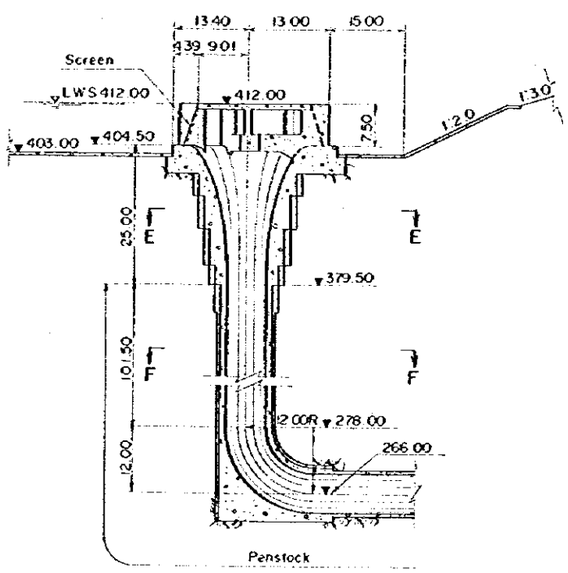
K-K SECTION L-L SECTION



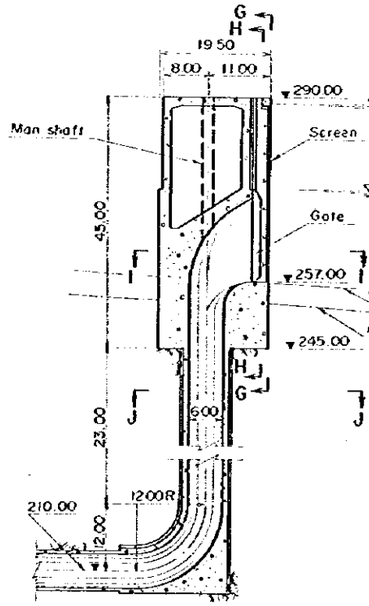
A-A SECTION



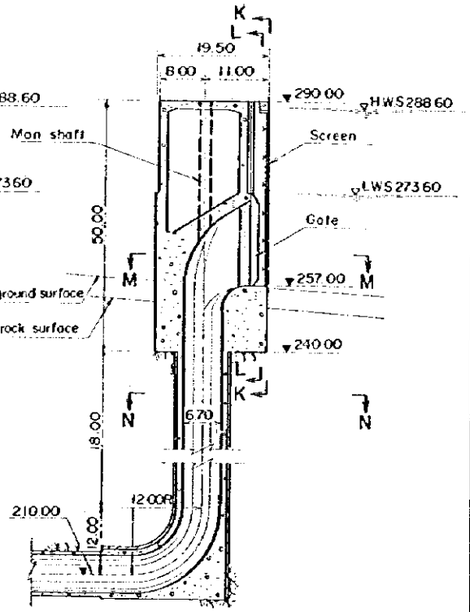
D-D SECTION



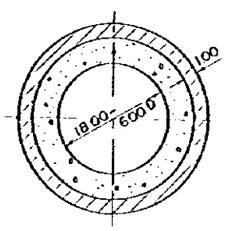
LONGITUDINAL SECTION



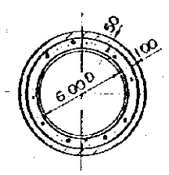
LONGITUDINAL SECTION



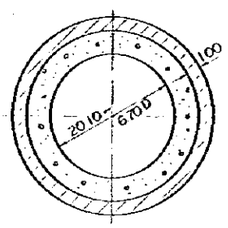
B-B SECTION



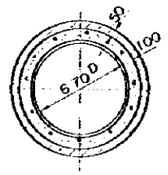
C-C SECTION



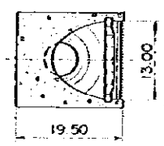
E-E SECTION



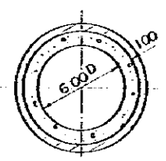
F-F SECTION



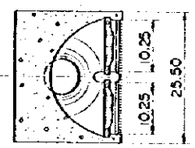
I-I SECTION



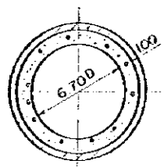
J-J SECTION



M-M SECTION



N-N SECTION



0 50m
(Intake, Outlet, except of J-J, N-N section)

0 20m
(B-B, C-C, E-E, F-F, J-J & N-N section)

REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

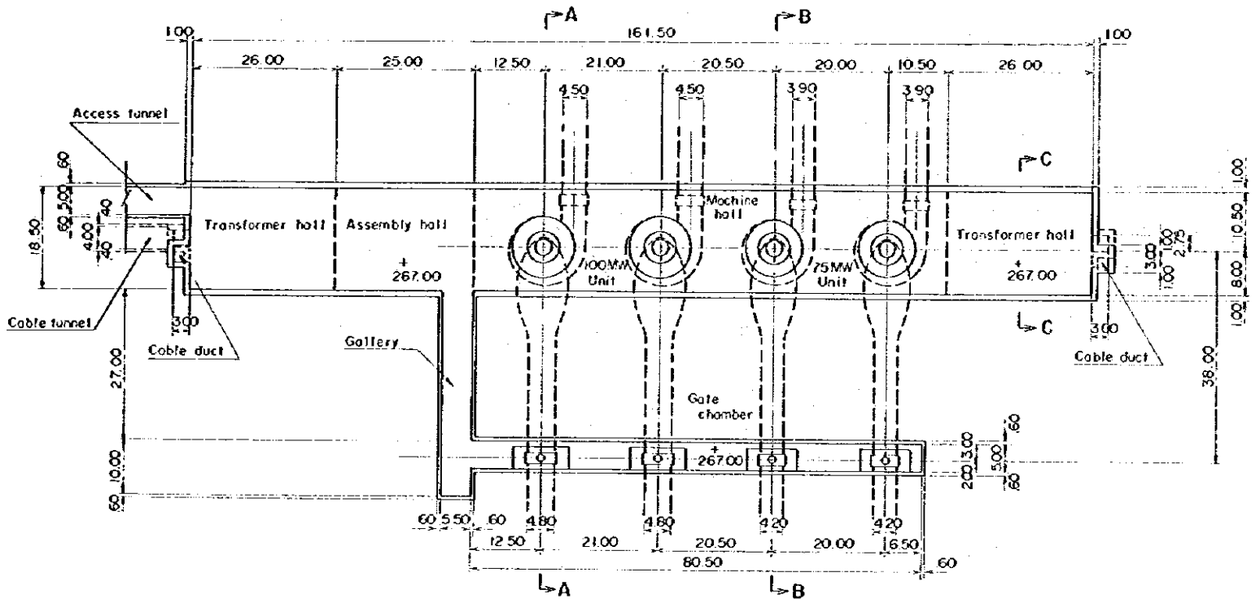
KASSEB PUMPED STORAGE PROJECT

INTAKE AND OUTLET

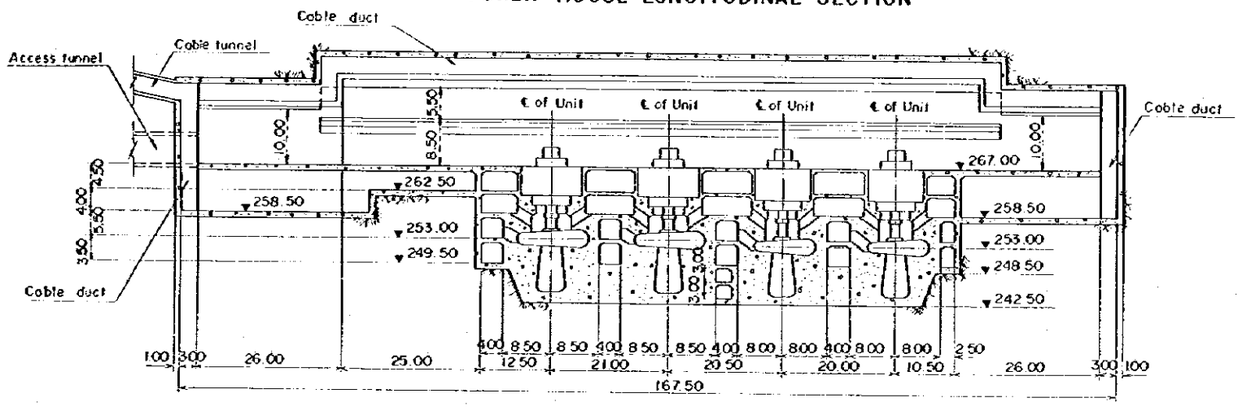
— Downstream Alternative (A) —
(Drawdown; 15 m)

