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CHAPTER 4
MUNICIPAL WATER NETWORK
REHABILITATION

CHAPTER 4 MUNICIPAL WATER NETWORK REHABILITATION

4.1 Basic Conditions

(1) Scope of the Study

The scope of the pre-feasibility study for the municipal water network rehabilitation shall be the highly populated areas of South Amman, Madaba city, Karak city, Tafilah city and Ma'an city as shown on Fig.4.1.1-1. The boundary of the study areas is as shown on Fig. 4.1.1-2 to 4.1.1-6 respectively.

(2) Target Year

The target year of the pre-feasibility study for the Municipal Water Network Rehabilitation shall be set as the year 2010.

(3) Criteria

The criteria for the rehabilitation of the pipelines shall be as mentioned in Table 4.1.1-1 below.

Table 4.1.1-1 Criteria for Rehabilitation of Pipeline

Parameter	Criteria	
Life of distribution pipes	For steel pipe	Distribution pipes whose life is over 30 years shall be replaced by DI pipes for 100 mm or over and by HDPE pipes for less than 100mm.
	For ductile iron pipe (DI)	Distribution pipes whose life is over 50 years shall be replaced by DI pipes for 100mm or over and by HDPE pipes for less than 100 mm.
Size of distribution pipes	Since it is considered that more than 90% of physical loss is produced in the pipelines with diameters of less than 100mm, distribution pipes whose diameter is less than 100mm (or 4 inch) and of galvanized steel or black steel shall be replaced by HDPE pipe regardless of the life	
Service pipes for house connection	Service pipes whose material is galvanized steel shall be replaced by HDPE pipes regardless of the life.	
Other	Tertiary pipes that are not shown on the drawings shall be considered to be included in the cost estimation of house connection, assuming that the length of house connection is 10m.	

