

Table S38 OPERATION AND MAINTENANCE COST

	(US\$1,000)		
	With-Project	Without-Project	Incremental
Salary	2,234	2,031	203
Electricity	4,043	3,399	644
Repair and Maintenance	984	884	100
Total	7,261	6,314	947

Economic Evaluation

Economic evaluation of the project is made by calculating EIRR based on the estimated economic benefit, economic construction cost and OM cost assuming that the economic life of the project is 25 years after completion of Stage 1. The estimated EIRR is 8.7%, which indicates that the project is economically justifiable.

Sensitivity analysis is conducted to check the project feasibility under the following conditions:

Case 1 Project cost increase by 15 %

Case 2 OM cost increase by 15 %

Case 3 Case (1) + Case (2)

The estimated EIRRs are 7.3 %, 8.5 % and 7.2 % for case 1, case 2 and case 3, respectively. The results indicate that the economic feasibility of the project is more sensitive to the construction cost increase rather than OM cost increase, and the project still keeps a marginally acceptable economic rate of return even for the case 3.

6.2 Financial Evaluation

6.2.1 General

Firstly, capacity to pay for water charge is assessed based on the current water tariff and household income in Zarqa. Then, financial evaluation is made by assessing Financial Internal Rate of Return (FIRR) on the basis of the estimated incremental revenue for WAJ Zarqa and the project cost.

The cash flow table is also prepared on the assumed financial conditions incorporating all the revenues and costs of WAJ Zarqa to check the level of the water tariff required to cover OM cost under the assumed financial conditions.

Finally, the fund requirement is assessed from the view point of WAJ investment.

6.2.2 Capacity to Pay for Water Charge

(1) Distribution of Water Consumption

For the assessment of the consumers' capacity to pay for water charge, the distribution of household water consumption in WAJ Zarqa is prepared for the year 1993. It shows that almost 90 % of the consumers use less than 70 m³ and about 70 % use less than 40 m³ during 3 months period. Approximately one third of the consumers use less than 20 m³ in Zarqa.

(2) Income Distribution

According to the Household Expenditure and Income Survey, 1992, about 60 % of the households get annual income less than JD 3,600 in Zarqa. About one third or 34 % of the households get the income less than JD 2,400. Weighted average household income is estimated at around JD 3,600.

(3) Assessment of Capacity to Pay

Based on the above figures, capacity to pay is assessed for different income groups, namely, low income households (annual income of JD 1,800) and middle income households (JD 3,000).

The following assumptions are made for estimating the water charge:

- 1) Present water consumption per household is
 - 33 m³/3 months for the low income household
 - 50 m³/3 months for the middle income household
- 2) Expected future water consumption per household is estimated at around 66 m³ on the basis of the per capita daily consumption of 80 liters and average number of family.

Table S39 WATER CHARGE AND INCOME

Income Class		Water Consumption	Water Charge (JD/year)	(Water Charge)/(Annual Income)
Low Income	Present	33 m ³ /3M	10.0	0.7 %
	Future	66 m ³ /3M	43.6	2.9 %
Middle Income	Present	50 m ³ /3M	24.4	0.8 %
	Future	60 m ³ /3M	43.6	1.5 %

As presented above, the costs of water consumption represents 0.7 - 0.8 % of the household income at present both for the low income and the middle income. Even if the consumption increases to the expected average level (80 liter), the cost of water would represent 1.5 - 2.9 % respectively of low and middle income household expenses. These ratios are well within the normally affordable level of 3 to 4 %. From this, it is considered that the households in the Study Area have sufficient capacity to pay for the water charges and further increase of the water tariff is financially feasible.

6.2.3 Financial Internal Rate of Return (FIRR)

Financial viability of the Stage 1 Project is assessed by calculating Financial Internal Rate of Return on the basis of the estimated incremental revenue and incremental costs for WAJ Zarqa.

(1) Incremental Revenue for WAJ Zarqa

The rehabilitation and expansion of the facilities and implementation of the leakage control plan, will increase available water for consumption resulting in a corresponding increase in the revenue from water sales. Average revenue from the present water charge is estimated at JD 0.21/m³ or US\$ 0.30/m³ in WAJ Zarqa. Incremental revenue from the water sales is presented below.