Figure. 8 – 12 | August 1978

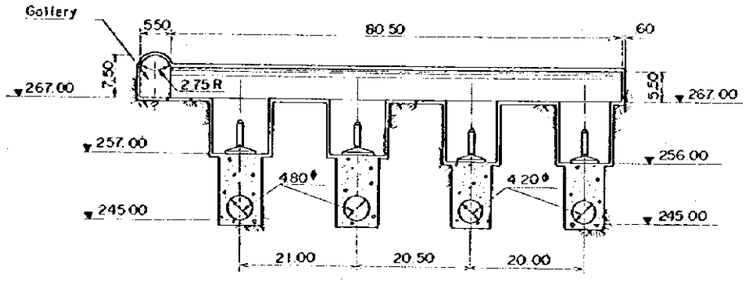
POWERPLANT PLAN



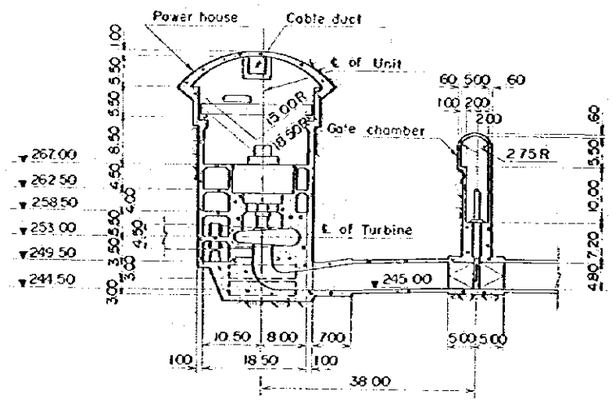
POWER HOUSE LONGITUDINAL SECTION



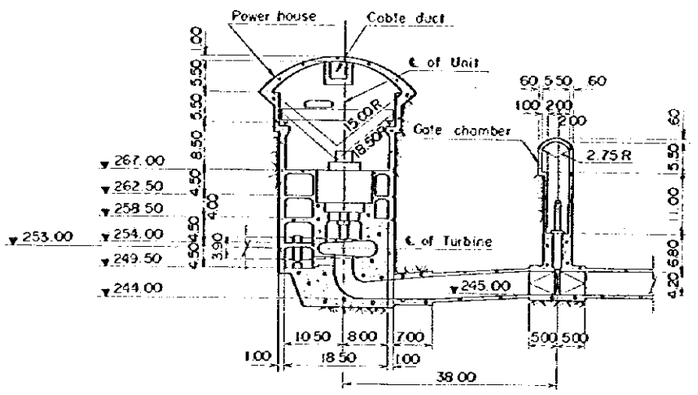
GATE CHAMBER LONGITUDINAL SECTION



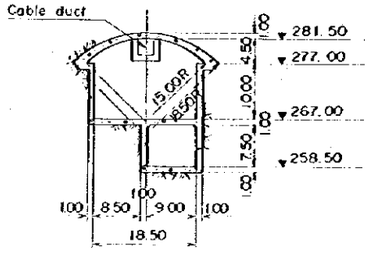
A-A SECTION (100MW SIDE)



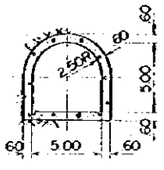
B-B SECTION (75MW SIDE)



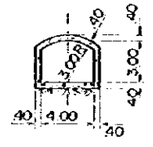
TRANSFORMER HALL(C-C) SECTION



ACCESS TUNNEL SECTION



CABLE TUNNEL SECTION



0 — 20m (Tunnel Section)

0 — 50m (Except Tunnel Section)

REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ(STEG)

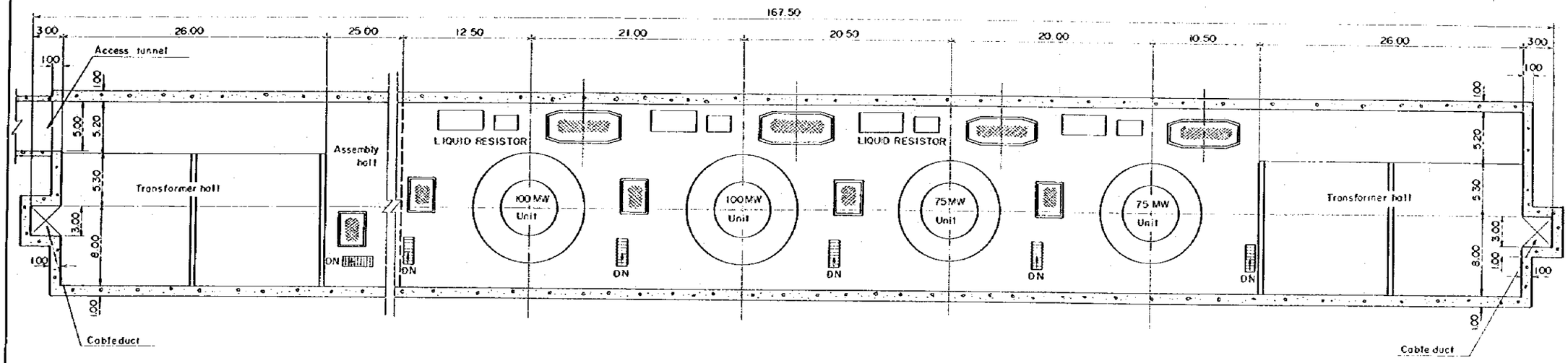
KASSEB PUMPED STORAGE PROJECT

POWER HOUSE (1-3)

