ANNEX

Annex F1204 FEATURE OF SULTANI-SIWAQA PIPELINE PROJECT (1/3)

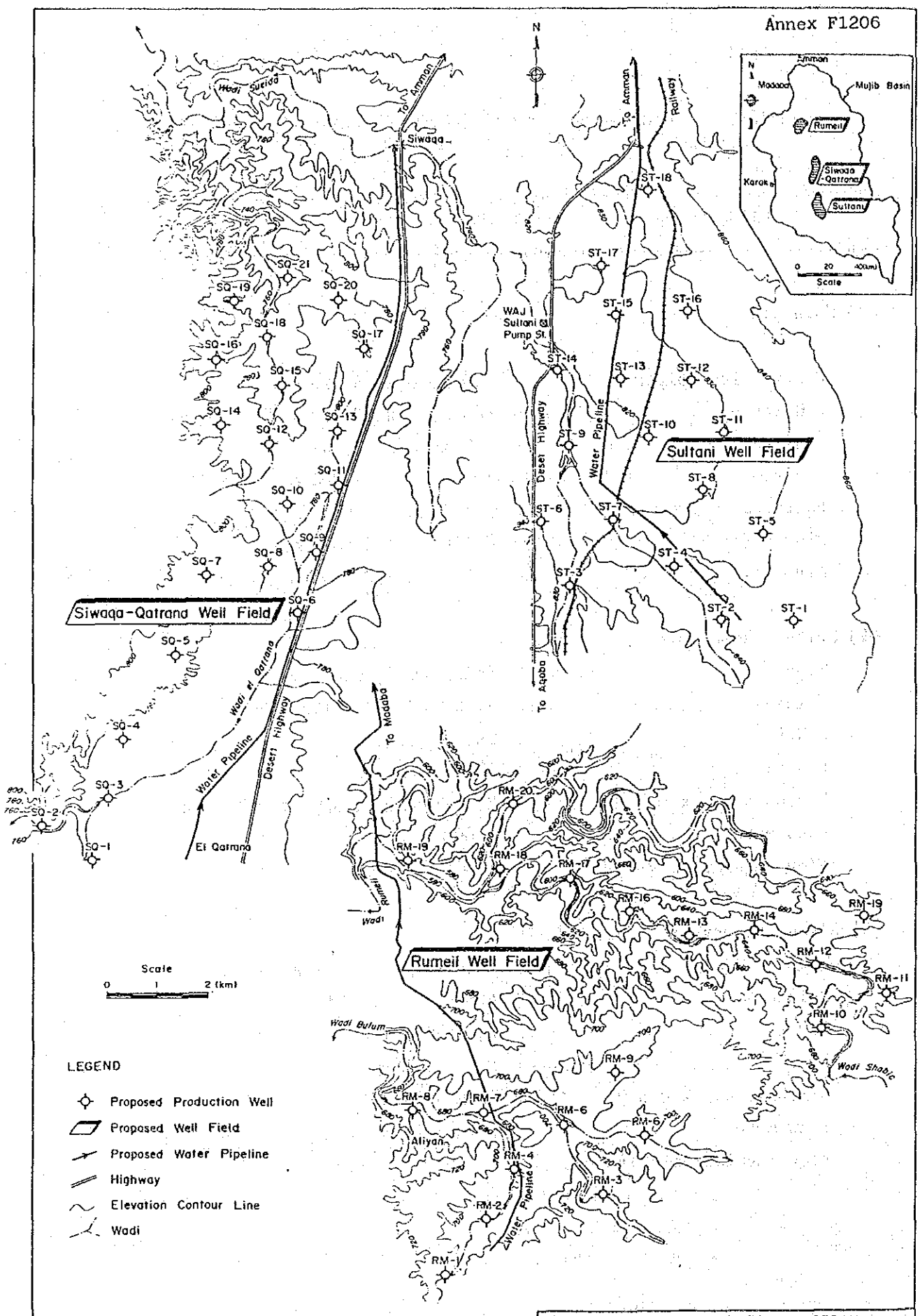
Description	Design Feature
(1) Sultani Well Field	
Wells	
Nos. of well	18 wels
Diameter of well	17-1/2 inches
Well depth	265 - 285 m
Diameter of pump chamber pipe	13-3/8 inches
Diameter of screen pipe	9-5/8 inches
Pumping rate per a well	60 m^3/hr
Pump	
Nos. of pump	18 units
Type of pump	Submersible pump
Design head	170 - 200 m
Motor capacity	55 - 75 KW
Design discharge	60 m^3/hr
Electric facilities	
Total length of distribution line	33 KV x approx. 35 km
Pole mounting transformer	33 KV/0.4 KV x 125 KVA x 18 units
Local control panel	18 units
Remote control panel	18 units
Flow meter	100 mm dia. x 18 units
Collecting pipes	
Ductile iron pipes	150 mm ϕ x 17,400 m
- ditto -	200 mm ϕ x 3,100 m

Annex F1204 FEATURE OF SULTANI-SIWAQA PIPELINE PROJECT (2/3)

Description	Design Feature
(2) Siwaqa-Qatrana Well Field	
Wells	
Nos. of well	21 well
Diameter of well	17-2/1 inches
Well Depth	260 - 280 m
Diameter of pump chamber pipe	13 - 3/8 inches
Diameter of screen pipe	9-5/8 inches
Pumping rate per a well	70 - 90 m^3/hr
Pump	
Nos. of pump	21 units
Type of pump	Submersible pump
Design head	150 - 185 m
Motor capacity	45 - 75 KW
Design discharge	70 - 90 m^3/hr
Electric facilities	
Total length of distribution line	33 KV x approx. 30 km
Pole mounting transformers	33 KV/0.4 KV x 125 KVA x 21 units
Local control panels	21 units
Remote control panels	21 units
Flow meters	130 mm ϕ x 21 units
Collecting pipes	
Ductile iron pipes	150 mm ϕ x 15,600 m
- ditto -	200 mm ϕ x 5,700 m
- ditto -	300 mm ϕ x 5,000 m
- ditto -	400 mm ϕ x 700 m

Annex F1204 FEATURE OF SULTANI-SIWAQA PIPELINE PROJECT (3/3)

Description	Design Feature
(3) Main pipe	
Ductile iron pipes	500 mm ϕ x 4,300 m
- ditto -	600 mm ϕ x 27,400 m
- ditto -	700 mm ϕ x 8,000 m
- ditto -	800 mm ϕ x 1,000 m
Butterfry valve	ϕ 500 mm - ϕ 800 mm x 15 units
Blow-off	ϕ 500 mm - ϕ 800 mm x 15 units
Air valve	ϕ 500 mm - ϕ 800 mm x 12 units
(4) Sultani Reservoir	
Type	Reinforced concrete
Volume	1,800 m^3 x 2 units
H.W.L.	EL. 868.0 m
L.W.L.	EL. 864.0 m
Dimension, L x B x H	25 m x 21 m x 5.65 m x 2 units
Flow meter	ϕ 600 x 1 unit
Flow regulation valve	ϕ 600 x 1 unit
(5) Siwaqa Reservoir	
Type	Reinforced concrete
Volume	4,550 m^3 x 2 units
H.W.L.	EL. 801.0 m
L.W.L.	EL. 796.0 m
Dimension, L x B x H	51 m x 21 m x 6.65 m x 2 units
Flow meter	ϕ 700 x 1 unit
Flow regulation valve	ϕ 700 x 1 unit



Annex F1206

Proposed Well Fields and Wells

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

Annex F1220 ALTERNATIVE PLANS FOR THE SULTANI-SIWAQA PIPELINE

1. Outline of each alternative plan

(1) Alternative 1 (proposed)

Two reservoirs are constructed, the Sultani reservoir (approx. 11.7 km from a starting point of the pipeline at the Sultani well field) and the Siwaqa reservoir (approx. 19.7 km point). The capacity of each reservoir is equal to 5-hour average flow volume. Water is pumped up from the Sultani and Siwaqa-Qatrana well fields to the pipeline.

(2) Alternative 2

Two reservoirs are constructed at the same points as in Alternative 1. Unlike Alternative 1, another reservoir (collecting reservoir) with a booster pump station is constructed in the middle of the Sultani well field. Its function is to collect water from the Sultani well field and send it to the Sultani reservoir by a booster pump. The capacity of each reservoir is as follows:

	Flow volume of:	
Sultani collecting reservoir	5 hours	3,600 m^3
Sultani reservoir	2 hours	1,440 m^3

(3) Alternative 3

The basic idea is the same as Alternative 2 except that the Sultani reservoir is not constructed. Water is pumped up from the Sultani well field to the Sultani collecting reservoir, and from there directly sent to the Siwaqa reservoir by a booster pump. The capacity of each reservoir is as follows:

Sultani collecting reservoir	Average flow volume of 5 hours	3,600 m^3

2. Cost comparison of each alternative plan

(1) Basis for the estimation of construction costs

(i) Taking the Alternative 1 as a base, overlapped works are cancelled out.

(ii) Therefore, only the following works are compared.

* Sultani well pump
* Sultani reservoir
* Sultani collecting reservoir
* Sultani booster pump station and pump house

(iii) Estimates are those of construction costs including engineering & administration cost.

(2) Basis for the estimation of annual costs

(i) Annual amortization : Discount rate 5%
Discount rate 10%
Project life 30 years

(ii) Operation and maintenance cost : Investment cost x 2%

(iii) Electricity charges : 23 fills/KWH
Load factor 1/1.3 = 0.769

3. Facilities of Pipeline

Item	Alternative 1	Alternative 2	Alternative 3
(1) Sultani well field well pump	37KWx1set = 37KW 45 x 10sets = 450KW 55 x 7sets = 385KW	37KWx10sets = 370KW 30 x 8sets = 240KW	37KWx10sets = 370KW 30 x 8sets = 240KW
Total	872 KW	610 KW	610 KW
(2) Booster pump station			
Pumps & motor	-	200ϕ x 110KW x 4 sets (1 set, stand by)	200t x 110KW x 4 sets (1 set, stand by)
Transformer	-	500 KVA x 1	500 KVA x 1
Electric facilities & cabling	-	1 lot	1 lot
(3) Booster pump house Dimension, B x L	-	12.00m x 10.00m	12.00m x 10.00m
(4) Sultani collecting reservoir (in well field)	-	3,600 m^3	3,600 m^3
(5) Sultani reservoir	3,600 m^3	1,440 m^3	-

4. Comparison of Cost

Unit : JD1,000

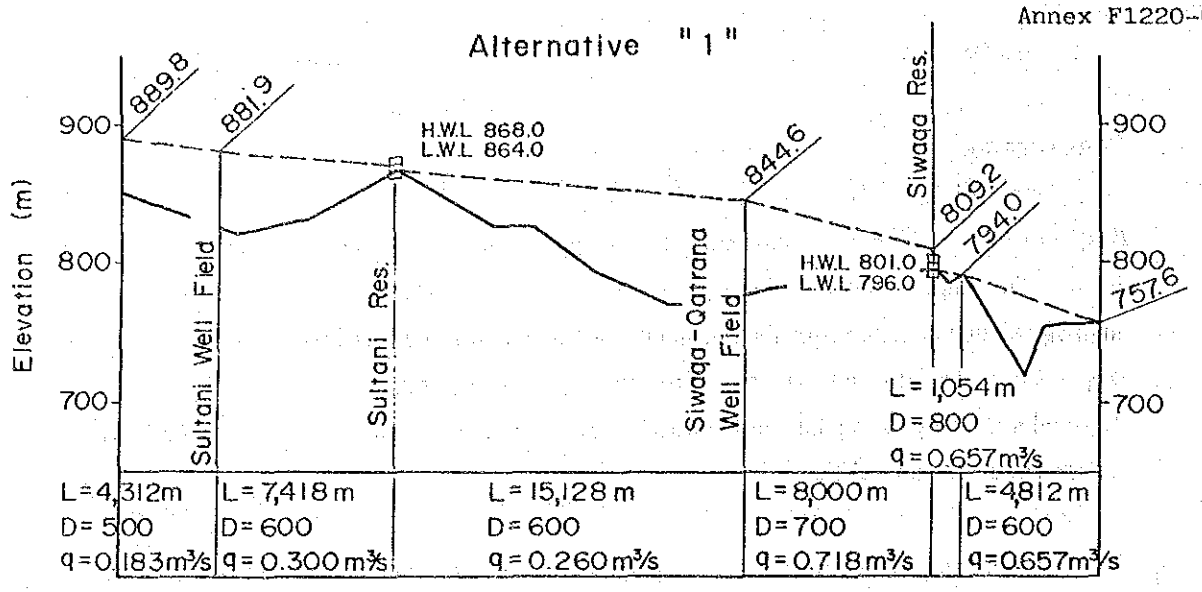
Item	Alternative 1	Alternative 2	Alternative 3
(1) Sultani well pumps	(872KW)	(610KW)	(610KW)
	523.2	366.0	366.0
(2) Sultani booster pump	-	(330KW)	(330KW)
		144.6	144.6
(3) Booster pump house	-	43.2	43.2
(4) Sultani collecting reservoir	-	309.0	309.0
(5) Sultani reservoir	309.0	158.4	-
(6) Sub-Total	832.2	1,021.2	862.8
(7) Engineering & Administration Cost	83.2	102.1	86.3
(8) Total ((6)+(7))	915.4	1,123.3	949.1
(1) Annual amortization			
Discount rate 5%	59.5	73.0	61.7
Discount rate 10%	91.5	112.3	100.7
(2) Operation & maintenance cost	18.3	22.5	19.0
(3) Electricity charge	135.1	145.7	145.7
Annual cost (1)+(2)+(3)			
Discount rate 5%	212.9	241.2	226.4
Discount rate 10%	244.9	280.5	265.4

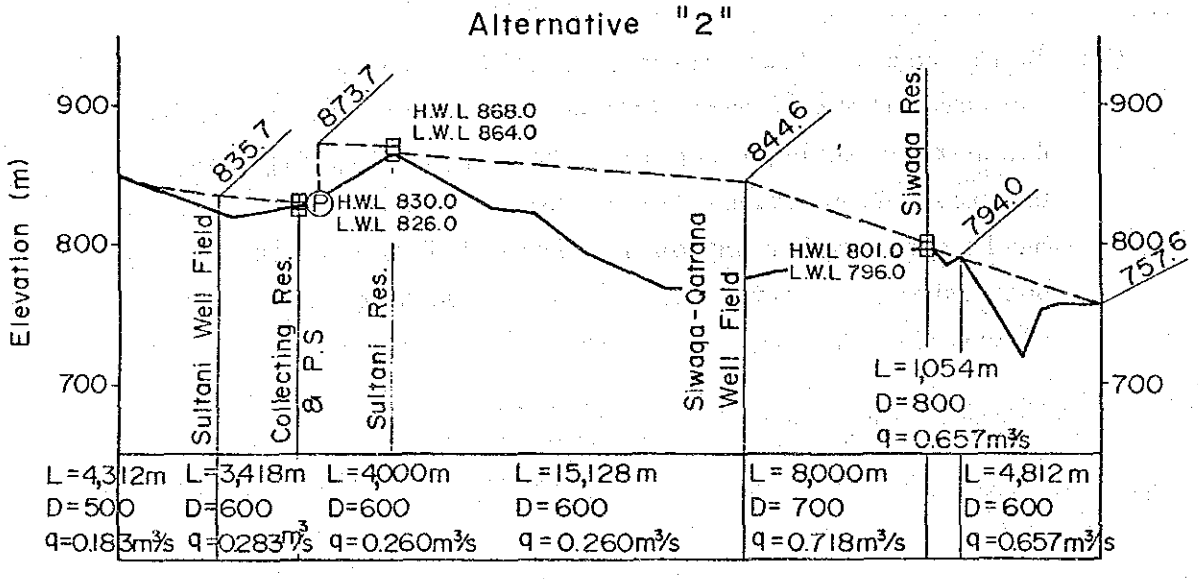
5. Conclusion

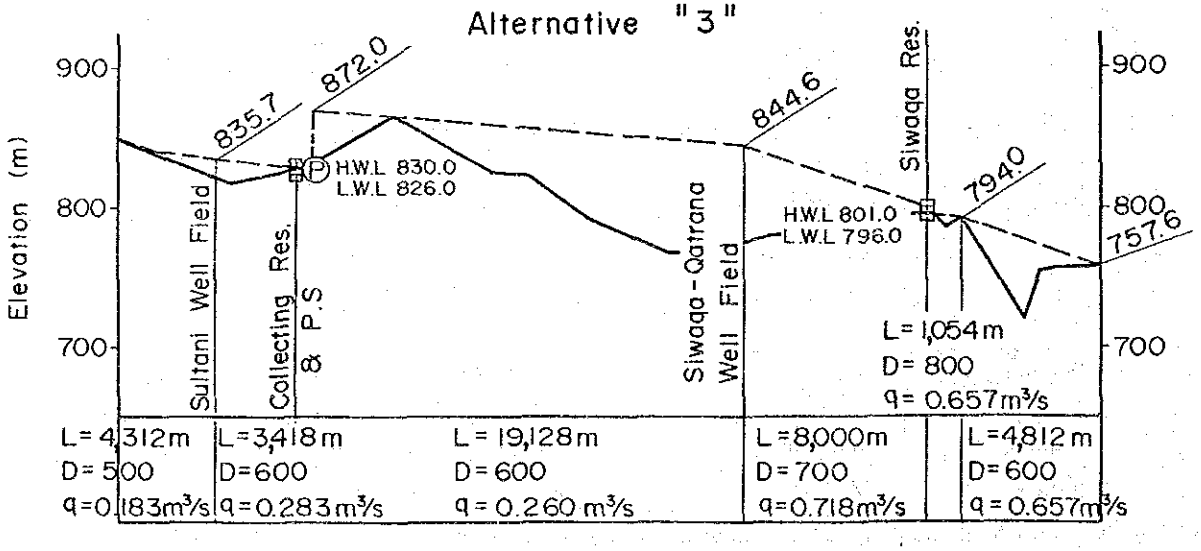
The construction cost of the Alternative 1 is smaller than the other two. The power costs for pumping up are roughly, on the same level among three alternatives. Therefore, Alternative 1 is the least expensive in annual cost. Moreover, the system of the Alternative 1 is relatively simple and stable to operate compared with other two, described as below:

(1) Since there is no pump station in the case of Alternative 1, operation will be rather simple.