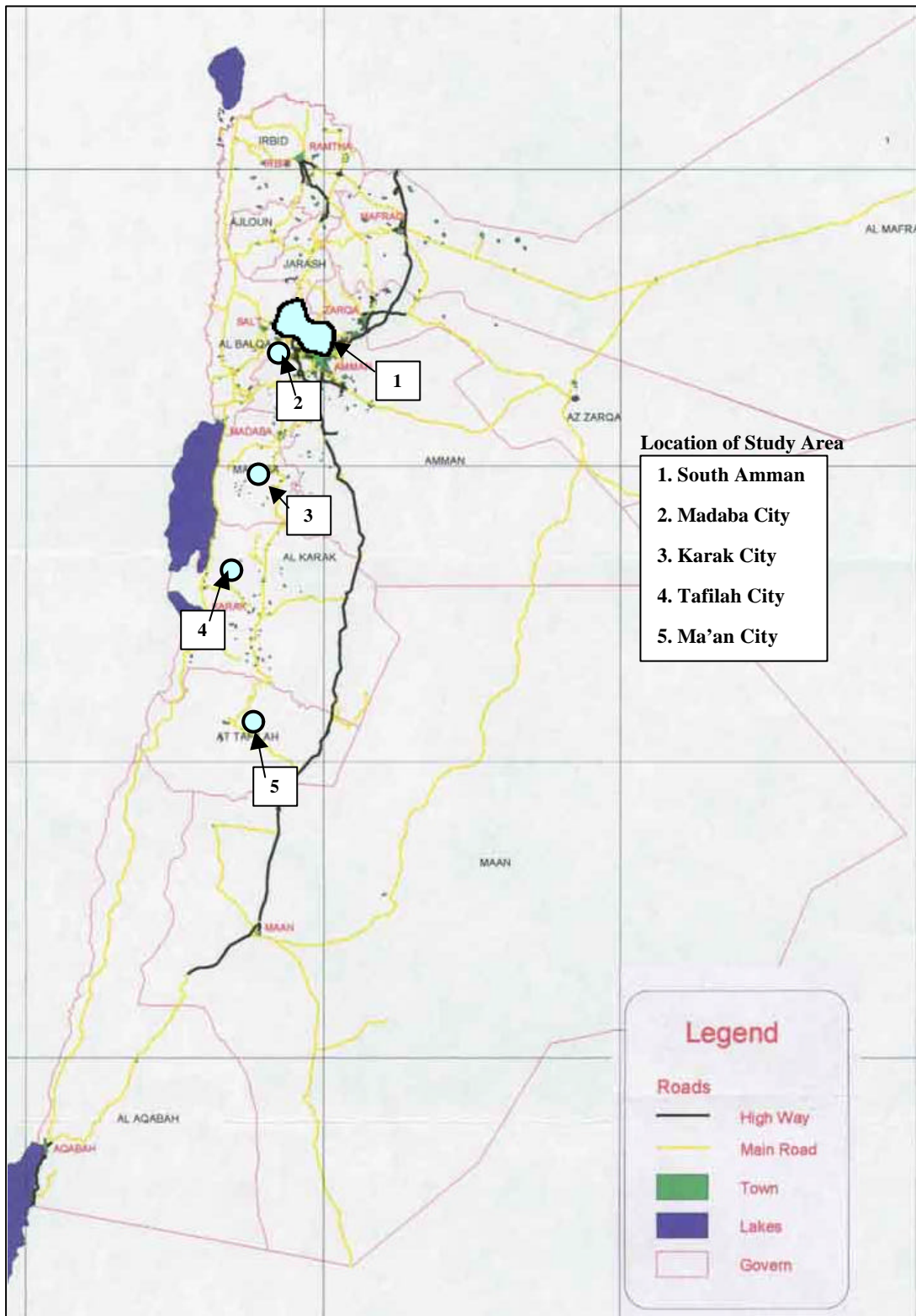


Fig. 4.1.1-1 Location of Study Areas for Network Rehabilitation

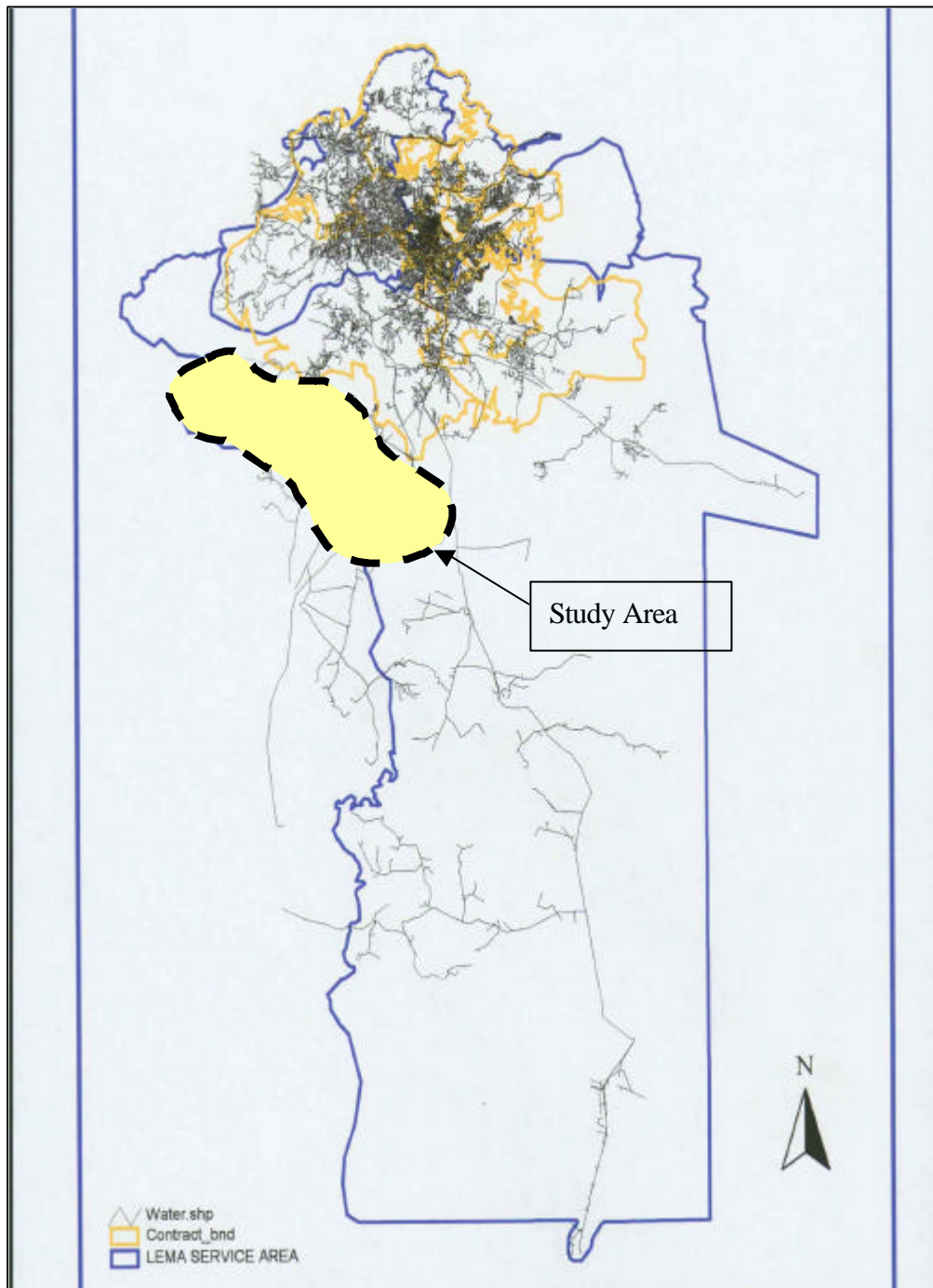


Fig. 4.1.1-2 Scope of Network Rehabilitation for South Amman



Fig. 4.1.1-3 Scope of Network Rehabilitation for Madaba City