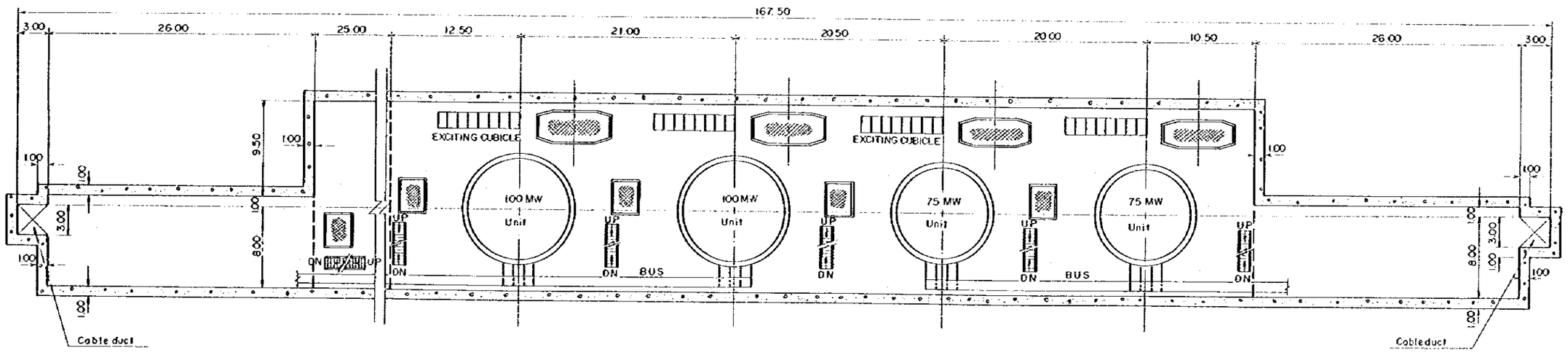
— Downstream Alternative (A) —
(Drawdown; 15 m)

Figure. 8-13 | August 1978

EL. 267.00



EL. 262.50



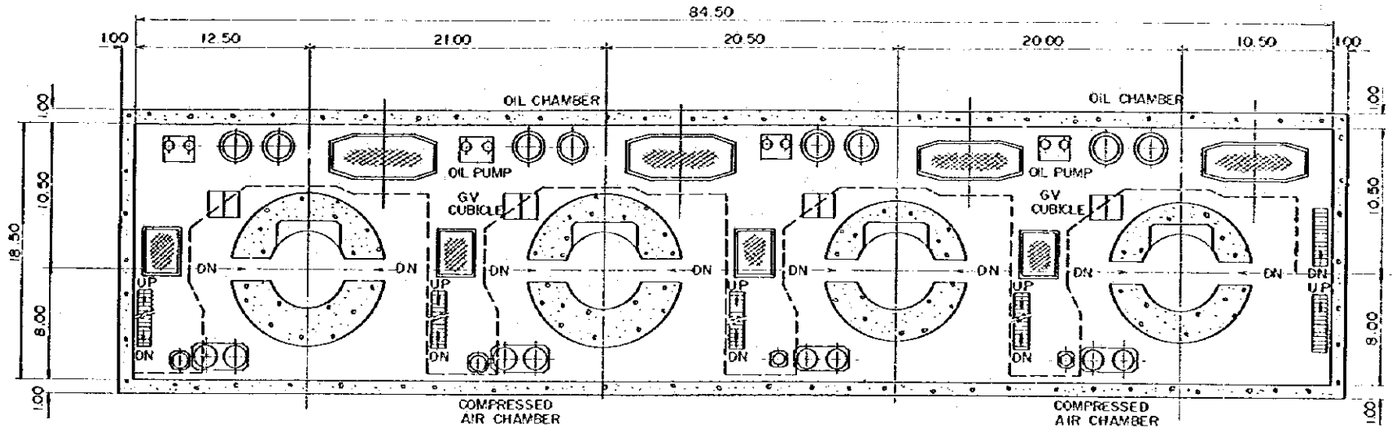
REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