(2) In the case of Alternative 3, negative pressure might appear at the down stream of pump station, when less quantity of water is discharged through the pipeline crossing over the hill of Sultani. Therefore, it will become inevitably necessary to build a reservoir on top of the hill in order to supply water constantly. Namely, this case will become quite similar to the Alternative 2.







Annex F1220
Alternatives of Sultani-Siwaqa Pipeline

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

Annex F1303 FEATURE OF RUMEIL-MADABA PIPELINE PROJECT (1/3)

Description	Design Feature
(1) Rumeil Well Field	
Wells	
Nos. of well	20 wels
Diameter of well	17-1/2 inches
Well depth	250 - 335 m
Diameter of pump chamber pipe	13-3/8 inches
Diameter of screen pipe	9-5/8 inches
Pumping rate per a well	60 m^3/hr
Pump	
Nos. of pump	20 units
Type of pump	Submersible pump
Design head	190 - 310 m
Motor capacity	55 - 75 KW
Design discharge	60 m^3/hr
Electric facilities	
Total length of distribution line	33 KV x approx. 60 km
Pole mounting transformer	33 KV/0.4 KV x 125 KVA x 20 units
Local control panel	20 units
Remote control panel	20 units
Flow meter	100 mm dia. x 20 units
Collecting pipes	
Ductile iron pipes	150 mm ϕ x 18,300 m
- ditto -	200 mm ϕ x 6,900 m
- ditto -	400 mm ϕ x 1,700 m
- ditto -	500 mm ϕ x 6,500 m

Annex F1303 FEATURE OF RUMEIL-MADABA PIPELINE PROJECT (2/3)

Description	Design Feature
(2) Abu Haliefa Reservoir	
Type	Reinforced concrete
Volume	900 m^3 x 2 units
H.W.L.	EL. 718.0 m
L.W.L.	EL. 714.0 m
Dimension, L x B x H	21 m x 13 m x 5.65 m x 2 units
Flow meter	ϕ 400 x 1 unit
Flow regulation valve	ϕ 400 x 1 unit
(3) Rumeil booster pump station	
Receiving reservoir	
Type	Reinforced concrete
Volume	2,000 m^3 x 2 units
H.W.L.	EL. 695.0 m
L.W.L.	EL. 691.0 m
Dimention	29 m x 21 m x 5.65 m x 2 units
Flow meter	ϕ 700 x 1 unit
Flow regulation valve	ϕ 700 x 1 unit
Booster pump station	
Design discharge	5.78 m^3/min
Design head	160 m
Motor capacity	260 KW
Type of pump	Horizontal double suction volute pump
Nos. of unit	4 units
Overhead crane	1 unit

Annex F1303 FEATURE OF RUMEIL-MADABA PIPELINE PROJECT (3/3)

Description	Design Feature
Electrical facilities	
Transformer	3.3 KV/0.4 KV x 1500 KVA x 1 unit
Control panel	4 units
Flow meter	700 mm ϕ x 1 unit
(4) Main pipe	
Ductile iron pipe	ϕ 300 mm x 3,100 m
- ditto -	ϕ 400 mm x 6,400 m
- ditto -	ϕ 700 mm x 17,900 m
Butterfly valve	ϕ 300 mm - ϕ 700 mm x 13 units
Blow-off	ϕ 300 mm - ϕ 700 mm x 25 units
Air valve	ϕ 300 mm - ϕ 700 mm x 20 units

Annex F1308 COMPARISON OF ROUTES FOR THE RUMEIL WELL FIELD TO THE YADUDA PUMPING STATION PIPELINE

1. General

There are two roads connecting the Rumeil well field with the Yaduda pump station. One is the Kings Highway through Madaba, and the other is the Desert Highway through Jiza. Both roads could be used for the planned pipeline. Here relative advantages of these two possible routes are compared.

2. Outline of the routes

The following are the pipeline routes along the Kings Highway (A-route) and the Desert Highway (B-route).

A-route : Rumeil well field -- Nitil -- Madaba
-- Kings Highway -- Yaduda pump station
(Total length : 43.7 km)

B-route : Rumeil well field -- Nitil -- Jiza
-- Desert Highway -- Yaduda pump station
(Total length : 42.2 km)

3. On-going pipeline project

WAJ is now constructing ϕ 1,000 mm pipelines along the Kings Highway and the Desert Highway. The former runs through Wala, Madaba and Yaduda, while the latter connects Siwaqa with Yaduda. Whether to be able to make use of these pipelines is decisive for the economy of the Rumeil-Madaba project.

4. Wala-Madaba-Yaduda pipe line

WAJ's Wala-Madaba-Yaduda pipeline will carry 15 MCM/y of water from Wala. If the pipeline from the Rumeil well field is connected to this pipeline at the Madaba point, total water flow will increase up

to 24 MCM/y (9 MCM/y from the Rumeil well field in the peak season). Nonetheless, the normal capacity of this WAJ's pipeline is approximately 35 MCM/y (estimated), so that additional water from the Rumeil well field can be well accommodated.

The pipeline from Rumeil to Madaba can be connected with this pipeline without problem.

5. Siwaqa-Yaduda pipeline

On the other hand, WAJ's Siwaqa-Yaduda pipeline will carry 21 MCM/y in the peak season. (The water comes from the planned Sultani-Siwaqa pipeline.) If the pipeline from Rumeil is connected to this pipeline at Jiza, the peak flow will increase up to 30 MCM/y between Jiza and Yaduda (9 MCM/y from the Rumeil well field). The Siwaqa-Madaba pipeline, however, is expected to become a trunk line to convey water from the south Jordan to Amman. So, it is not recommendable to lessen its flow capacity at Jiza point. In other words, if B-route were taken, an additional pipeline would have to be constructed between Jiza and Yaduda.

6. Conclusion

In consequence, each route would require the following pipeline:

A-route : Rumeil-Nitil-Madaba, length 27.4 km
B-route : Rumeil-Nitil-Jiza-Yaduda, length 42.2 km

A-route is obviously preferable to B-route. The pipelines should be constructed between the Rumeil well field and Madaba.

Annex F1316 ALTERNATIVE PLANS FOR THE RUMEIL-MADABA PIPELINE

1. Outline of each alternative plan

(1) Alternative 1 (proposed)

Two reservoirs are constructed, the Abu Haliefa reservoir (approx. 5.0 km from a starting point of the pipeline in the Abu Haliefa well field) and the Rumeil reservoir (approx. 11.9 km). In addition a booster pump station is constructed at the downstream of the Rumeil reservoir. The capacity of each reservoir is equal to 5-hour average flow volume. Water from the Wadi Shabik well field is directly pump up to the Rumeil reservoir through main pipeline by each well pump.

(2) Alternative 2

Two reservoirs and a booster pump station are constructed at the same points as in Alternative 1. Unlike Alternative 1, Wadi Shabik reservoir and a booster pump station are constructed at the downstream of branch pipeline, near the connecting point to the main pipeline. The function of this reservoir and the booster pump station are to collect water from the Wadi Shabik well field and send it to the Rumeil reservoir through the main pipeline. The capacity of each reservoir is as follows:

	Average flow volume of:	
Abu Haliefa reservoir	5 hours	1,800 m^3
Wadi Shabik reservoir	5 hours	2,200 m^3
Rumeil reservoir	2 hours	1,600 m^3

(3) Alternative 3

Two reservoirs, the Abu Haliefa and the Wadi Shabik reservoir, are constructed together with two booster pump stations. From the reservoirs, the water is pressed directly to the Yaduda pump

station by these booster pump stations.

The capacity of each reservoir is as follows:

	Average flow volume of:	
Abu Haliefa reservoir	5 hours	1,800 m^3
Wadi Shabik reservoir	5 hours	2,200 m^3

2. Cost comparison of each alternative plan

(1) Basis for the estimation of construction costs

(i) Taking the Alternative 1 as a base, overlapped works are cancelled out.

(ii) Therefore, only the following works are compared.

* Rumeil well pump
* Rumeil booster pump station and pump house
* Wadi Shabik booster pump station and pump house
* Abu Haliefa booster pump station and pump house
* Rumeil reservoir
* Wadi shabik reservoir
* Abu Haliefa reservoir

(iii) Estimates are those of construction costs including engineering & administration cost.

(2) Basis of the estimation of annual costs

The same conditions as for the Sultani-Siwaqa pipeline is to be applied.

3. Facilities of Pipeline

Item	Alternative 1	Alternative 2	Alternative 3
(1) Rumeil well field well pump	55KWx9sets = 495KW 75 x 11sets = 825KW	55KWx20sets = 1100KW	55KWx20sets = 1100kw
Total	1320KW	1100KW	1100KW
(2) Rumeil booster pump station			
Pump & motor (1 set, stand by)	250ϕ x 260KW x 4 sets	250ϕ x 260KW x 4 sets	-
Transformer	1500KVA x 1set	1500KVA x 1set	-
Electric facilities and cabling	1 lot	1 lot	-
Surge arrester tank	2 units	-	-
(3) Wadi Shabik booster pump station			
Pump & motor (1 set, stand by)	-	200ϕ x 150KW x 4 sets	200ϕ x 260KW x 4 sets
Transformer	-	800 KVA x 1 set	1750 KVA x 1 set
Electric facilities and cabling	-	1 lot	1 lot
Surge arrester tank	-	2 units	2 units

Item	Alternative 1	Alternative 2	Alternative 3
(4) Aba Haliefa booster pump station			
pump & motor	-	-	150ϕ x 150KW x
(1 set, stand by)			4 sets
Transformer	-	-	800 KVA x 1 set
Electric facilities and cabling	-	-	1 lot
(5) Rumeil pump house			
Dimension, B x L	12.00mx15.00m	12.00mx15.00m	-
(6) Wadi Shabik pump house			
Dimension, B x L	-	10.00mx12.00m	12.50mx18.00m
(7) Abu Haliefa pump house			
Dimension, B x L	-	-	10.00mx12.00m
(8) Abu Haliefa reservoir	1,800 m^3	1,800 m^3	1,800 m^3
(9) Wadi Shabik reservoir	-	2,200 m^3	2,200 m^3
(10)Rumeil reservoir	4,000 m^3	1,600 m^3	-

4. Comparison of Cost

Unit : JD1,000

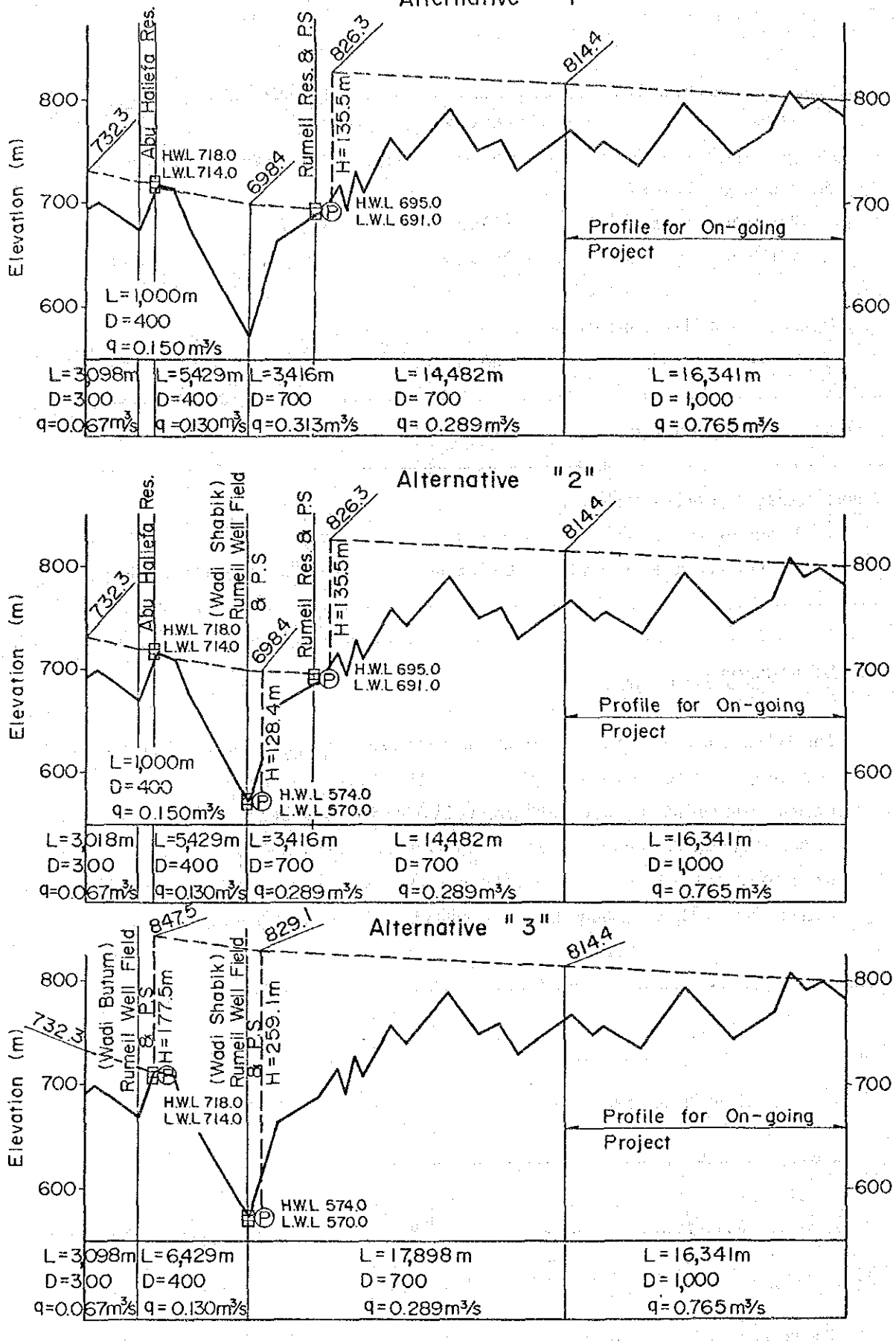
Item	Alternative 1	Alternative 2	Alternative 3
(1) Rumeil well field well pumps	(1320KW) 792.0	(1100KW) 660.0	(1100KW) 660.0
(2) Abu Haliefa booster pump station	-	-	(450KW) 160.6
(3) Wadi Shabik booster pump station	-	(450KW) 460.6	(700KW) 789.0
(4) Rumeil booster pump station	(780KW) 904.0	(780KW) 904.0	
(5) Abu Haliefa pump house	-	-	43.2
(6) Wadi Shabik pump house	-	81.0	81.0
(7) Rumeil pump house	89.0	89.0	-
(8) Wadi Shabik reservoir	-	242.0	242.0
(9) Rumeil reservoir	343.0	176.0	-
(10) Sub-Total	2,128.0	2,612.6	1,975.8
(11)Engineering & Administration Cost	212.8	261.3	197.6
Total ((10)+(11))	2,340.8	2,873.9	2,173.4

Unit : JD1,000

Item	Alternative 1	Alternative 2	Alternative 3
(1) Annual Amortization			
Discount rate 5%	152.2	186.8	141.3
Discount rate 10%	248.4	304.9	230.6
(2) Operation & Maintenance Cost	46.8	57.5	39.5
(3) Electricity charge	325.5	361.1	361.1
Annual cost ((1)+(2)+(3))			
Discount rate 5%	524.5	605.4	541.9
Discount rate 10%	620.7	723.5	631.2

5. Conclusion

The Alternative 1 is the least expensive case in electric power cost for pumping yet more expensive than the Alternative 3 in construction cost. Meanwhile, the Alternative 1 is the cheapest among three alternatives in annual cost. Moreover, equipped with only one pump station, the Alternative 1 is simple to operate compared with the other two. That is why the Alternative 1 is proposed in this study.



Annex F1316
Alternatives of Rumeil-Madaba Pipeline

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

Annex F2104 OPTIMUM PIPELINE DIAMETER

1. General

The increase of a pipe diameter entails the increase of construction cost and the decrease of pumping up cost. Inversely, the decrease of a pipe diameter results in the decrease of construction cost and the increase of pumping up cost. The optimum diameter, therefore, is such one that makes the sum of annual interest amortization cost and pumping up cost minimum. The relation between optimum pipe diameters and annual flow volumes is illustrated in the following page. The case of energy cost escalation is included in the graph. The basis of calculation is as follows:

2. Basis of calculation

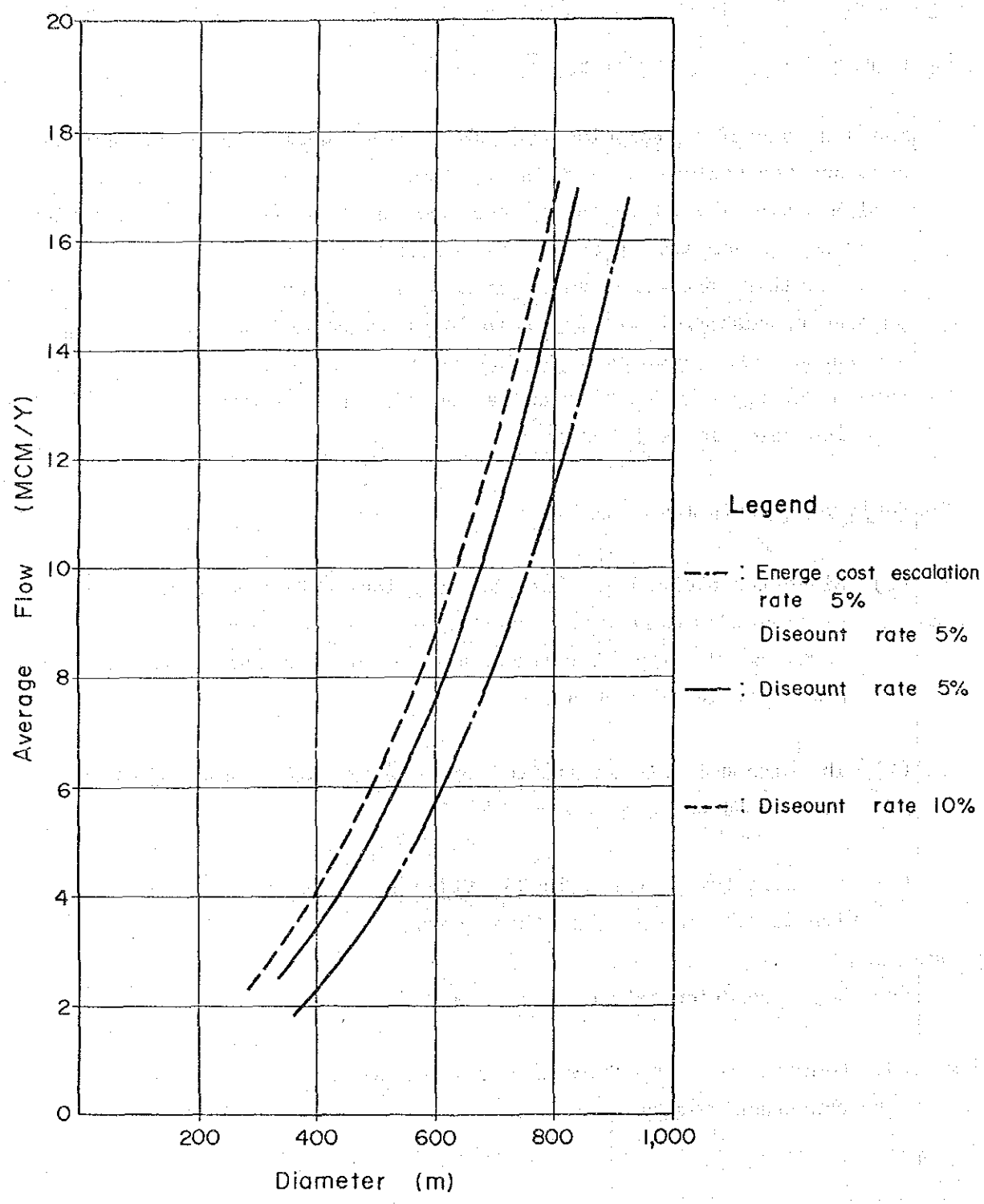
(1) Since the planned pipeline is very long, the construction costs of pump stations become negligibly small. The construction costs of the pipeline (contingency cost excluded) is used as same cost in this study.