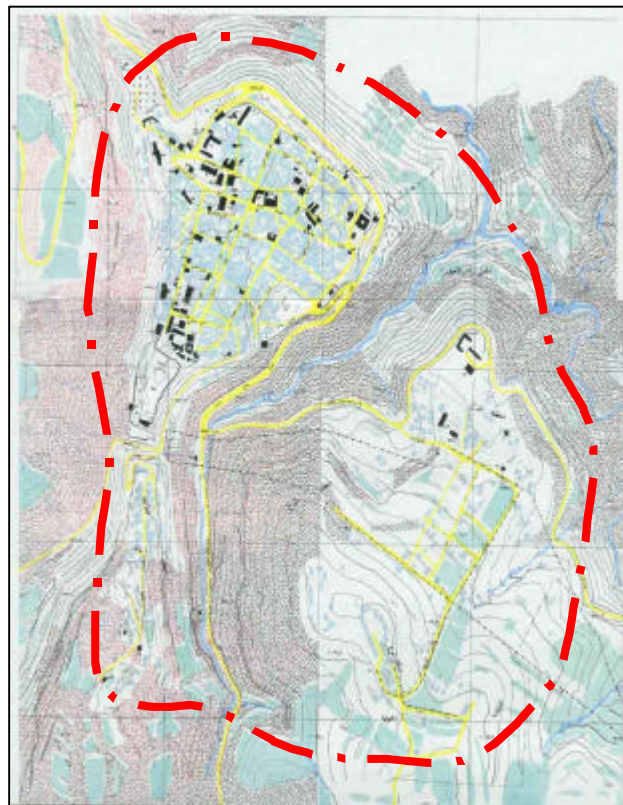


Fig. 4.1.1-4 Scope of Network Rehabilitation for Karak City

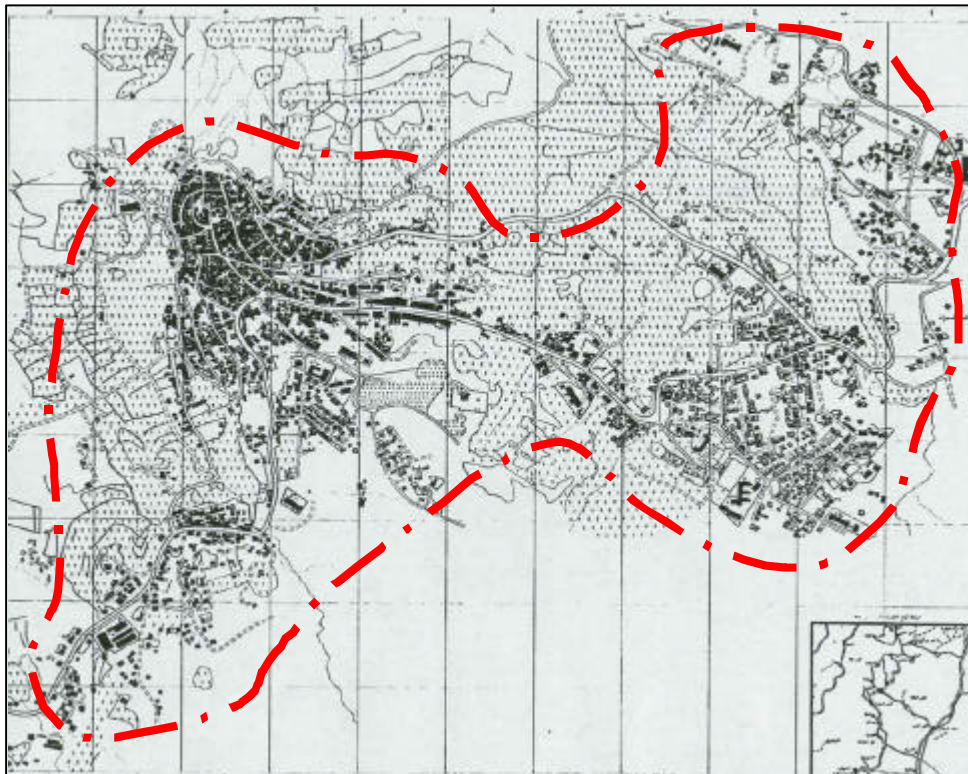


Fig. 4.1.1-5 Scope of Network Rehabilitation for Tafilah City

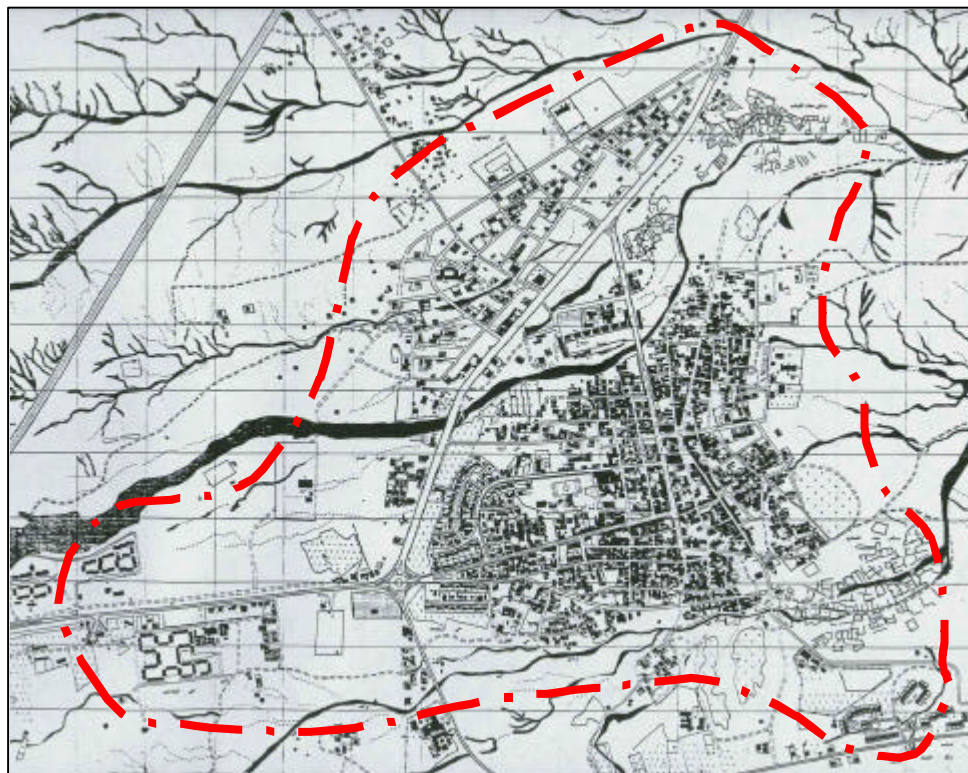


Fig. 4.1.1-6 Scope of Network Rehabilitation for Ma'an City

4.2 Current Situation of Water Supply in the Study Areas

(1) Water Supply Volume

The current situation of water supply in the study areas is described in Table 4.2.1-1.