KASSEB PUMPED STORAGE PROJECT

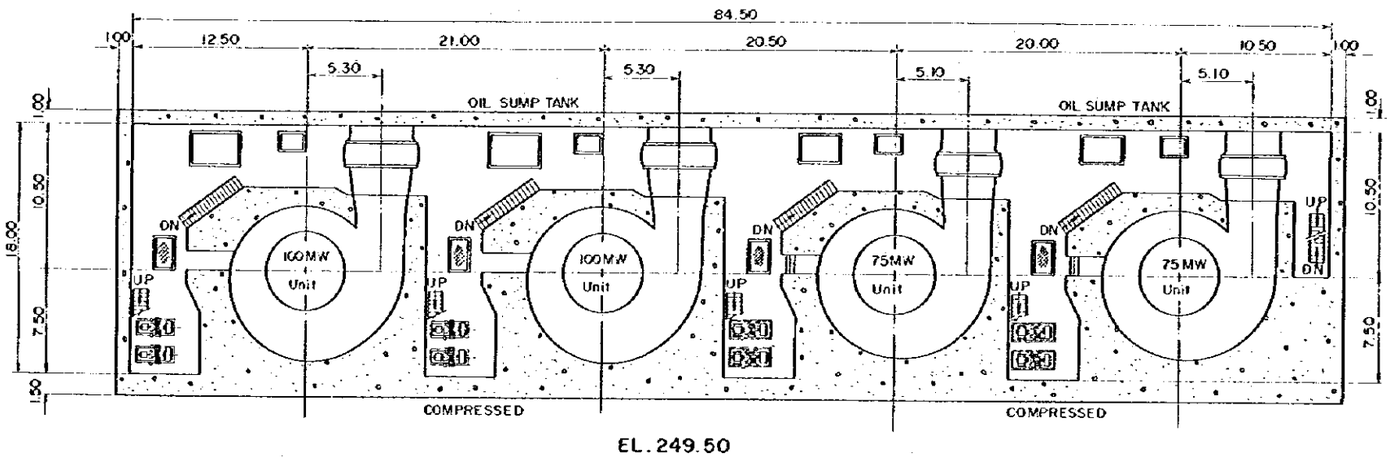
POWER HOUSE (2-3)
— Down stream Alternative (A) —
(Drawdown 15m)

Figure. 8 – 14 | August 1978

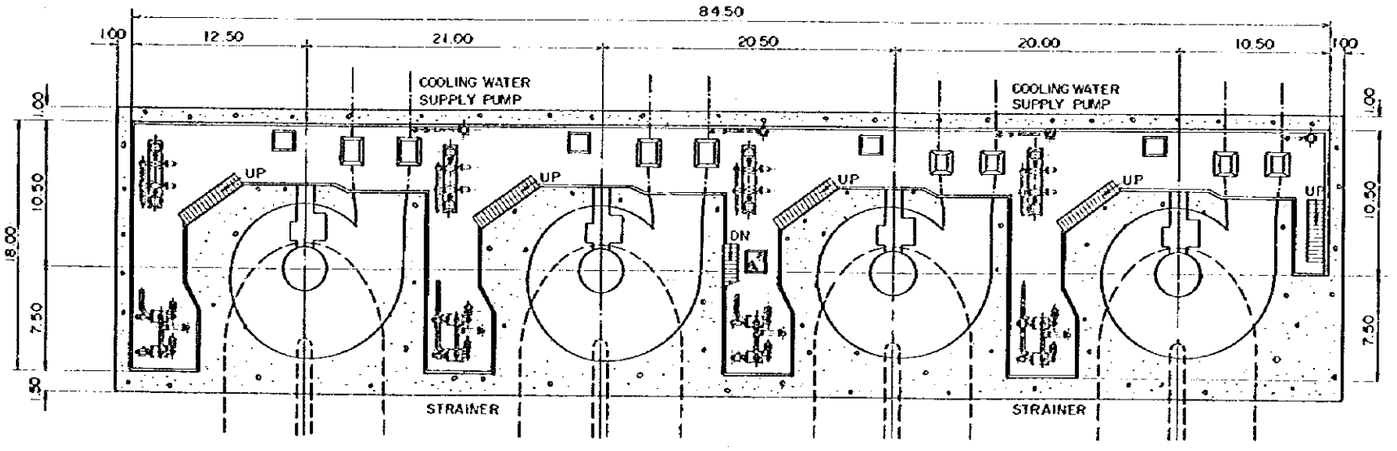
EL. 258.50



EL. 254.00



EL. 249.50



REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

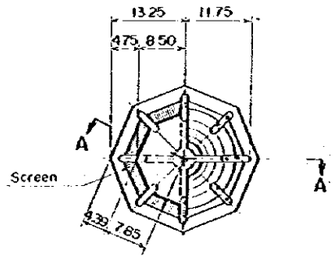
KASSEB PUMPED STORAGE PROJECT

POWER HOUSE (3-3)
— Downstream Alternative (A) —
(Drawdown, 15m)