(2) The discount rate is assumed to be 5% or 10%. The project life is assumed to be 30 years.

(3) The electricity charge is 23 fills/KWH. Pumping up rate at peak time is 1.3 times higher than average.

(4) The escalation rate of energy cost is assumed to be 5%.

(5) Operation and maintenance cost assumed to be 2% of the construction cost.



Annex F2104-2

Optimum Pipeline Diameter

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

Annex F2107 TYPE OF PIPE

1. General

There are three types of pipe which could be used; steel pipe, ductile iron pipe and prestressed concrete pipe. However, since prestressed concrete pipe has never been used in Jordan, it is not considered for this Project. So, steel pipe and ductile iron pipe are compared below.

2. Steel pipe

(1) Steel pipe can be resist to high hydraulic pressure if an adequate wall thickness is chosen. Joints are generally made by welding. This provides a benefit in that protective supports are not needed at fittings as the welded joint is highly resistant to axial thrust of the pipe.

(2) Steel pipes, however, are highly susceptible to corrosion from both inside and out. However, if adequate coating and lining are provided, durability is sufficient.

3. Ductile iron pipe

(1) The wall thickness of this pipe is fixed to standard and it is not especially resistant to very high hydraulic pressure. However, if the value of the hydrostatic head is lower than 150 m, no problem will occur.

(2) Ductile iron pipe is more resistant to corrosion than steel pipe and, since generally exterior coating and internal lining of cement mortar are done to the pipe, there will be no durability problem.

(3) Mechanical joints are generally used for this type of pipe and are easy to install. However, since this type of joint is not resistant to axial thrust, protective supports are required at each

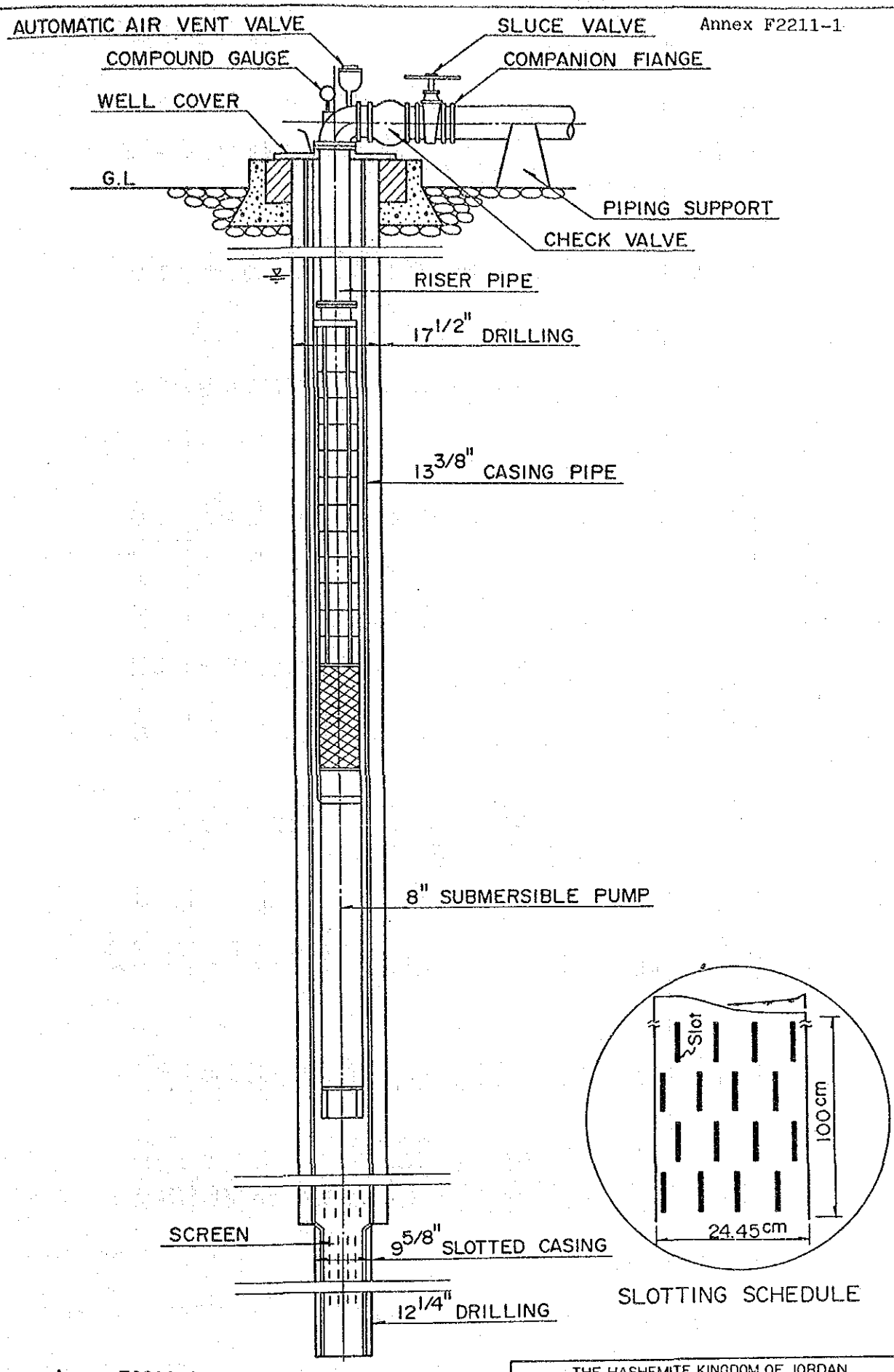
fitting.

4. Selection of type of pipe

(1) For this Project, both steel pipe and ductile iron pipe are usable. From the point of view of economy, a diameter of ϕ 600 mm - ϕ 700 mm is considered to be the baundary. If the diameter of pipe is larger than this, steel pipe should be used and, if the diameter is small than this, ductile iron pipe is considered more economical.

(2) Considering that ductile iron pipe is more easily installed and needs no coating or lining at joints executed in the field, ductile iron pipe is to be used in this Project.

(3) Since a fluctuating economy will influence the cost of pipe, this topic should be reconsidered at the time a detailed design is created.



Annex F2211-1
Typical Example of Well Design

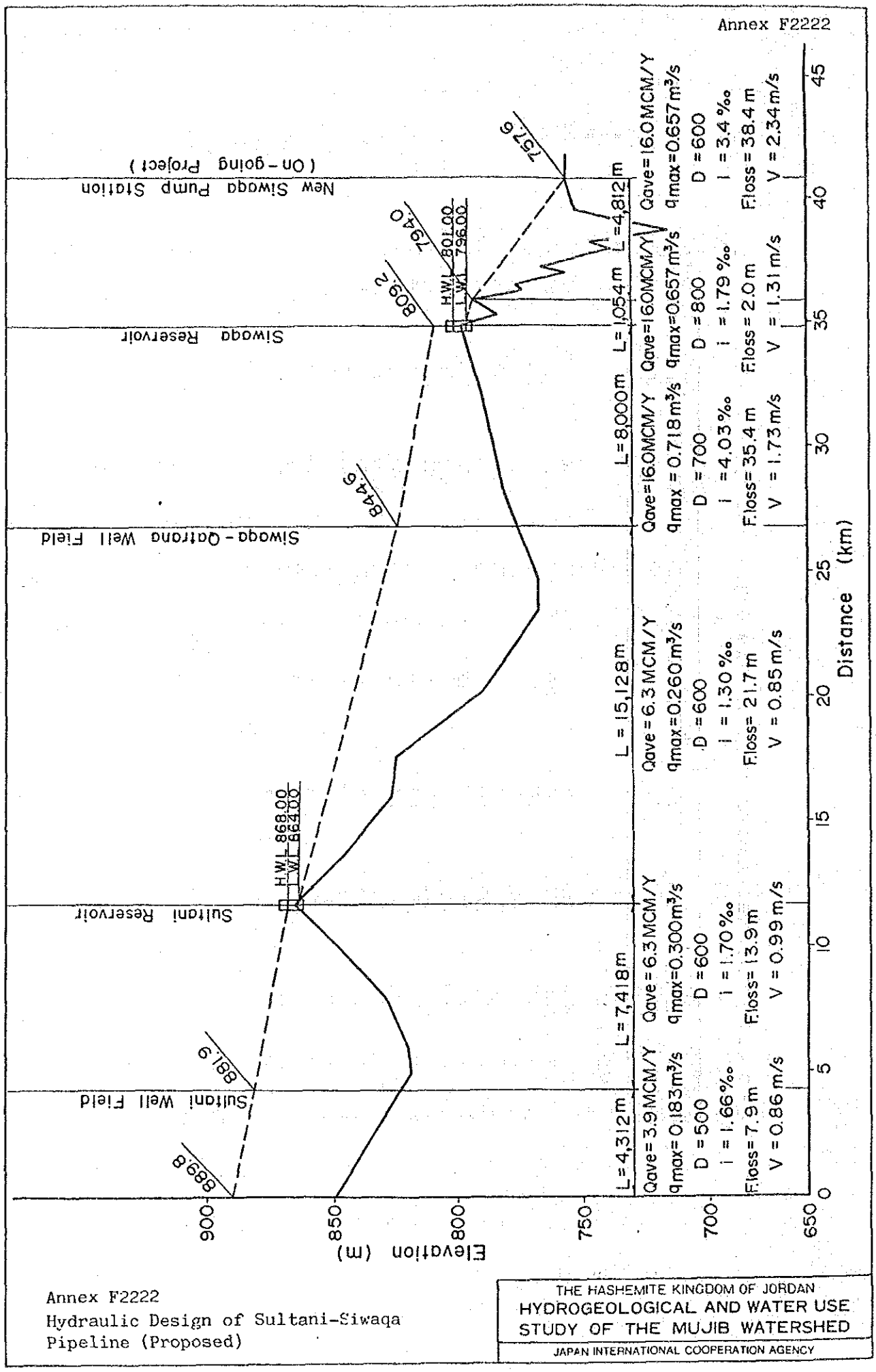
THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

Annex F2211-2 WELL ARRANGEMENT OF SULTANI-SIWAQA PIPELINE PROJECT (1/2)

Well No.	Ground Elevation (m)	Well Depth (m)	Drilling Dia. ϕ=17-1/2" (m)	Drilling Dia. ϕ=12-1/4" (m)	Casing Dia. ϕ=13-3/8" (m)	Casing Dia. ϕ=9-5/8" (m)	Pump Depth (m)	Pumping Rate (m^3/h)
(Siwaqa - Qatrana Well Field)								
SQ-1	765	265	175	90	175	90	150	90
SQ-2	755	275	175	100	175	100	150	90
SQ-3	762	260	170	90	170	90	150	70
SQ-4	775	275	185	90	185	90	170	70
SQ-5	787	280	195	85	195	85	170	70
SQ-6	778	275	195	80	195	80	170	70
SQ-7	790	280	195	85	195	85	170	70
SQ-8	780	275	195	80	195	80	170	70
SQ-9	781	275	185	90	185	90	160	70
SQ-10	783	275	195	80	195	80	170	90
SQ-11	782	275	185	90	185	90	160	90
SQ-12	784	275	195	80	195	80	170	70
SQ-13	789	280	195	85	195	85	170	90
SQ-14	789	280	195	85	195	85	170	70
SQ-15	770	270	195	75	195	75	170	90
SQ-16	780	275	195	80	195	80	170	70
SQ-17	779	275	200	75	200	75	170	70
SQ-18	760	255	175	80	175	80	150	90
SQ-19	775	275	200	75	200	75	170	70
SQ-20	770	275	195	80	195	80	175	90
SQ-21	755	265	190	75	190	75	160	90
		(5,735)						

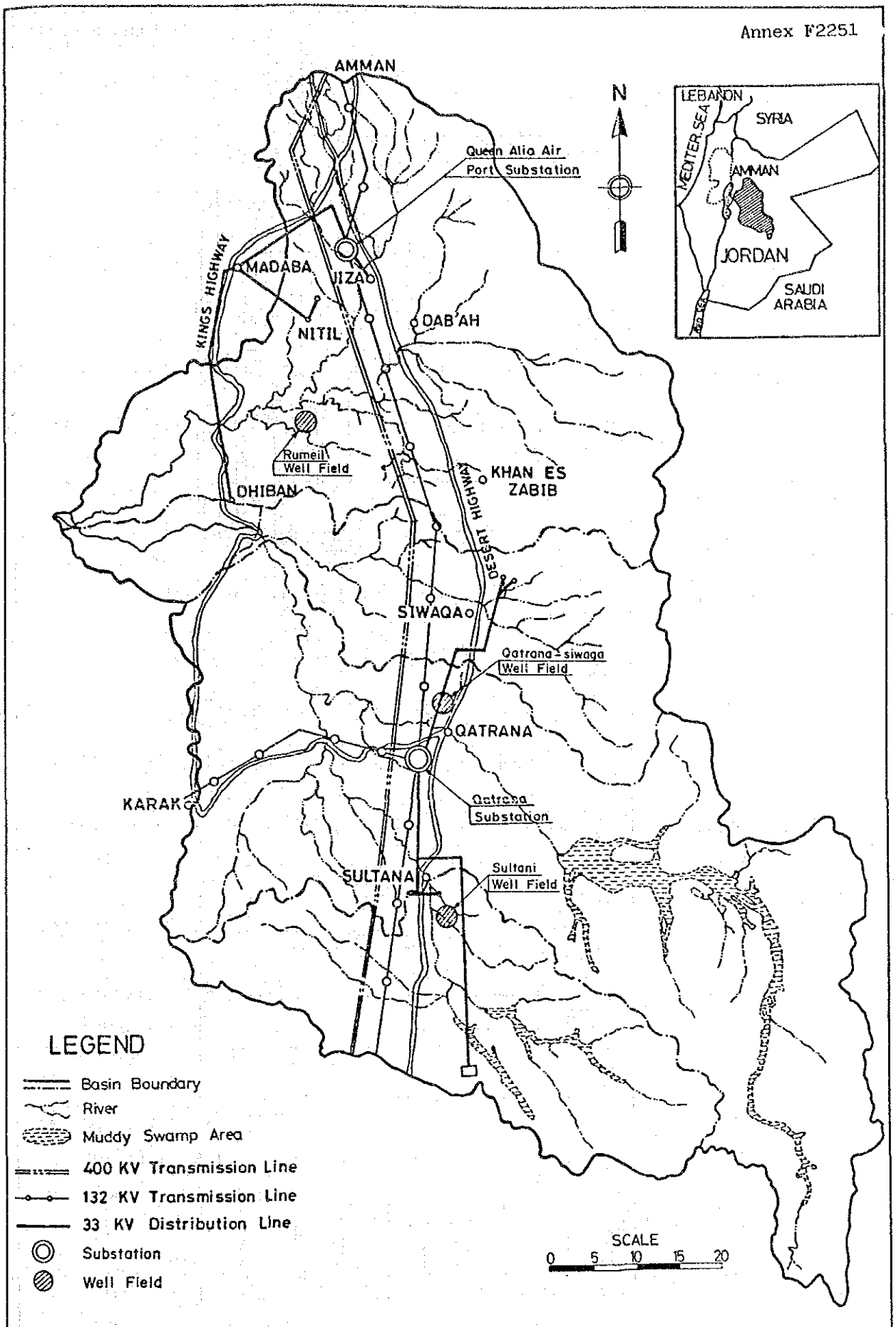
Annex F2211-2 WELL ARRANGEMENT OF SULTANI-SIWAQA PIPELINE PROJECT (2/2)

Ground Well No.	Elevation (m)	Well Depth (m)	Drilling Dia. ϕ=17-1/2" (m)	Drilling Dia. ϕ=12-1/4" (m)	Casing Dia. ϕ=13-3/8" (m)	Casing Dia. ϕ=9-5/8" (m)	Pump Depth (m)	Pumping Rate (m^3/h)
(Sultani Well Field)								
ST-1	847	285	175	110	175	110	150	60
ST-2	837	275	175	100	175	100	150	60
ST-3	823	265	175	90	175	90	150	60
ST-4	835	275	175	100	175	100	150	60
ST-5	838	275	175	100	175	100	150	60
ST-6	830	270	175	95	175	95	150	60
ST-7	827	270	175	95	175	95	150	60
ST-8	832	275	175	100	175	100	150	60
ST-9	820	275	175	100	175	100	150	60
ST-10	822	275	175	100	175	100	150	60
ST-11	829	275	175	100	175	100	150	60
ST-12	828	275	175	100	175	100	150	60
ST-13	823	265	175	90	175	90	150	60
ST-14	822	275	175	100	175	100	150	60
ST-15	826	275	175	100	175	100	150	60
ST-16	838	285	175	110	175	110	150	60
ST-17	822	270	175	95	175	95	150	60
ST-18	838	285	175	110	175	110	150	60
		(4,945)						



Annex F2222
Hydraulic Design of Sultani-Siwaqa Pipeline (Proposed)