Table 4.2.1-1 Current Situation of Water Supply in the Study Areas (Year 2000)

Study Area	Project Area (km ²)	No. of Subscriber in 2000 (nos.)	No. of House Connection in 2000 (nos.)	Water Supplied in 2000 (m ³ /year)
South Amman	128.0	6,660	4,000	1,802,500
Madaba city	5.0	8,235	5,800	2,995,900
Karak city	4.0	4,500	3,200	1,593,000
Tafilah city	5.0	6,776	5,400	1,906,400
Ma'an city	8.9	5,600	4,500	1,529,400

(2) Water Supply System

The water supply system in the study area is summarized in Table 4.2.1-2.

Table 4.2.1-2 Current Water Supply System in the Study Area

Study Area	System Outline
South Amman	Water is supplied by pressurized mains mainly from Qastal pump station and partly from Umm Sumaq South booster pump station.
Madaba city	Water is supplied by pressurized mains from Madaba pump station and by gravity from water reservoirs located at the same pump station.
Karak city	Water is supplied by gravity from water reservoir, which needs to be expanded from existing capacity of 1,000m ³ to 3,000m ³ in the future.
Tafilah city	Water is supplied by gravity from water reservoirs. New water reservoir with a capacity of 5,000m ³ is under construction.
Ma'an city	Water is supplied by gravity from water reservoir located at hilly area outside the city.

4.3 Examination of Physical Loss

(1) Current situation of UFW

Since it is difficult to get the accurate UFW ratio for the specific area in the related Governorate, the overall UFW ratio in the Governorate shall be applied in this study.

The overall UFW ratio in the year 2000 for the Governorate where the study areas are located is as shown in Table 4.3.1-1.

Table 4.3.1-1 UFW Ratio of Governorates related to Study Areas in 2000

Governorate	Supplied (m ³)	Water Billed (m ³)	UFW (m ³)	UFW Ratio (%)
Amman	90,293,930	45,336,171	44,601,104	50
Madaba	5,582,576	2,378,379	3,204,197	57
Karak	9,214,308	3,962,731	5,251,577	57
Tafilah	2,411,807	1,387,573	1,024,234	42
Ma'an	7,548,698	2,966,826	4,581,872	61

Source : For Amman : LEMA, for other Governorates : WAJ

(2) Projection of UFW reduction

In general and from the experience of PMU's pilot projects that have been done by the assistance of JICA long-term expert, it is considered that the physical loss accounts for 25 to 30 % of the water supplied.

Therefore, in this study, it is assumed that the reductions as mentioned in Table 4.3.1-2 be achieved after the proposed rehabilitation projects have been implemented.

Table 4.3.1-2 Assumption of UFW Reduction

Study Area	UFW in 2000 (%)	Assumed Physical Loss (%)	Physical Loss After Project Implementation in 2010 (%)
South Amman	50	30	15
Madaba city	57	30	15
Karak city	57	30	15
Tafilah city	42	25	15
Ma'an city	61	30	15

For the study areas, it is expected that the physical loss be reduced as shown in Table 4.3.1-3 after the projects proposed in the study have been implemented.

Table 4.3.1-3 Expected Reduction of Physical Loss in 2010 for the Study Area

Study Area	Water Supplied in 2000 (m ³ /year)	Pct. to whole Gov. (%)	Water Supplied in 2010 (m ³ /year)	Physical Loss Without Project in 2010 (m ³ /year)	Physical Loss With Project in 2010 (m ³ /year)	Expected Reduction of Physical Loss in 2010 (m ³ /year)
South Amman (#1)	1,802,500	2.0	2,936,000	880,800	440,400	440,400
Madaba city	2,995,900	53.7	4,026,200	1,207,900	603,950	603,950
Karak city	1,593,000	17.3	2,140,900	642,300	321,150	321,150
Tafilah city	1,906,400	79.0	2,562,000	640,500	384,300	256,200
Ma'an city	1,529,400	20.3	2,207,200	662,200	331,100	331,100
Total	9,827,200		13,872,300	4,033,700	2,080,900	1,952,800

Note 1. Current PMU project for rehabilitation of Greater Amman is dealing with 97% of water supplied in the Amman Governorate.