Figure . 8 – 15 | August 1978

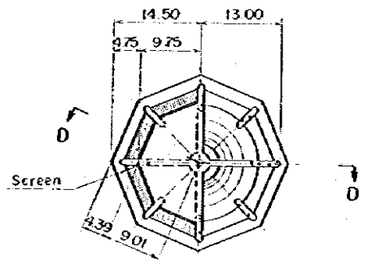
NO.1 INTAKE

PLAN



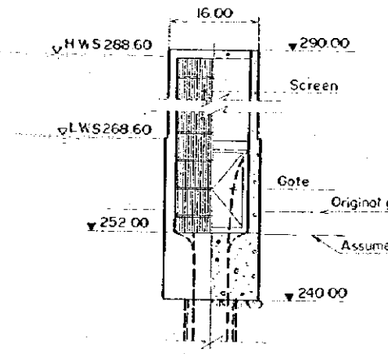
NO.2 INTAKE

PLAN



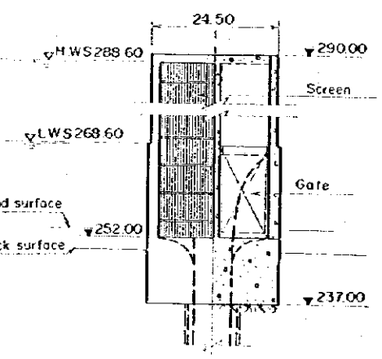
NO.1 OUTLET

G-G SECTION H-H SECTION

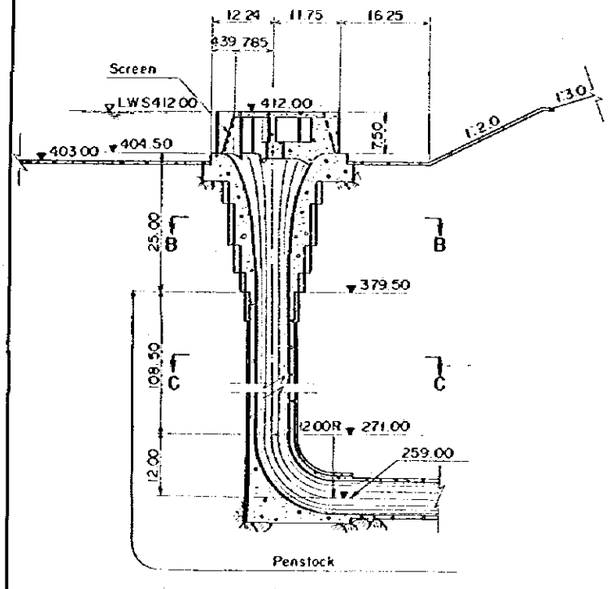


NO.2 OUTLET

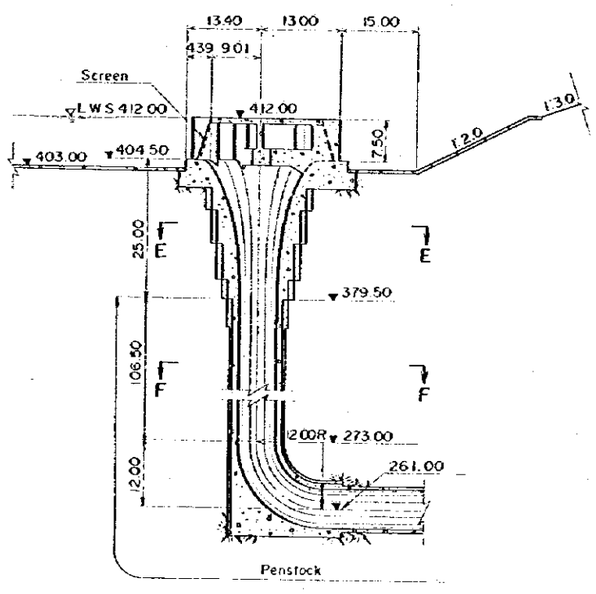
K-K SECTION L-L SECTION



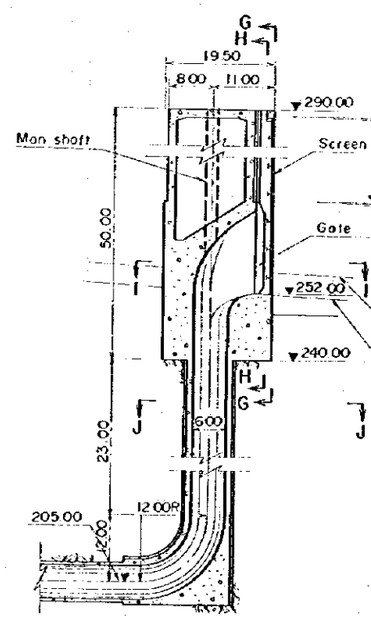
A-A SECTION



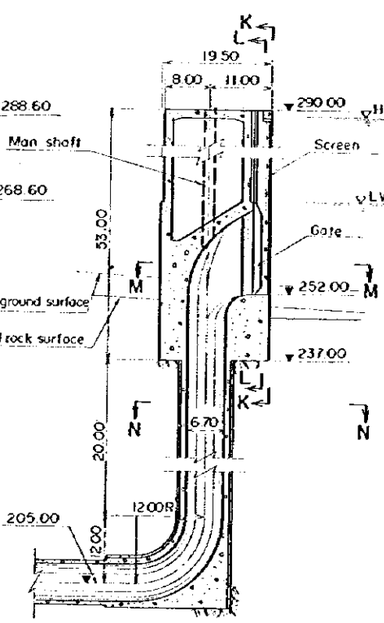
D-D SECTION