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY



Annex F2251
Existing Transmission and Distribution Lines

THE HASHEMITE KINGDOM OF JORDAN
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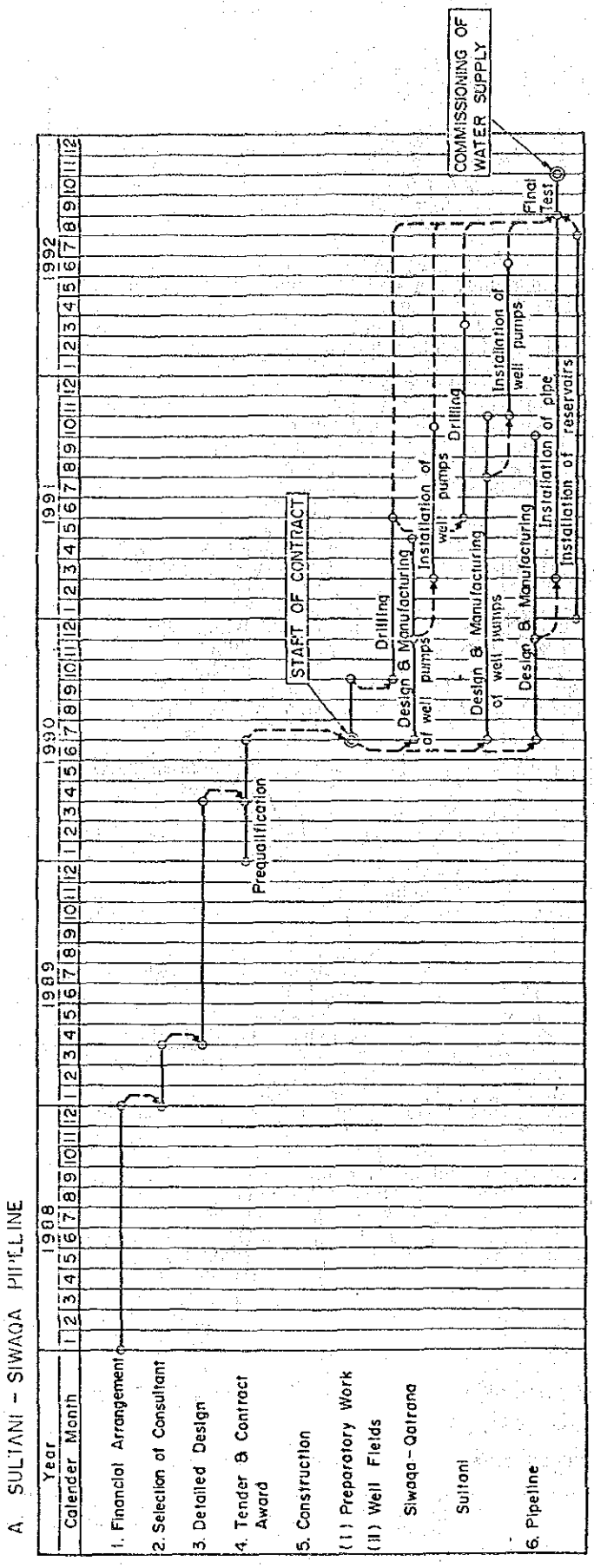
JAPAN INTERNATIONAL COOPERATION AGENCY



Annex F2321
Implementation Program for
Sultani-Siwaqa Pipeline Project

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

Annex F2322 WORK QUANTITY OF MAJOR WORKS FOR SULTANI-SIWAQA PIPELINE PROJECT (1/2)

Work Items	Unit	Quantity Year 1990	1991	1992
(1) Main pipeline				
Trench excavation	m3	-	87,500	45,900
Backfilling (sand)	m3	-	37,500	18,500
- ditto - (earth)	m3	-	42,600	22,000
Ductile iron pipe ϕ 500 mm	ton	-	450	-
- ditto - ϕ 600 mm	ton	-	3,150	560
- ditto - ϕ 700 mm	ton	-	-	1,390
- ditto - ϕ 800 mm	ton	-	-	240
(2) Sultani Reservoir				
Open excavation	m3	-	2,400	-
Backfilling (earth)	m3	-	1,500	-
Concrete (28 = 210 kg/cm2)	m3	-	1,620	-
Steel bar (SD 30)	ton	-	230	-
(3) Siwaqa Reservoir				
Open excavation	m3	-	2,600	-
Backfilling (earth)	m3	-	-	2,200
Concrete (28 = 210 kg/cm2)	m3	-	3,620	3,620
Steel bar (SD 30)	m3	-	510	510
(4) Sultani Well Field				
Drilling ϕ 17-1/2 inch	unit	5	13	-
Installationof pumps ϕ 150mm x 37Kw	unit	-	1	-
- ditto - ϕ 150mm x 45Kw	unit	-	10	-
- ditto - ϕ 150mm x 55Kw	unit	-	7	-
Pipeline				
Trench excavation	m3	-	40,200	-

Annex F2322 WORK QUANTITY OF MAJOR WORKS FOR SULTANI-SIWAQA PIPELINE PROJECT (2/2)

Work Items	Unit	Quantity Year 1990	1991	1992
Backfilling (sand)	m3	-	19,300	-
- ditto - (earth)	m3	-	26,800	-
Ductile iron pipe ϕ 150 mm	ton	-	420	-
- ditto - ϕ 200 mm	ton	-	100	-
Distribution line	km	-	35	-
Pole mounting transformer	unit	-	18	-
(5) Qatrana Well Field				
Drilling / 17-1/2 inch	unit	6	15	-
Installation of pumps ϕ 150mm x 45Kw	unit		4	-
- ditto - ϕ 150mm x 55Kw	unit	-	13	-
- ditto - ϕ 150mm x 75Kw	unit	-	4	-
Pipeline				
Trench excavation	m3	-	-	55,400
Backfilling (earth)	m3	-	-	18,500
Backfilling (earth)	m3	-	-	35,900
Ductile iron pipe ϕ 150 mm	ton	-	-	380
- ditto - ϕ 200 mm	ton	-	-	180
- ditto - ϕ 300 mm	ton	-	-	250
- ditto - ϕ 400 mm	ton	-	-	50
Distribution line	km	-	60	-
Pole mounting transformer	unit	-	21	-

Annex F2341 MAJOR CONSTRUCTION EQUIPMENT AND PLANTS FOR SULTANI-SIWAQA PIPELINE PROJECT

Equipment	Capacity	Unit	Quantity
Back-hoe	0.6 m^3	unit	20
Breaker	1,300 kg	unit	11
Hand rammer	60 - 80 kg	unit	35
Hydraulic crane	4.8 - 4.9 t	unit	10
- ditto -	15 - 16 t	unit	2
Crawler crane	20 - 22 t	unit	2
Portable concrete mixer	0.2 m^3	unit	8
Concrete pumping car	65 - 85 m^3	unit	2
Maintenance car	6 t	unit	9
Concrete mixing plant	0.75 m^3 - 1 m^3	unit	2
Bulldozer	21 t	unit	2
- ditto -	8 t	unit	7

Annex F2421 INVESTMENT COST FOR SULTANI-SIWAQA PIPELINE PROJECT

(Unit : JD1,000)

Item No. Description	Total	Foreign Currency	Local Currency
(1) Land Acquisition	43	0	43
(2) Direct Cost			
a. Preparatory Works	1,116	875	241
b. Main Pipeline	4,691	4,026	665
c. Reservoir (3,600 m3)	286	179	107
d. Reservoir (9,100 m3)	798	411	387
e. Sultani Well Field			
- Drilling	985	740	245
- Pumps and Electrical Facilities	1,282	1,026	256
- Collecting Pipes	716	540	176
f. Siwaqa-Qatrana Well Field			
- Drilling	1,120	839	281
- Pumps and Electrical Facilities	1,486	1,188	298
- Collecting Pipes	1,081	834	247
(3) Sub-total (2)	13,561	10,658	2,903
(4) Engineering Services and Administration ((3) x 10%)	1,356	664	692
(5) Sub-total ((3) + (4))	14,917	11,322	3,595
(6) Physical Contingency ((5) x 15%)	2,238	1,698	540
(7) Sub-total ((1) + (5) + (6))	17,198	13,020	4,178
(8) Price Contingency	2,064	1,405	659
(9) Grand Total ((7) + (8))	19,262	14,425	4,837

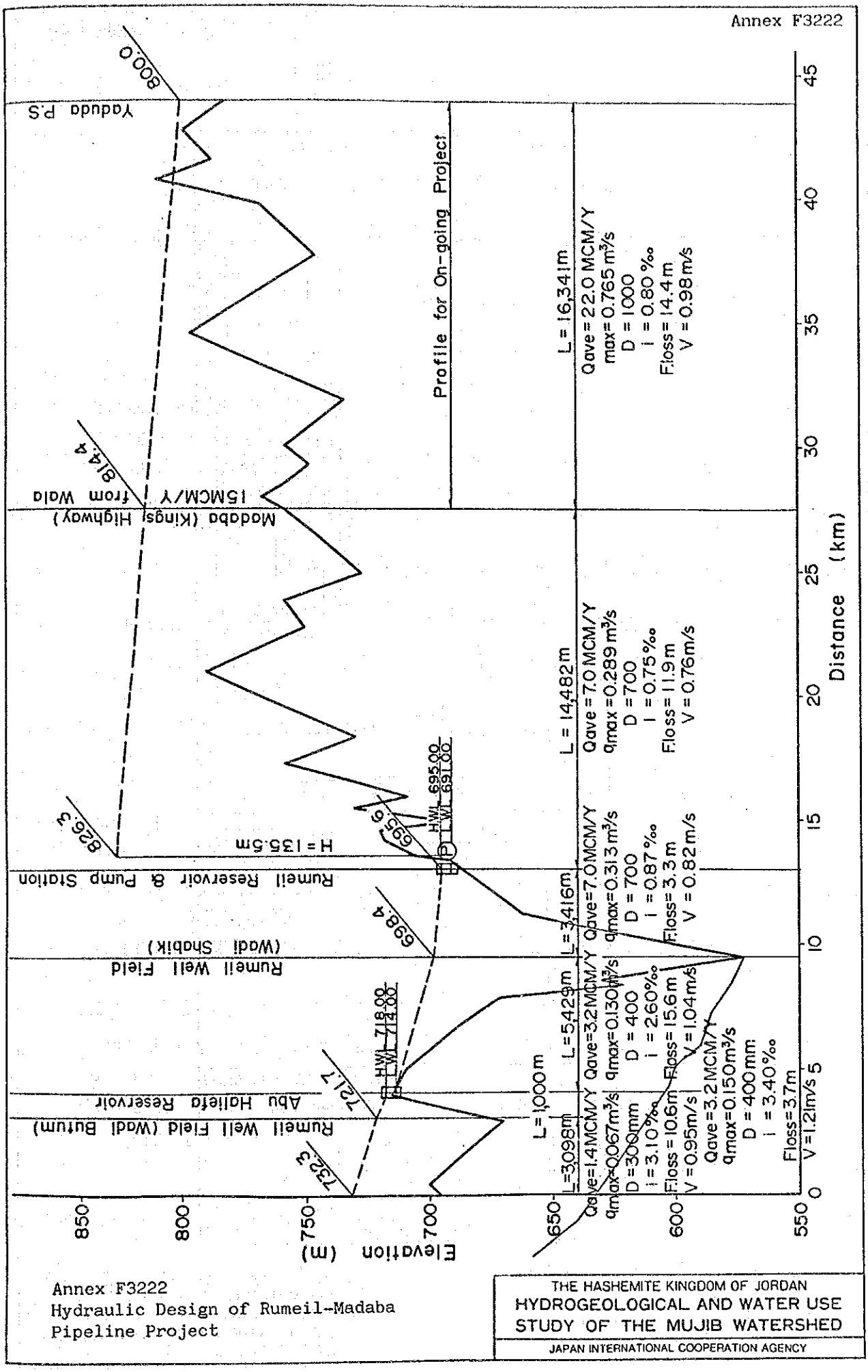
Annex F2431 DISBURSEMENT SCHEDULE OF INVESTMENT COST FOR SULTANI-SIWAQA PIPELINE PROJECT

(Unit : JD1,000)

Item No.	Description	Summary			1989		1990		1991		1992	
		Total	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency
(1)	Land Acquisition	43	0	43	0	0	0	43	0	0	0	0
(2)	Direct Cost											
	a. Preparaty Works	1,116	875	241	0	0	875	241	0	0	0	0
	b. Main Pipeline	4,691	4,026	665	0	0	0	0	2,617	432	1,409	233
	c. Reservoir (3,600 m^3)	286	179	107	0	0	0	0	179	107	0	0
	d. Reservoir (9,100 m^3)	798	411	387	0	0	0	0	206	194	205	193
	e. Sultani Well Field											
	- Drilling	985	740	245	0	0	204	68	536	177	0	0
	- Pump and Electrical Facilities	1,282	1,026	256	0	0	0	0	1,026	256	0	0
	- Collecting Pipes	716	540	176	0	0	0	0	540	176	0	0
	f. Siwaqa-Qatrana Well Field											
	- Drilling	1,120	839	281	0	0	231	78	608	203	0	0
	- Pumps and Electrical Facilities	1,486	1,188	298	0	0	0	0	1,188	298	0	0
	- Collecting Pipes	1,081	834	247	0	0	0	0	0	0	834	247
(3)	Sub-total (2)	13,561	10,658	2,903	0	0	1,310	387	6,900	1,843	2,448	673
(4)	Engineering Services and Administration ((3) x 10%)	1,356	664	692	228	257	19	24	280	299	137	112
(5)	Sub-total ((3)+(4))	14,917	11,322	3,595	228	257	1,329	411	7,180	2,142	2,585	785
(6)	Physical Contingency ((5) x 15%)	2,238	1,698	540	34	39	199	62	1,077	321	388	118
(7)	Sub-total ((1)+(5)+(6))	17,198	13,020	4,178	262	296	1,528	516	8,257	2,463	2,973	903
(8)	Price Contingency	2,064	1,405	659	15	28	107	65	867	392	416	175
(9)	Grand Total ((7)+(8))	19,262	14,425	4,837	277	324	1,635	581	9,124	2,855	3,389	1,078

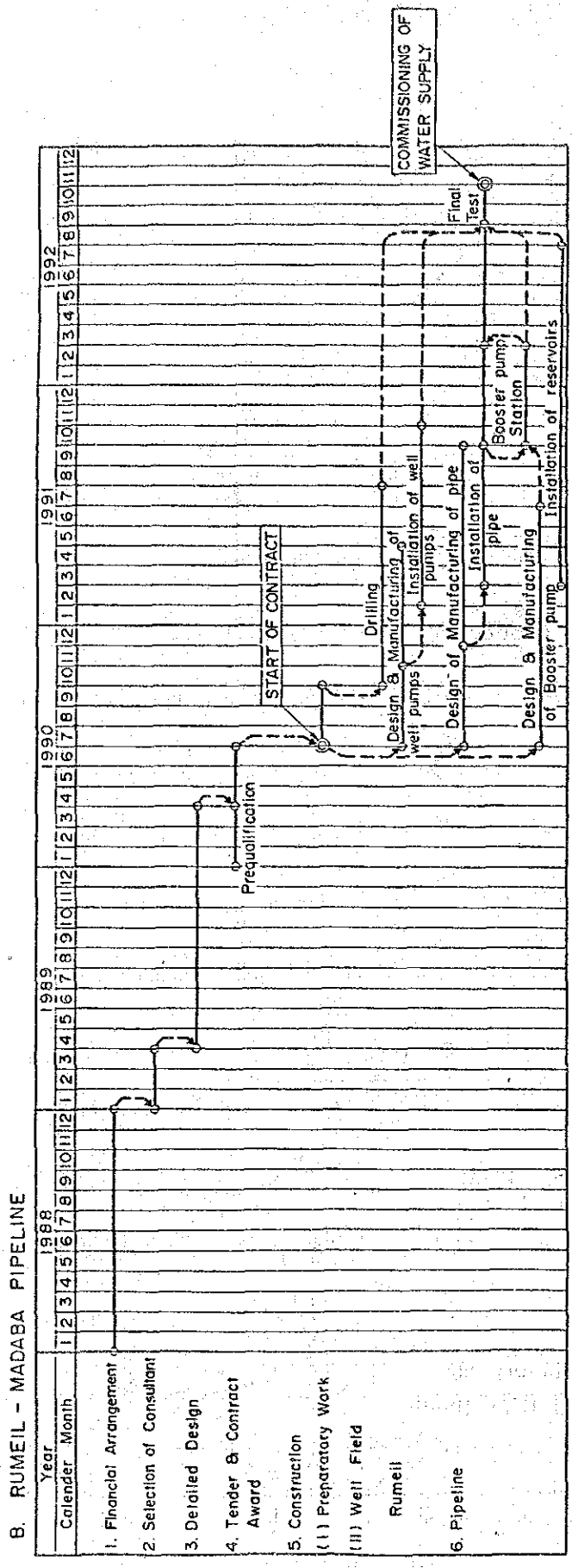
Annex F3211 WELL ARRANGEMENT OF RUMEIL-MADABA PIPELINE PROJECT

Well No.	Ground Elevation (m)	Well Depth (m)	Drilling Dia. ø=17-1/2" (m)	Drilling Dia. ø=12-1/4" (m)	Casing Dia. ø=13-3/8" (m)	Casing Dia. ø=9-5/8" (m)	Pump Depth (m)	Pumping Rate (m^3/h)
RM-1	697	330	220	110	220	110	200	60
RM-2	683	320	220	100	220	100	195	60
RM-3	706	335	230	105	230	105	210	60
RM-4	678	320	210	110	210	110	190	60
RM-5	691	330	235	95	235	95	215	60
RM-6	680	320	225	95	225	95	200	60
RM-7	675	315	205	110	205	110	185	60
RM-8	670	310	205	105	205	105	180	60
RM-9	692	330	225	105	225	105	200	60
RM-10	655	300	205	95	205	95	175	60
RM-11	675	330	190	140	190	140	170	60
RM-12	640	300	180	120	180	120	155	60
RM-13	620	280	170	110	170	110	145	60
RM-14	632	290	170	120	170	120	150	60
RM-15	652	310	200	110	200	110	175	60
RM-16	615	280	160	120	160	120	140	60
RM-17	595	270	160	110	160	110	135	60
RM-18	580	260	150	110	150	110	125	60
RM-19	565	250	155	95	155	95	130	60
RM-21	583	270	160	110	160	110	135	60
		(4,050)						



Annex F3222
Hydraulic Design of Rumeil-Madaba Pipeline Project

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY



Annex F3321
Implementation Program for
Rumeil-Madaba Pipeline Project

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

Annex F3322 WORK QUANTITY OF MAJOR WORKS FOR RUMEIL-MADABA PIPELINE PROJECT (1/2)

Work Items	Unit	Quantity Year 1990	1991	1992
(1) Main pipeline				
Trench excavation	m3	-	43,400	44,400
Backfilling (sand)	m3	-	17,200	18,700
- ditto - (earth)	m3	-	23,200	21,000
Ductile iron pipe ϕ 300 mm	ton	-	160	-
- ditto - ϕ 400 mm	ton	-	470	-
- ditto - ϕ 700 mm	ton	-	940	2,170
(2) Abu Haliefa Reservoir				
Open excavation	m3	-	1,900	-
Backfilling (earth)	m3	-	1,250	-
Concrete (σ28 = 210 kg/cm2)	m3	-	920	-
Steel bar (SD 30)	ton	-	130	-
(3) Rumeil Reservoir				
Open excavation	m3	-	2,300	-
Backfilling (earth)	m3	-	-	2,400
Concrete (σ28 = 210 kg/cm2)	m3	-	930	930
Steel bar (SD 30)	m3	-	130	130
(4) Rumeil pump station				
House L 15.0m x B 12.0m x H 6.0m	m2	-	-	180
Booster pump ϕ 250mm x 260 KW	unit	-	-	4
Surge arrester tank 100 m3	unit	-	-	2
Overhead crane	unit	-	-	1

Annex F3322 WORK QUANTITY OF MAJOR WORKS FOR RUMEIL-MADABA PIPELINE PROJECT (2/2)

Work Items	Unit	Quantity		
		Year		
		1990	1991	1992
(5) Rumeil Well Field				
Drilling ϕ 17-1/2 inch	unit	6	14	-
Installation of pumps ϕ 150mm x 55Kw	unit	-	9	-
- ditto - ϕ 150mm x 15Kw	unit	-	11	-
Pipeline				
Trench excavation	m^3	-	51,500	-
Backfilling (sand)	m^3	-	17,200	-
- ditto - (earth)	m^3	-	33,500	-
Ductile iron pipe ϕ 150 mm	ton	-	440	-
- ditto - ϕ 300 mm	ton	-	340	-
- ditto - ϕ 400 mm	ton	-	-	120
- ditto - ϕ 500 mm	ton	-	-	640
Distribution line	km	-	60	-
Pole mounting transformer	unit	-	20	-

Annex F3341 MAJOR CONSTRUCTION EQUIPMENT AND PLANTS FOR RUMEIL-MADABA PIPELINE PROJECT

Equipment	Capacity	Unit	Quantity
Back-hoe	0.6 m^3	unit	14
Breaker	1,300 kg	unit	8
Hand rammer	60 - 80 kg	unit	25
Hydraulic crane	4.8 - 4.9 t	unit	7
- ditto -	15 - 16 t	unit	1
Crawler crane	20 - 22 t	unit	1
Portable concrete mixer	0.2 m^3	unit	6
Concrete pumping car	65 - 85 m^3	unit	2
Maintenance car	6 t	unit	7
Concrete mixing plant	0.75 m^3 - 1 m^3	unit	2
Bulldozer	21 t	unit	2
- ditto -	8 t	unit	5

Annex F3421 INVESTMENT COST FOR RUMEIL-MADABA PIPELINE PROJECT

(Unit : JD1,000)

Item No. Description	Total	Foreign Currency	Local Currency
(1) Land Acquisition	27	0	27
(2) Direct Cost			
a. Preparatory Works	835	665	170
b. Main Pipeline	3,079	2,633	446
c. Reservoir (1,800 m^3)	182	116	66
d. Reservoir (4,000 m^3)	318	197	121
e. Rumeil Well Field			
- Drilling	1,252	939	313
- Pumps and Electrical Facilities	1,977	1,581	396
- Collecting Pipes	1,703	1,366	337
f. Rumeil Booster Pump Station and Pump Equipment	917	708	209
(3) Sub-total (2)	10,263	8,205	2,058
(4) Engineering Services and Administration ((3) x 10%)	1,026	503	523
(5) Sub-total (3) + (4)	11,289	8,708	2,581
(6) Physical Contingency ((5) x 15%)	1,693	1,306	387
(7) Sub-total ((1)+(5)+(6))	13,009	10,014	2,995
(8) Price Contingency	1,612	1,129	483
(9) Grand Total ((7) + (8))	14,621	11,143	3,478

Annex F3431 DISBURSEMENT SCHEDULE OF INVESTMENT COST FOR RUMEIL-MADABA PIPELINE PROJECT

(Unit : JD1,000)

Item No. Description	Summary			1989		1990		1991		1992	
	Total	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency	Foreign Currency	Local Currency
(1) Land Acquisition	27	0	27	0	0	0	27	0	0	0	0
(2) Direct Cost											
a. Preparatory Works	835	665	170	0	0	665	170	0	0	0	0
b. Main Pipeline	3,079	2,633	446	0	0	0	0	1,184	200	1,449	246
c. Reservoir (1,800 m^3)	182	116	66	0	0	0	0	116	66	0	0
d. Reservoir (4,000 m^3)	318	197	121	0	0	0	0	138	84	59	37
e. Rumeil Well Field											
- Drilling	1,252	939	313	0	0	257	87	682	226	0	0
- Pumps and Electrical Facilities	1,977	1,581	396	0	0	0	0	1,581	396	0	0
- Collecting Pipes	1,703	1,366	337	0	0	0	0	615	152	751	185
f. Rumeil Booster Pump Station and Pump Equipment	917	708	209	0	0	0	0	0	0	708	209
(3) Sub-total (2)	10,263	8,205	2,058	0	0	922	257	4,316	1,124	2,967	677
(4) Engineering Services and Administration ((3) x 10%)	1,026	503	523	156	190	19	15	223	194	105	124
(5) Sub-total ((3)+(4))	11,289	8,708	2,581	156	190	941	272	4,539	1,318	3,072	801
(6) Physical Contingency ((5) x 15%)	1,693	1,306	387	23	28	141	41	681	198	461	120
(7) Sub-total ((1)+(5)+(6))	13,009	10,014	2,995	179	218	1,082	340	5,220	1,516	3,533	921
(8) Price Contingency	1,612	1,129	483	10	20	76	43	548	241	495	179
(9) Grand Total ((7)+(8))	14,621	11,143	3,478	189	238	1,158	383	5,768	1,757	4,028	1,100

Conditions for Estimating Economic Cost

In the present study, estimates of the economic cost of the project are made under the following assumptions:

1. Transfer payment

(1) Income tax of the employed such as engineers and laborers employed locally in the project is assumed at 10% of their income on average, taking into account the income tax law of Jordan.

(2) Goods and services imported from abroad for the project are assumed to be exempted from duty.

2. Opportunity Cost

(1) Economic wages of unskilled laborers employed locally are set to be 90% of the actual market wages in consideration of the unemployment situation in Jordan in recent years.

(2) Opportunity cost of land acquired for the construction of pipeline is assumed to be 20% of the estimated acquisition cost for the Sultani-Siwaqa pipeline and 50% for the Rumeil-Madaba pipeline, judging from the production situation of crops planted.

3. Standard conversion factor (SCF)

The tariff rates of main goods imported are within the range zero to 40%, and most of goods exported are the duty free, except some fruits and vegitables with the Government subsidies. In the present study, by assuming the import duty of 20% and the subsidy of 5% on average, SCF of 85% is assumed to be applied to equipment and materials of domestic procurement.

Annex F4201-2-1 ECONOMIC CONSTRUCTION COST OF SULTANI-SIWAQA PIPELINE PROJECT

Unit: JD1,000

Item	Total	1989	1990	1991	1992
1. Land Acquisition	9	0	9	0	0
2. Direct Construction Cost	13,041	0	1,627	8,411	3,003
3. Eng. Services & Administration	1,287	459	41	549	238
4. Physical Contingency (15%)	2,149	69	250	1,344	486
5. Total	16,486	528	1,927	10,304	3,727

Annex F4201-2-2 ECONOMIC CONSTRUCTION COST OF RUMEIL-MADABA PIPELINE PROJECT

Unit: 1,000 JD

Item	Total	1989	1990	1991	1992
1. Land Acquisition	14	0	14	0	0
2. Direct Construction Cost	9,892	0	1,132	5,237	3,523
3. Eng. Services & Administration	974	327	32	398	217
4. Physical Contingency (15%)	1,630	49	175	845	561
5. Total	12,510	376	1,353	6,480	4,301

Annex F4202-1 ECONOMIC BENEFIT AND COST FLOW OF SULTANI-SIWAQA PIPELINE PROJECT

[I] Unit: JD 1,000

Year in Order	Year	Construction Cost	OMR Cost			Total Cost	Benefit
			OM-cost	R-cost	Subtotal		
0	1988	-	-	-	-	-	-
1	1989	528	-	-	-	528	-
2	1990	1,927	-	-	-	1,927	-
3	1991	10,304	-	-	-	10,304	-
4	1992	3,727	-	-	-	3,727	-
5	1993	-	230	-	230	261	2,072
6	1994	-	230	-	230	261	2,134
7	1995	-	230	-	230	261	2,198
8	1996	-	230	-	230	261	2,264
9	1997	-	230	-	230	261	2,332
10	1998	-	230	-	230	261	2,402
11	1999	-	230	-	230	261	2,474
12	2000	-	230	1,344	1,574	1,574	2,548
13	2001	-	230	-	230	261	2,625
14	2002	-	230	-	230	261	2,703
15	2003	-	230	-	230	261	2,785
16	2004	-	230	-	230	261	2,868
17	2005	-	230	-	230	261	2,954
18	2006	-	230	-	230	261	3,043
19	2007	-	230	-	230	261	3,134
20	2008	-	230	-	230	261	3,228
21	2009	-	230	1,344	1,574	1,574	3,325
22	2010	-	230	672	902	902	3,425
23	2011	-	230	-	230	230	3,527
24	2012	-	230	-	230	230	3,633
25	2013	-	230	-	230	230	3,742
26	2014	-	230	-	230	230	3,855
27	2015	-	230	-	230	230	3,970
28	2016	-	230	-	230	230	4,089
29	2017	-	230	-	230	230	4,212
30	2018	-	230	-	230	230	4,338

Annex F4202-2 ECONOMIC BENEFIT AND COST FLOW OF RUMEIL-MADABA PIPELINE PROJECT

[II] Unit: JD 1,000

Year in Order	Year	Construction Cost	OMR Cost			Total	Benefit
			OM-cost	R-cost	Subtotal		
0	1988	-	-	-	-	-	-
1	1989	376	-	-	-	376	-
2	1990	1,353	-	-	-	1,353	-
3	1991	6,480	-	-	-	6,480	-
4	1992	4,301	-	-	-	4,301	-
5	1993	-	174	-	174	174	1,116
6	1994	-	174	-	174	174	1,149
7	1995	-	174	-	174	174	1,184
8	1996	-	174	-	174	174	1,219
9	1997	-	174	-	174	174	1,256
10	1998	-	174	-	174	174	1,294
11	1999	-	174	-	174	174	1,333
12	2000	-	174	835	1,009	1,009	1,373
13	2001	-	174	-	174	174	1,414
14	2002	-	174	-	174	174	1,456
15	2003	-	174	-	174	174	1,500
16	2004	-	174	-	174	174	1,545
17	2005	-	174	749	923	923	1,591
18	2006	-	174	-	174	174	1,639
19	2007	-	174	-	174	174	1,688
20	2008	-	174	-	174	174	1,739
21	2009	-	174	835	1,009	1,009	1,791
22	2010	-	174	605	779	779	1,845
23	2011	-	174	-	174	174	1,900
24	2012	-	174	-	174	174	1,957
25	2013	-	174	-	174	174	2,016
26	2014	-	174	-	174	174	2,076
27	2015	-	174	-	174	174	2,138
28	2016	-	174	-	174	174	2,203
29	2017	-	174	-	174	174	2,269
30	2018	-	174	-	174	174	2,337

Annex F4202-3 ECONOMIC BENEFIT AND COST FLOW OF SULTANI-SIWAQA AND RUMEIL-MADABA PIPELINES PROJECT

[III] Unit : JD 1,000

Year in Order	Year	Construction Cost	OMR Cost			Total Cost	Benefit
			OM-cost	R-cost	Subtotal		
0	1988	-	-	-	-	-	-
1	1989	904	-	-	-	904	-
2	1990	3,280	-	-	-	3,280	-
3	1991	16,784	-	-	-	16,784	-
4	1992	8,028	-	-	8,028	8,028	-
5	1993	-	404	-	404	404	3,188
6	1994	-	404	-	404	404	3,283
7	1995	-	404	-	404	404	3,382
8	1996	-	404	-	444	404	3,483
9	1997	-	404	-	404	404	3,588
10	1998	-	404	-	404	404	3,696
11	1999	-	404	-	404	404	3,807
12	2000	-	404	2,179	2,858	2,583	3,921
13	2001	-	404	-	404	404	4,039
14	2002	-	404	-	404	404	4,159
15	2003	-	404	-	404	404	4,285
16	2004	-	404	-	404	404	4,413
17	2005	-	404	749	1,153	1,153	4,545
18	2006	-	404	-	404	404	4,682
19	2007	-	404	-	404	404	4,822
20	2008	-	404	-	404	404	4,967
21	2009	-	404	2,179	2,584	2,583	5,116
22	2010	-	404	1,277	1,681	1,681	5,270
23	2011	-	404	-	404	404	5,427
24	2012	-	404	-	404	404	5,590
25	2013	-	404	-	404	404	5,758
26	2014	-	404	-	404	404	5,931
27	2015	-	404	-	404	404	6,108
28	2016	-	404	-	404	404	6,292
29	2017	-	404	-	404	404	6,481
30	2018	-	404	-	404	404	6,675

Annex F5102-1 CASH FLOW STATEMENT

(Sultani-Siwaqa Pipeline)

(I) Unit : JD 1,000

Year in Order	Year	Capital Cost		Loan Payment (F.C.)		Loan Payment (L.C.)		OMR Cost	Total	Const. Fund		Revenue	Total	Surplus	Accumulated Surplus	Year
		F.C.	L.C.	Interest	Capital	Interest	Capital			F.C.	L.C.					
1	1989	277	324	-	-	-	-	-	601	277	324	-	601	0	0	1989
2	1990	1,635	581	12	-	19	-	-	2,247	1,635	581	-	2,216	-31	-31	1990
3	1991	9,124	2,855	86	-	54	-	-	12,119	9,124	2,855	-	11,979	-140	-171	1991
4	1992	3,389	1,078	497	-	226	-	-	5,190	3,389	1,078	-	4,467	-723	-894	1992
5	1993	-	-	649	-	290	302	271	1,512	-	-	1,567	1,567	55	-839	1993
6	1994	-	-	649	-	272	302	271	1,494	-	-	1,614	1,614	120	-719	1994
7	1995	-	-	649	-	254	302	271	1,476	-	-	1,662	1,662	186	-533	1995
8	1996	-	-	649	802	236	302	271	2,260	-	-	1,712	1,712	-548	-1,081	1996
9	1997	-	-	613	802	218	302	271	2,206	-	-	1,764	1,764	-442	-1,523	1997
10	1998	-	-	577	802	200	302	271	2,152	-	-	1,817	1,817	-335	-1,858	1998
11	1999	-	-	541	802	181	302	271	2,097	-	-	1,871	1,871	-226	-2,084	1999
12	2000	-	-	505	802	163	302	1,671	2,641	-	-	1,927	1,927	-714	-2,798	2000
13	2001	-	-	469	802	145	302	271	1,989	-	-	1,985	1,985	-4	2,802	2001
14	2002	-	-	433	802	127	302	271	1,935	-	-	2,045	2,045	110	-2,692	2002
15	2003	-	-	397	802	109	302	271	1,881	-	-	2,106	2,106	225	-2,467	2003
16	2004	-	-	361	802	91	302	271	1,827	-	-	2,169	2,169	342	-2,125	2004
17	2005	-	-	325	802	73	302	271	1,773	-	-	2,234	2,234	461	-1,664	2005
18	2006	-	-	288	802	54	302	271	1,717	-	-	2,301	2,301	584	-1,080	2006
19	2007	-	-	252	802	36	302	271	1,663	-	-	2,370	2,370	707	-373	2007
20	2008	-	-	216	802	18	302	271	1,609	-	-	2,441	2,441	832	459	2008
21	2009	-	-	180	802	-	-	1,671	2,653	-	-	2,515	2,515	-138	321	2009
22	2010	-	-	144	802	-	-	971	1,917	-	-	2,590	2,590	673	994	2010
23	2011	-	-	108	802	-	-	271	1,181	-	-	2,668	2,668	1,487	2,481	2011
24	2012	-	-	72	802	-	-	271	1,145	-	-	2,748	2,748	1,603	4,084	2012
25	2013	-	-	36	802	-	-	271	1,109	-	-	2,830	2,830	1,721	5,805	2013
26	2014	-	-	-	-	-	-	271	271	-	-	2,915	2,915	2,644	8,449	2014
27	2015	-	-	-	-	-	-	271	271	-	-	3,003	3,003	2,732	11,181	2015
28	2016	-	-	-	-	-	-	271	271	-	-	3,093	3,093	2,822	14,003	2016
29	2017	-	-	-	-	-	-	271	271	-	-	3,185	3,185	2,914	16,917	2017
30	2018	-	-	-	-	-	-	271	271	-	-	3,281	3,281	3,010	19,927	2018

Annex F5102-2 CASH FLOW STATEMENT

(Rumeil-Madaba Pipeline)