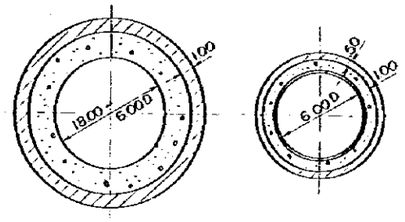
LONGITUDINAL SECTION



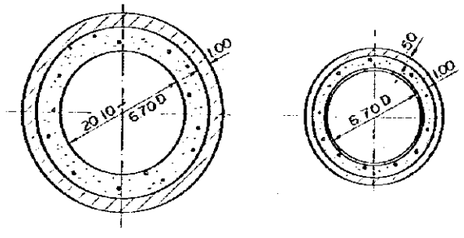
LONGITUDINAL SECTION



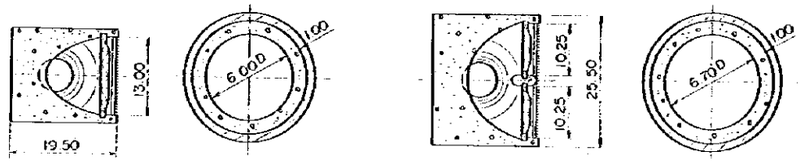
B-B SECTION C-C SECTION



E-E SECTION F-F SECTION



I-I SECTION J-J SECTION M-M SECTION N-N SECTION



0 50m

(Intake, Outlet, except of J-J & N-N section)

0 20m

(B-B, C-C, E-E, F-F, J-J & N-N section)

REPUBLIC OF TUNISIA

SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ (STEG)