(II) Unit : JD 1,000

Year in Order	Year	Capital Cost		Loan Payment (F.C.)		Loan Payment (L.C.)		O&M Cost	Total	Const. Fund		Revenue	Total	Surplus	Accumulated Surplus	Year
		F.C.	L.C.	Interest	Capital	Interest	Capital			F.C.	L.C.					
1	1989	189	238	-	-	-	-	-	427	189	238	-	427	0	0	1989
2	1990	1,158	383	9	-	14	-	-	1,564	1,158	383	-	1,541	-17	-17	1990
3	1991	5,768	1,757	61	-	37	-	-	7,623	5,768	1,757	-	7,525	-98	-115	1991
4	1992	4,028	1,100	320	-	143	-	-	5,591	4,028	1,100	-	5,128	-463	-578	1992
5	1993	-	-	501	-	209	217	205	1,132	-	-	685	685	-447	-1,025	1993
6	1994	-	-	501	-	196	217	205	1,119	-	-	706	706	-413	-1,438	1994
7	1995	-	-	501	-	183	217	205	1,106	-	-	727	727	-379	-1,817	1995
8	1996	-	-	501	619	170	217	205	1,712	-	-	749	749	-963	-2,780	1996
9	1997	-	-	474	619	157	217	205	1,467	-	-	771	771	-696	-3,476	1997
10	1998	-	-	446	619	143	217	205	1,630	-	-	794	794	-836	-4,312	1998
11	1999	-	-	418	619	130	217	205	1,589	-	-	818	818	-771	-5,083	1999
12	2000	-	-	390	619	117	217	1,075	2,418	-	-	842	842	-1,576	-6,659	2000
13	2001	-	-	362	619	104	217	205	1,507	-	-	868	868	-639	-7,298	2001
14	2002	-	-	334	619	91	217	205	1,466	-	-	894	894	-572	-7,870	2002
15	2003	-	-	306	619	78	217	205	1,425	-	-	921	921	-504	-8,374	2003
16	2004	-	-	279	619	65	217	205	1,385	-	-	948	948	-437	-8,811	2004
17	2005	-	-	251	619	52	217	985	2,124	-	-	977	977	-1,147	-9,958	2005
18	2006	-	-	223	619	39	217	205	1,098	-	-	1,006	1,006	-92	-10,050	2006
19	2007	-	-	195	619	26	217	205	1,262	-	-	1,036	1,036	-226	-10,276	2007
20	2008	-	-	167	619	13	217	205	1,221	-	-	1,067	1,067	-154	-10,430	2008
21	2009	-	-	139	619	-	-	1,075	1,833	-	-	1,099	1,099	-734	-11,164	2009
22	2010	-	-	111	619	-	-	835	1,565	-	-	1,132	1,132	-433	-11,597	2010
23	2011	-	-	84	619	-	-	205	908	-	-	1,166	1,166	258	-11,339	2011
24	2012	-	-	56	619	-	-	205	880	-	-	1,201	1,201	321	-11,018	2012
25	2013	-	-	28	619	-	-	205	852	-	-	1,237	1,237	385	-10,633	2013
26	2014	-	-	-	-	-	-	205	205	-	-	1,274	1,274	1,069	-9,564	2014
27	2015	-	-	-	-	-	-	205	205	-	-	1,313	1,313	1,108	-8,456	2015
28	2016	-	-	-	-	-	-	205	205	-	-	1,352	1,352	1,147	-7,309	2016
29	2017	-	-	-	-	-	-	205	205	-	-	1,392	1,392	1,187	-6,122	2017
30	2018	-	-	-	-	-	-	205	205	-	-	1,434	1,434	1,229	-4,893	2018

Annex F5102-3

CASH FLOW STATEMENT

(Sultani-Siwaqa and Rumeil-Madaba Pipeline)

(III)

Unit : JD 1,000

Year in Order	Year	Capital Cost		Loan Payment (F.C.)		Loan Payment (L.C.)		OMR Cost	Total	Const. Fund		Revenue	Total	Surplus	Accumulated Surplus	Year
		F.C.	L.C.	Interest	Capital	Interest	Capital			F.C.	L.C.					
1	1989	466	562	-	-	-	-	-	1,028	466	562	-	1,028	0	0	1989
2	1990	2,793	964	21	-	33	-	-	3,811	2,793	964	-	3,757	-48	-48	1990
3	1991	14,892	4,612	147	-	91	-	-	19,742	14,892	4,612	-	19,504	-238	-286	1991
4	1992	7,417	2,178	817	-	369	-	-	10,781	7,417	2,178	-	9,595	-1,186	-1,472	1992
5	1993	-	-	1,150	-	499	519	476	2,644	-	-	2,252	2,252	-392	-1,864	1993
6	1994	-	-	1,150	-	468	519	476	2,613	-	-	2,320	2,320	-293	-2,157	1994
7	1995	-	-	1,150	-	437	519	476	2,582	-	-	2,389	2,389	-193	-2,350	1995
8	1996	-	-	1,150	1,421	406	519	476	3,972	-	-	2,461	2,461	-1,511	-3,861	1996
9	1997	-	-	1,087	1,421	375	519	476	3,673	-	-	2,535	2,535	-1,138	-4,999	1997
10	1998	-	-	1,023	1,421	343	519	476	3,782	-	-	2,611	2,611	-1,171	-6,170	1998
11	1999	-	-	959	1,421	311	519	476	3,686	-	-	2,689	2,689	-997	-7,167	1999
12	2000	-	-	895	1,421	280	519	2,746	5,059	-	-	2,769	2,769	-2,290	-9,457	2000
13	2001	-	-	831	1,421	249	519	476	3,496	-	-	2,853	2,853	-643	-10,100	2001
14	2002	-	-	767	1,421	218	519	476	3,401	-	-	2,939	2,939	-462	-10,562	2002
15	2003	-	-	703	1,421	187	519	476	3,306	-	-	3,027	3,027	-279	-10,841	2003
16	2004	-	-	640	1,421	156	519	476	3,212	-	-	3,117	3,117	-95	-10,936	2004
17	2005	-	-	576	1,421	125	519	1,256	3,897	-	-	3,211	3,211	-686	-11,622	2005
18	2006	-	-	511	1,421	93	519	426	2,815	-	-	3,307	3,307	492	-11,130	2006
19	2007	-	-	447	1,421	62	519	476	2,925	-	-	3,406	3,406	481	-10,649	2007
20	2008	-	-	383	1,421	31	519	476	2,830	-	-	3,508	3,508	678	-9,971	2008
21	2009	-	-	319	1,421	-	-	2,746	4,486	-	-	3,614	3,614	-872	-10,843	2009
22	2010	-	-	255	1,421	-	-	1,806	3,482	-	-	3,722	3,722	240	-10,603	2010
23	2011	-	-	192	1,421	-	-	476	2,089	-	-	3,834	3,834	1,745	-8,858	2001
24	2012	-	-	128	1,421	-	-	476	2,025	-	-	3,949	3,949	1,924	-6,934	2012
25	2013	-	-	64	1,421	-	-	476	1,961	-	-	4,067	4,067	2,106	-4,828	2013
26	2014	-	-	-	-	-	-	476	476	-	-	4,189	4,189	3,713	-1,115	2014
27	2015	-	-	-	-	-	-	476	476	-	-	4,316	4,316	3,840	2,725	2015
28	2016	-	-	-	-	-	-	476	476	-	-	4,445	4,445	3,969	6,694	2016
29	2017	-	-	-	-	-	-	476	476	-	-	4,577	4,577	4,101	10,795	2017
30	2018	-	-	-	-	-	-	476	476	9	9	4,715	4,715	4,239	15,034	2018

Annex F5102-3

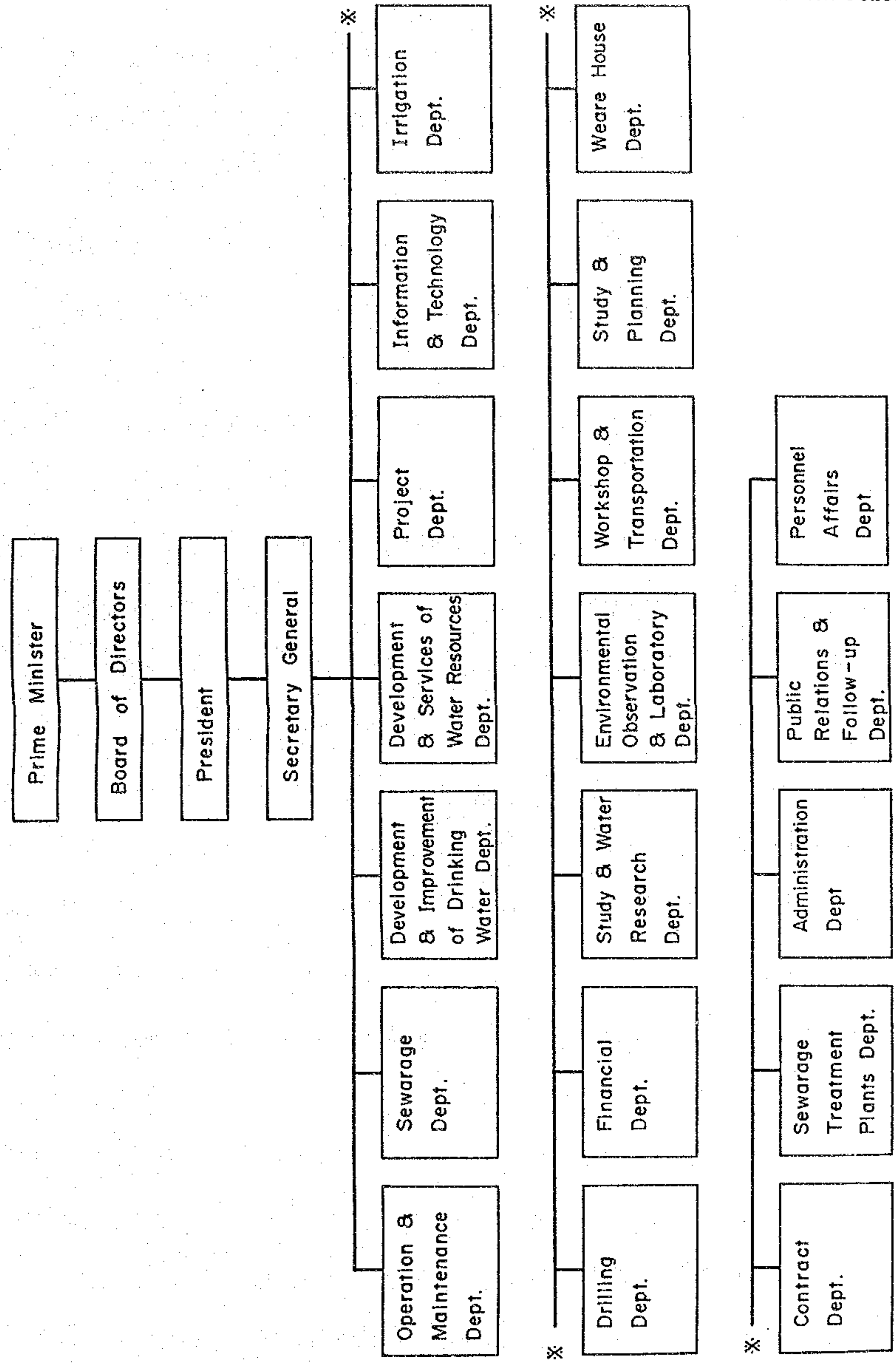
Annex F201 WATER TARIFF
FOR
METERED RETAIL CONSUMPTION PER MONTH

(1) Amman Governorate

m^3	JD per m^3
1- 20	0.120
21- 40	0.200
41-100	0.400
Over 100	0.500

(2) Outside Amman Governorate

1- 5	0.080
6- 15	0.096
16- 25	0.300
Over 25	0.400

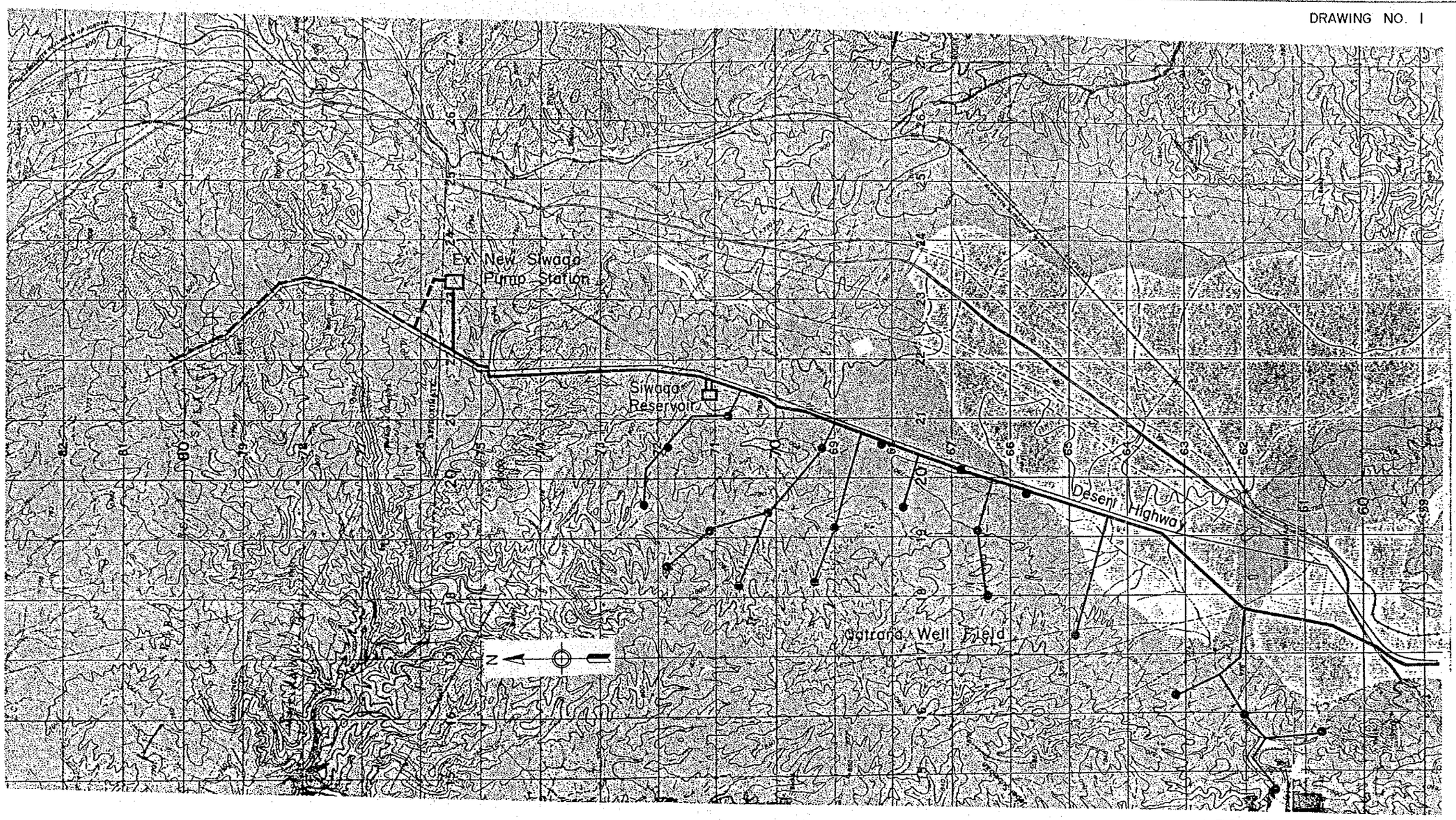


Annex F6103
Organization Chart of Water Authority of Jordan (Tentative)

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

DRAWING

DRAWING NO. I



SCALE

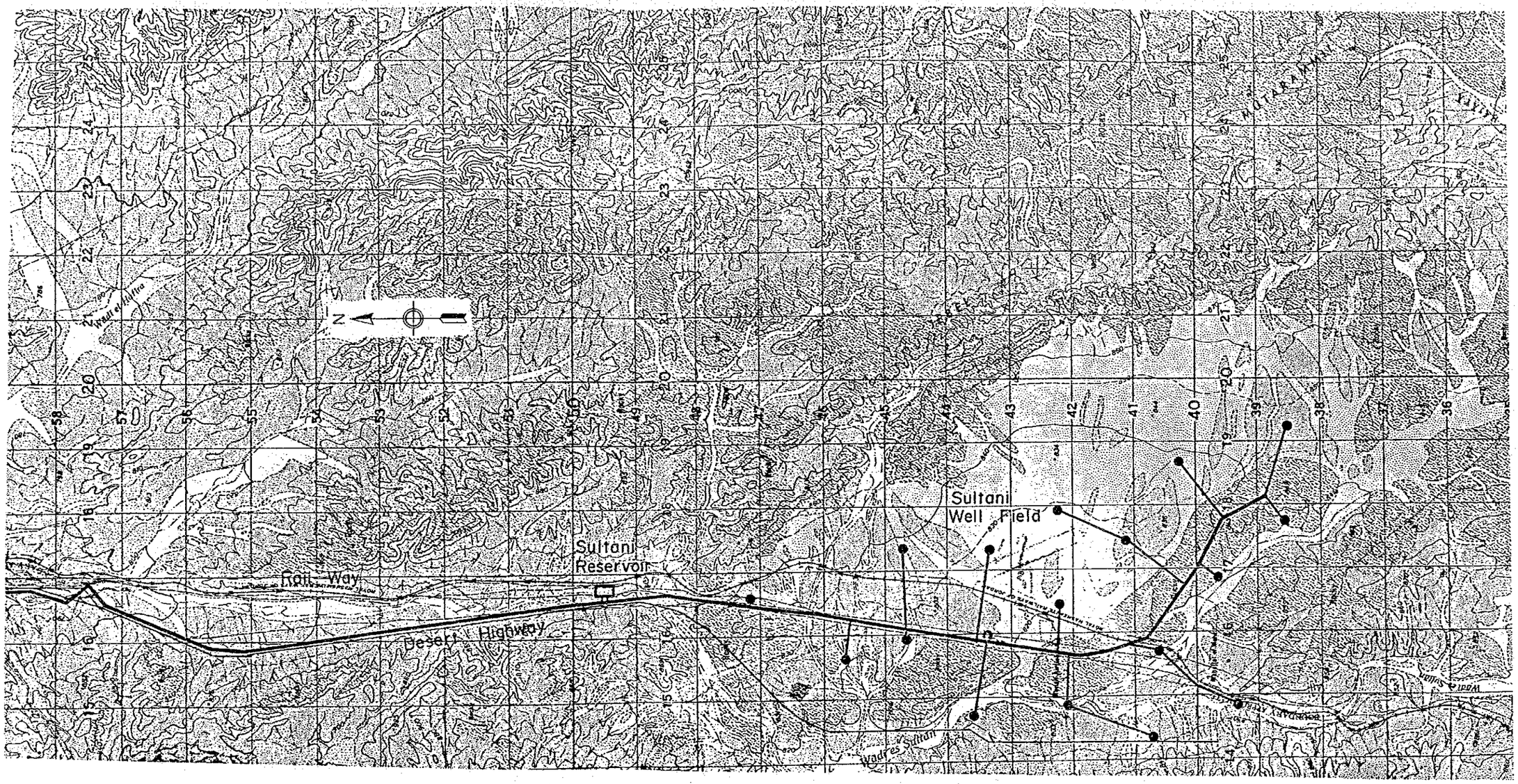
0 km 1 km 2 km 3 km 4 km 5 km

LEGEND

- ● : Well
- ——— : Pipeline
- □ : Reservoir
- - - - : Pipeline (for on-going Project)

DRAWING NO. I : SULTANI - SIWAQA PIPELINE
GENERAL LAYOUT (1/2)

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY



SCALE

0 km 1 km 2 km 3 km 4 km 5km

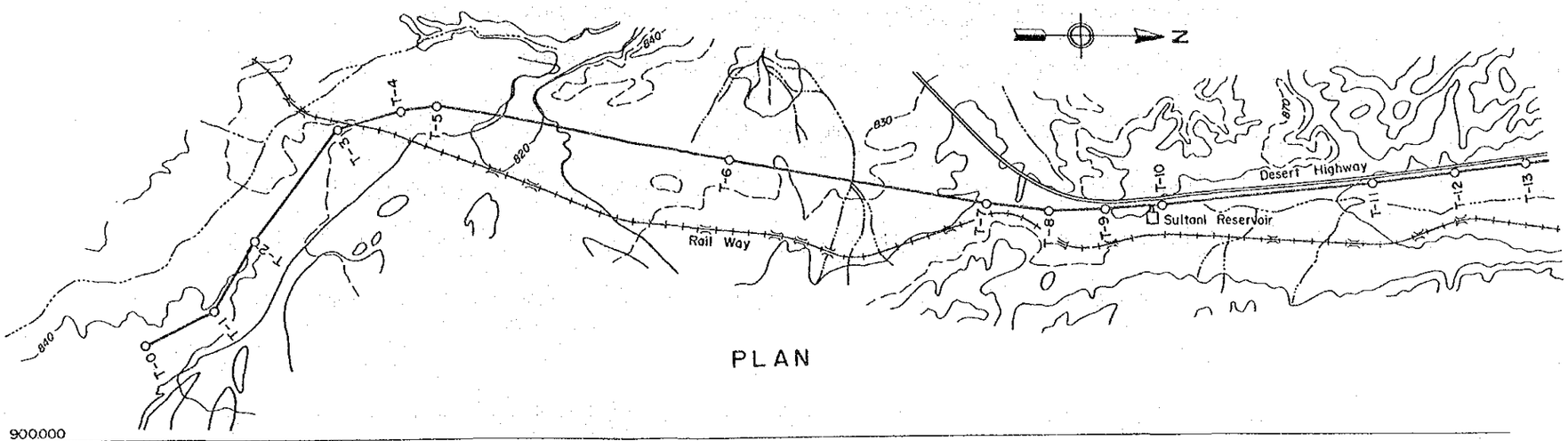
LEGEND

- ● : Well
- ——— : Pipeline
- □ : Reservoir

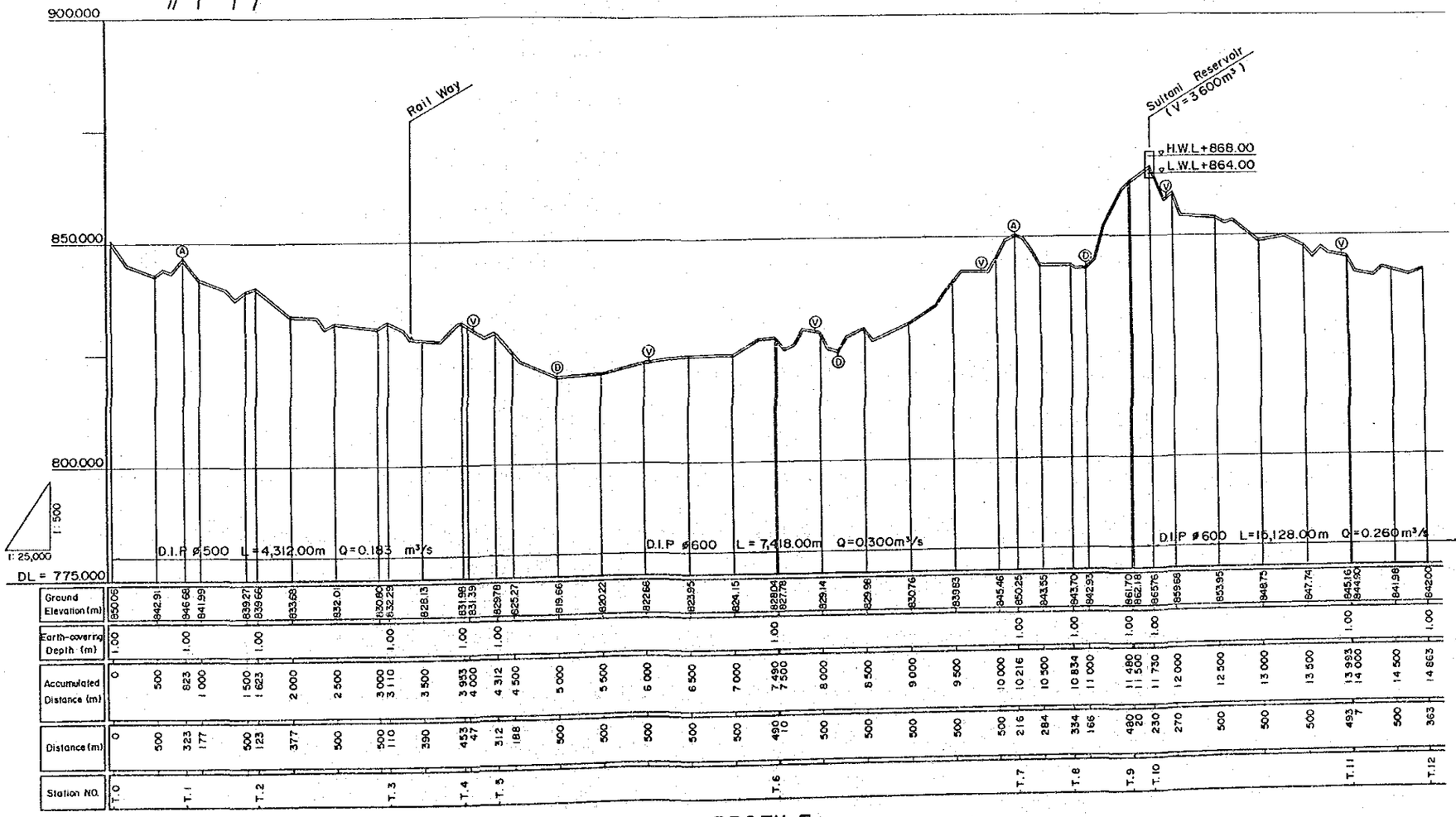
DRAWING NO. 2 : SULTANI - SIWAQA PIPELINE
GENERAL LAYOUT (2/2)

THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE
STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY

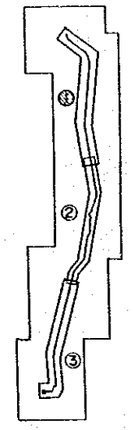
DRAWING NO. 3



PLAN



PROFILE



KEY PLAN

LEGEND

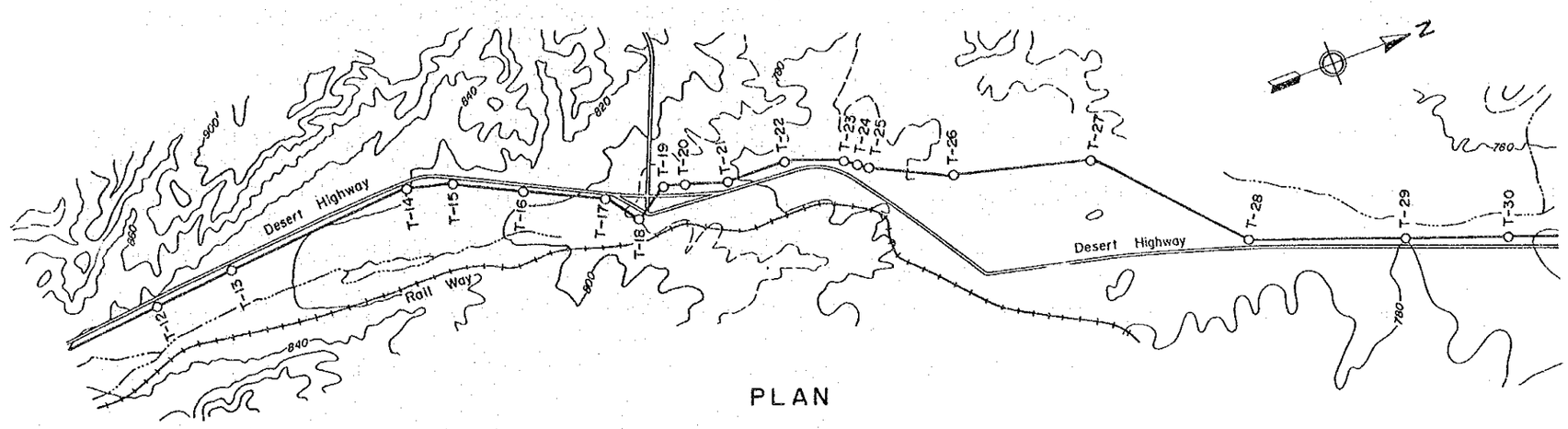
Ⓐ	Air Valve
Ⓓ	Blow Off
Ⓥ	Valve
	Pipeline
- - - -	On-going Pipeline

SCALE

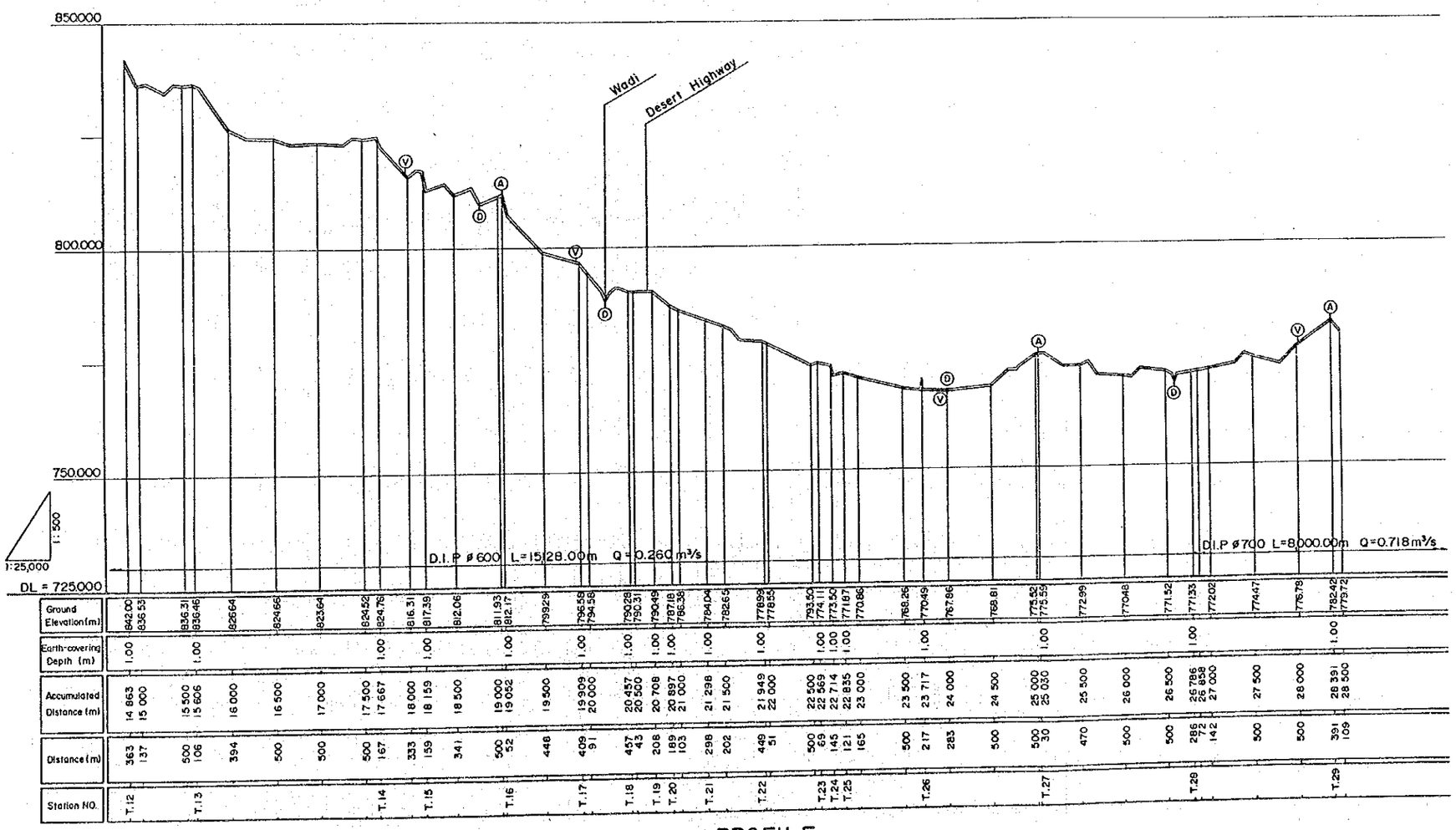
0km 1km 2km 3km

DRAWING NO. 3 : SULTANI - SIWAQA PIPELINE
PLAN & PROFILE (1/3)

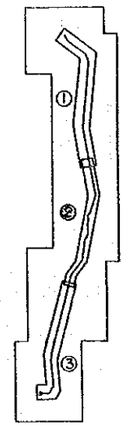
THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN



PROFILE



KEY PLAN

LEGEND

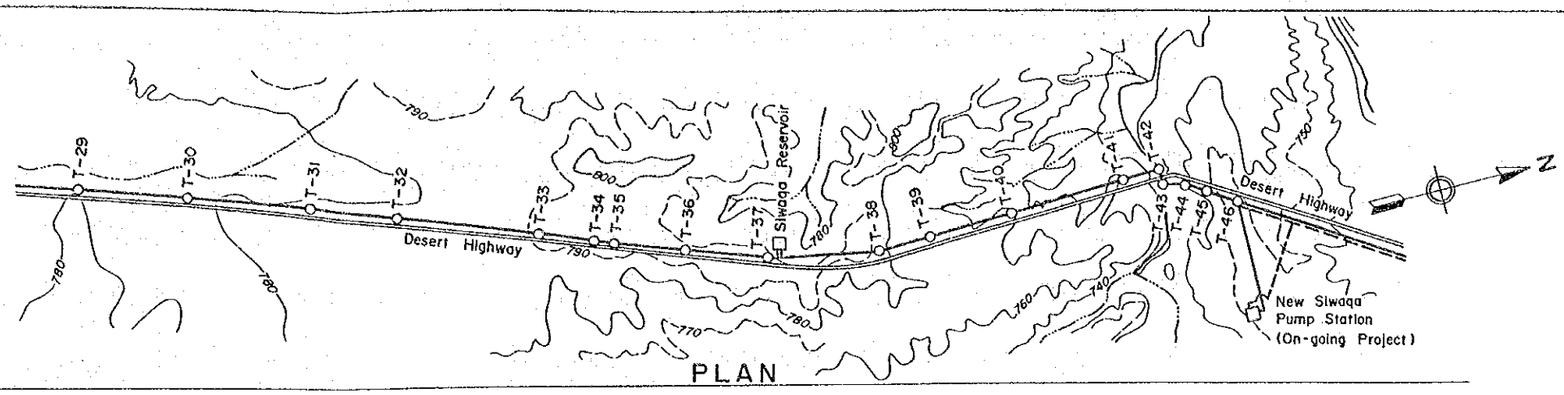
Ⓐ	Air Valve
Ⓓ	Blow Off
Ⓥ	Valve
———	Pipeline
- - - - -	On-going Pipeline

SCALE

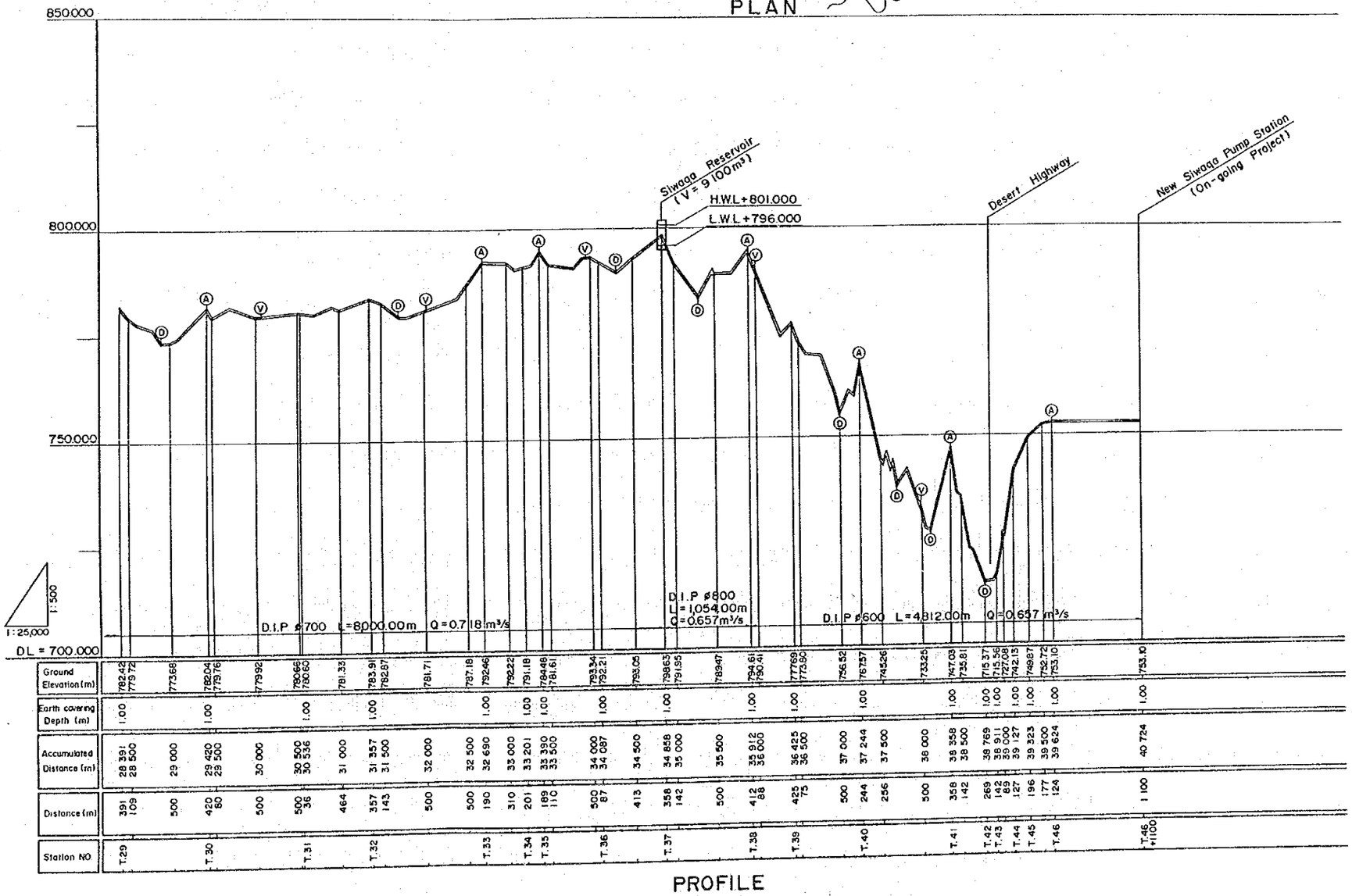
0km 1km 2km 3km

DRAWING NO. 4 : SULTANI-SIWAQA PIPELINE
PLAN & PROFILE (2/3)