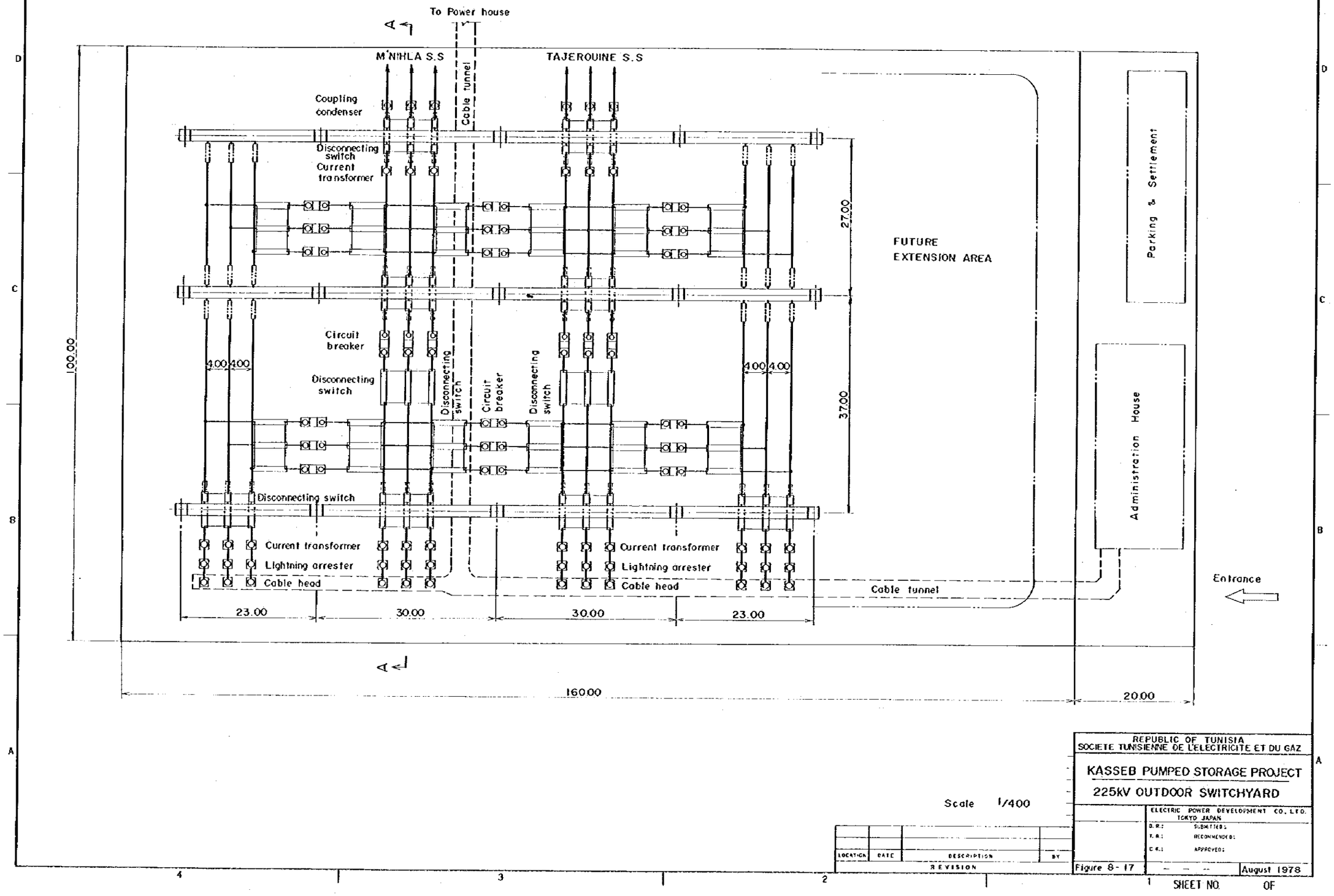
KASSEB PUMPED STORAGE PROJECT

INTAKE AND OUTLET

— Downstream Alternative (B) —

(Drawdown; 20 m)

Figure. 8 – 16 | August 1978



Scale 1/400

LOCATION	DATE	DESCRIPTION	BY
		REVISION	

REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ

KASSEB PUMPED STORAGE PROJECT
225kV OUTDOOR SWITCHYARD

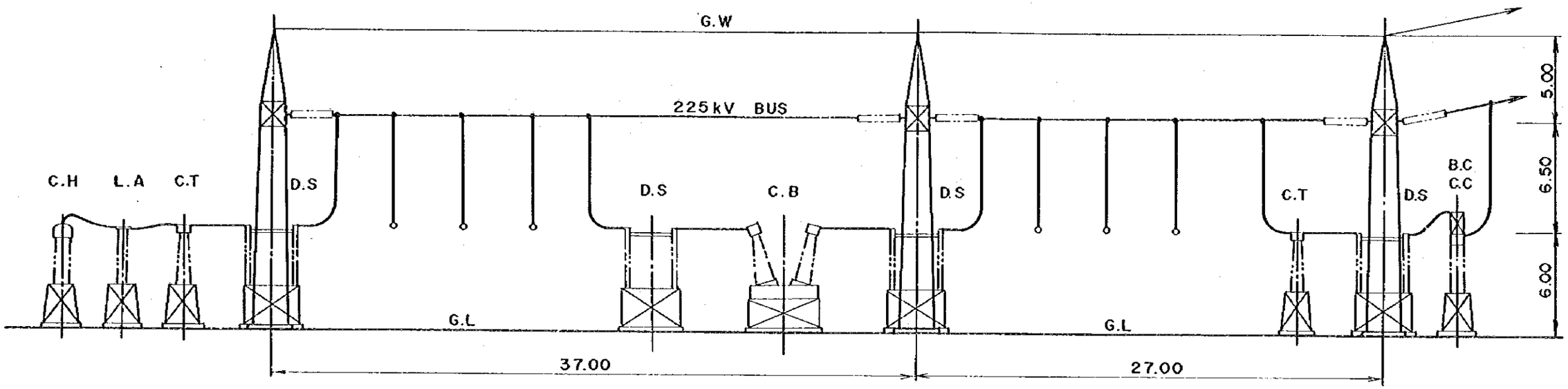
ELECTRIC POWER DEVELOPMENT CO., LTD.
TOKYO JAPAN

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

Figure 8-17 — — — August 1978

SHEET NO. OF

A – A VIEW



LEGEND :

C.H	Coble Head
L.A	Lightning Arrester
C.T	Current Transformer
D.S	Disconnecting Switch
C.B	Circuit Breaker
B.C	Blocking Coil
C.C	Coupling Condenser
G.W	Ground Wire
G.L	Ground Level

REPUBLIC OF TUNISIA
SOCIETE TUNISIENNE DE L'ELECTRICITE ET DU GAZ

KASSEB PUMPED STORAGE PROJECT

225KV OUTDOOR SWITCHYARD (2-2)

ELECTRIC POWER DEVELOPMENT CO., LTD. TOKYO JAPAN

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

LOCATION	DATE	DESCRIPTION	BY

REVISION

Figure 8-18 | – – – | August 1978

SHEET NO. OF