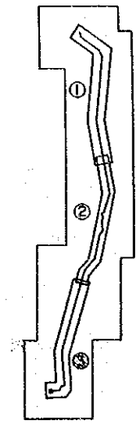
THE HASHEMITE KINGDOM OF JORDAN
HYDROGEOLOGICAL AND WATER USE STUDY OF THE MUJIB WATERSHED
JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN



PROFILE



KEY PLAN

LEGEND

Ⓐ	Air Valve
Ⓓ	Blow Off
Ⓥ	Valve
	Pipeline
	On-going Pipeline

SCALE

0km 1km 2km 3km

DRAWING NO. 5 : SULTANI-SIWAQA PIPELINE
PLAN & PROFILE (3/3)

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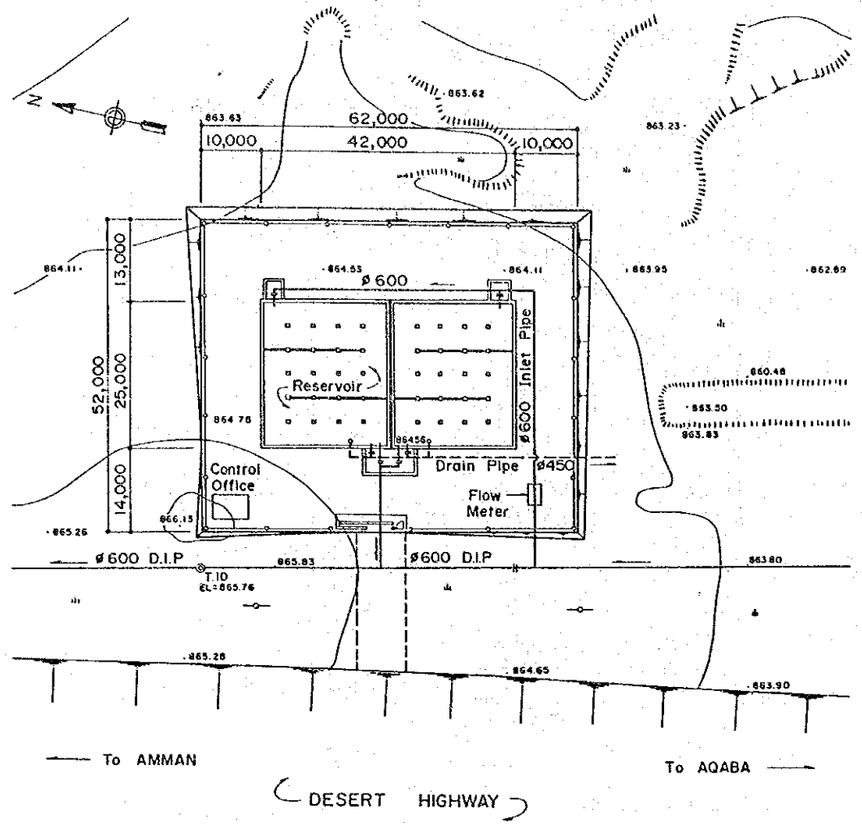
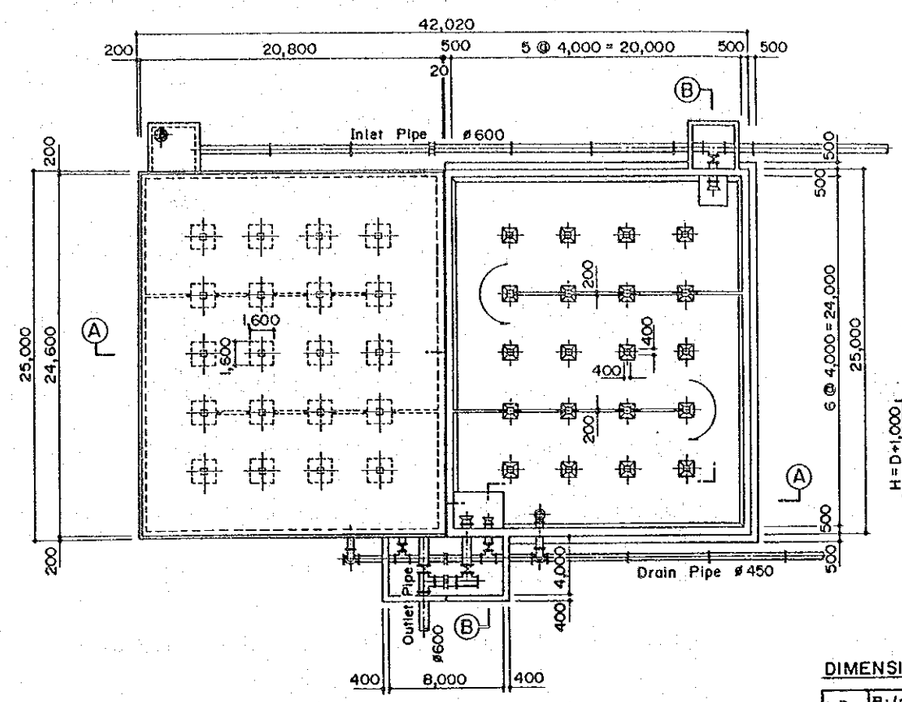
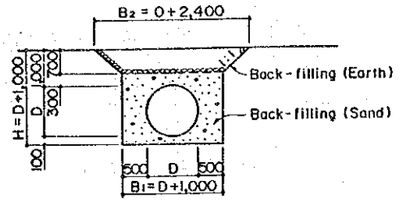


GENERAL LAYOUT SCALE A



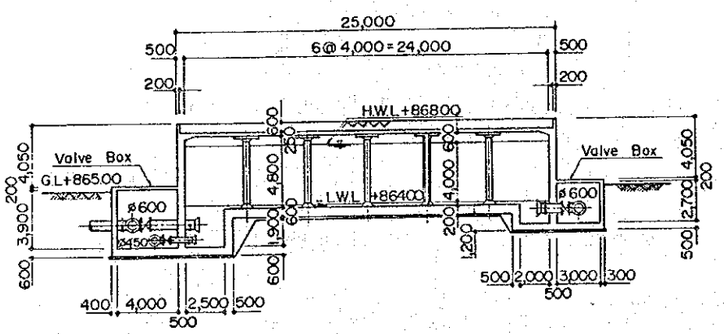
PLAN SCALE B



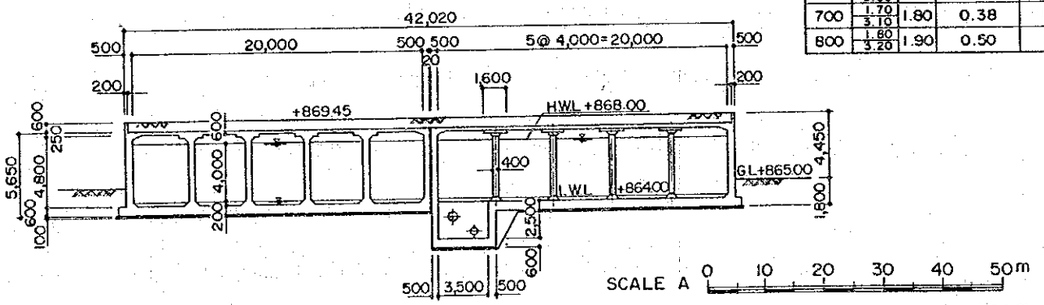
TYPICAL CROSS SECTION OF PIPELINE

DIMENSION TABLE

D (mm)	B1 (m) / B2 (m)	H (m)	Cross Sectional Area of Pipe (m²)	Back filling Sand (m³)	Back filling Earth (m³)	Surplus Soil (m³)
150	1.15 / 2.55	1.25	0.02	0.62	1.30	0.64
200	1.20 / 2.60	1.30	0.03	0.69	1.33	0.72
300	1.30 / 2.70	1.40	0.07	0.84	1.40	0.91
400	1.40 / 2.80	1.50	0.13	0.99	1.47	1.12
500	1.50 / 2.90	1.60	0.20	1.15	1.54	1.35
600	1.60 / 3.00	1.70	0.28	1.32	1.61	1.60
700	1.70 / 3.10	1.80	0.38	1.49	1.68	1.87
800	1.80 / 3.20	1.90	0.50	1.66	1.75	2.16



SECTION Ⓑ-Ⓑ SCALE B



SECTION Ⓐ-Ⓐ SCALE B

DRAWING NO. 6 : SULTANI - SIWAQA PIPELINE
SULTANI RESERVOIR (T-10)

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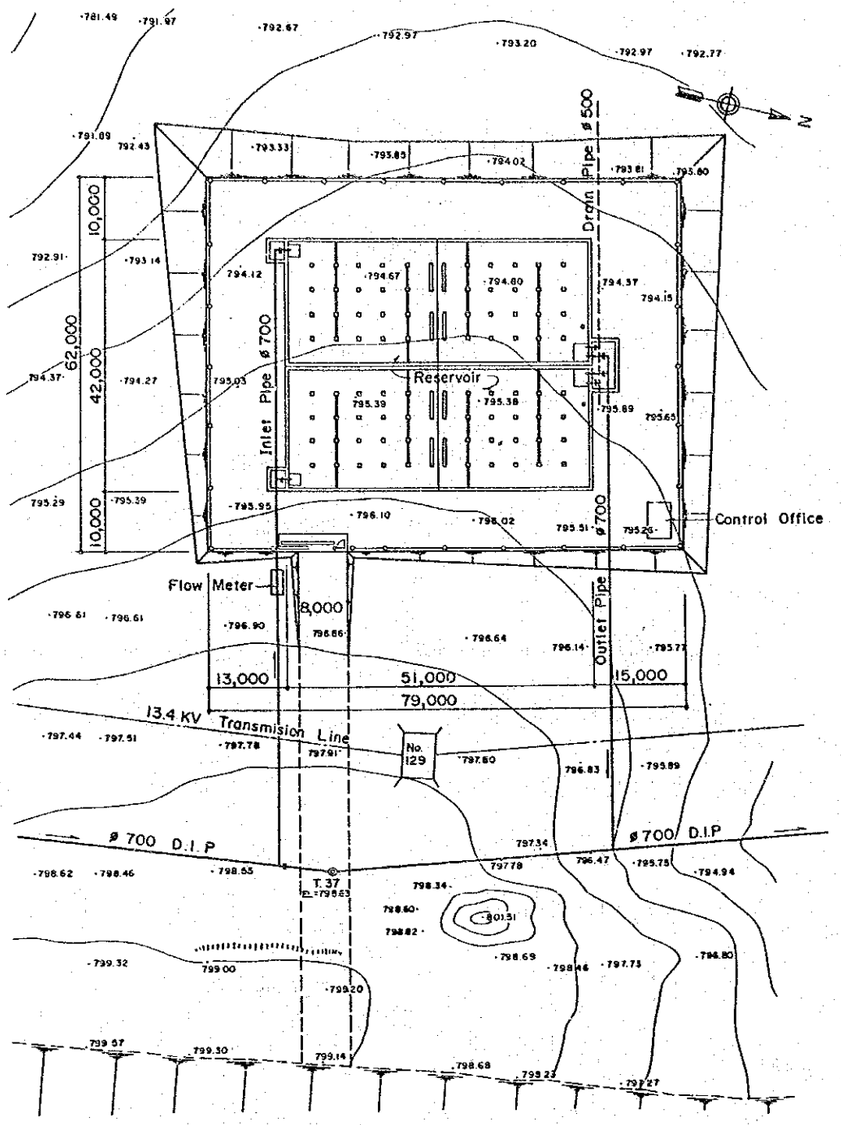
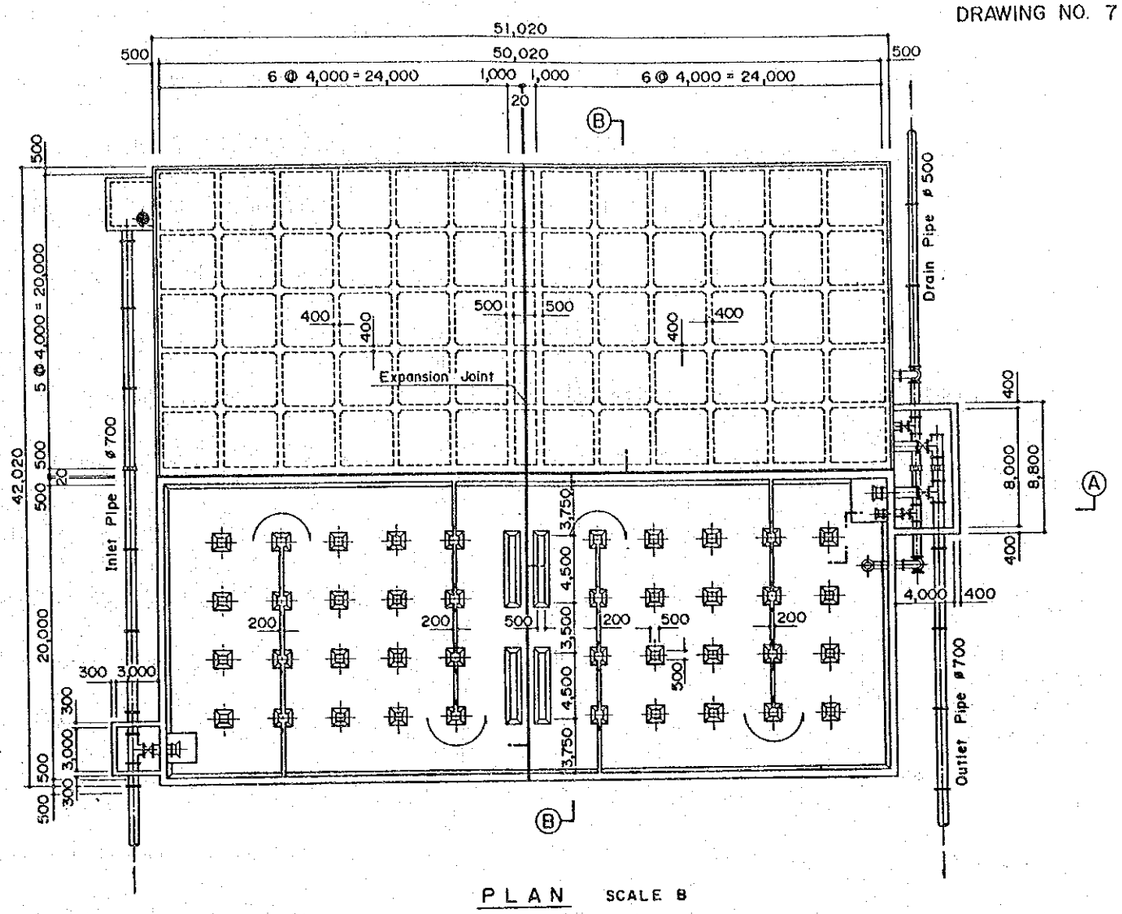
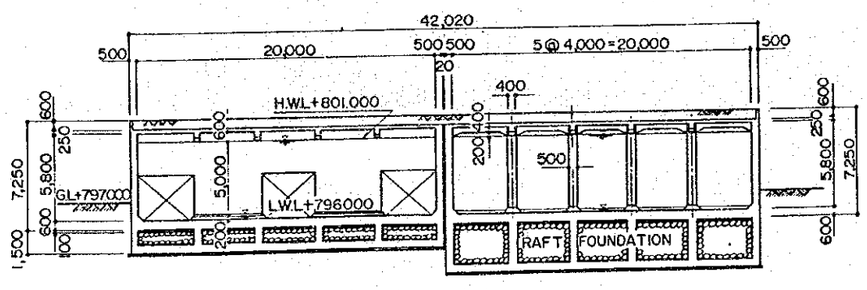


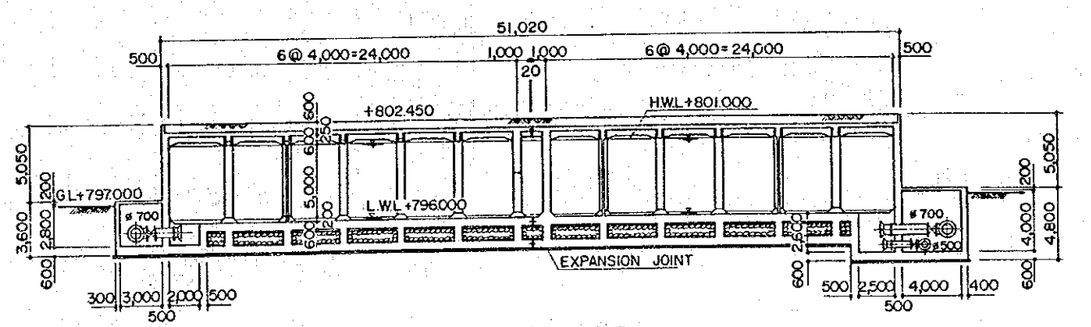
GENERAL LAYOUT SCALE A



PLAN SCALE B



SECTION Ⓑ - Ⓑ SCALE B



SECTION Ⓐ - Ⓐ SCALE B

SCALE A 0 10 20 30 40 50m

SCALE B 0 10 20m

DRAWING NO. 7 : SULTANI - SIWAQA PIPELINE
SIWAQA RESERVOIR (T-37)

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