Table S40 INCREMENTAL WATER CONSUMPTION AND WATER REVENUE FOR WAJ ZARQA

	2002	2003	2004	2005 and after
Incremental Water Consumption (1,000m ³ /year)	2,056	2,313	2,570	9,771
Incremental Revenue (US\$1,000)	617	694	771	2,931

(2) Incremental Cost for WAJ Zarqa

The incremental cost for WAJ Zarqa consists of the following cost items:

- | | |
|--|-------------------------|
| 1) Investment for rehabilitation and expansion : | US\$ 63,000 thousand |
| 2) OM costs including leakage control : | US\$ 947 thousand /year |

(3) FIRR Calculation

Based on the incremental revenue and incremental cost estimated above, the cash flow table is prepared for calculation of FIRR. However, the total incremental cost is larger than the total incremental revenue and a positive FIRR cannot be established. This means that the project is not financially viable under the present water tariff structure and further increases in the tariff will be required to make the project financially feasible.

To determine what increase in the water tariff will make the project financially viable, the following sensitivity analysis is made:

Case 1	Raise water tariff by 50 % (US\$ 0.45/m ³ on an average)	FIRR=2.5 %
Case 2	Raise water tariff by 75 % (US\$0.53/m ³ on an average)	FIRR=4.0 %
Case 3	Raise water tariff by 100 % (US\$ 0.60/m ³ on an average)	FIRR=5.3 %

The sensitivity analysis indicates that to attain the minimum level of 5 % FIRR, the present water tariff needs to be doubled.

6.2.4 Cash Flow Analysis

(1) Assumptions and Conditions

The result of the cash flow analysis indicates that the revenue of WAJ Zarqa covers only operation and maintenance costs excluding depreciation. This deficit situation would persist even if water sales were to increase considerably. Interest on foreign loans is also not covered by the projected revenue. In order to cover the OM cost including depreciation the water and sewerage tariff must be increased by 19 % to an average of US\$0.43/m³. A rate increase of 37 % (US\$0.50/m³ on an average) is required to cover all the OM costs plus interest on foreign loans.

6.2.5 Fund Requirement and WAJ Investment

Required investment funding for the project is assessed for WAJ. Annual funding required for

the project varies from US\$ 2.0 million to US\$ 15.8 million during the implementation period of 1998 - 2004. For checking the financial viability of the investment, WAJ's historical investment patterns were studied.

Table S41 WAJ INVESTMENT

(1,000 JD)	
Year	Investment
1989	75,800
1990	39,732
1991	33,181
1992	37,477
1992	56,033
Average	48,444

Source : WAJ, Finance Directorate

As recorded in the above table, WAJ has spent an average of about JD 48.4 million or US\$69.1 million annually during the past 5 years.

Compared with this figure, the estimated annual funding required for the project corresponds to 2.9 - 22.9% of WAJ's annual investment spending levels. Required project funding levels are considered within the reasonable investment level for WAJ since they are less than 20 % of current WAJ investment spending levels in all years except 2001

6.3 Socio-economic Impacts and Overall Evaluation

6.3.1 Socio-economic Impacts

Considerable socio-economic benefits are expected from the implementation of the project.

Alleviation of water shortage and rationing: This is likely the most important benefit since it will improve sanitary and hygiene environment and contribute to the general health of residents in the Study Area. Rusaiifa municipality located in south-west part of the Study Area is being seriously affected by water shortage, where income of the residents are relatively low compared with those of Zarqa municipality. The expected benefit for the improvement of the basic human needs will be realized particularly in these lower income areas, that will contribute to the income redistribution in the region.

Facilitation of regional development: The expansion of the water supply network and increase of the available water will promote industrial and commercial development in the Study Area. Urban development will, thus, be accelerated to the north and north-west.

Reduction in high unemployment: unemployment is a serious socio-economic problem in the Study Area. The expected industrial and commercial development resulting from improved water supply will improve this situation. Thus, the project will contribute to raising the living standard through economic development and environmental improvements, and will enhance social welfare in the Study Area.

6.3.2 Overall Evaluation

The project will produce a reasonable economic return and the investment is economically justified. However, the existing low water tariff makes the project financially unfeasible. Considerable increases in water tariff rates will be necessary for attaining financial feasibility. The cash flow analysis indicates that at least a 19 % increase is required to covering the OM cost including depreciation. The annual funding required for the implementation of the project is within the existing range of WAJ investment spending levels and is acceptable.

Considerable socio-economic benefits are expected from the implementation of the project. The improvement to basic human needs through the alleviation of water shortage and rationing is considered a great benefit to the Study Area as well as the resulting regional development. Taking into account all the above the project is justified economically and socially and its early implementation is recommended.

7. ENVIRONMENTAL IMPACT ASSESSMENT

Through the IEE process conducted in the Long Term Development Plan, the following environmental elements are nominated for further study.

- 1) Resettlement
- 2) Economic Activity (Impacts on existing tenant or lower income people)
- 3) Traffic and Public Facilities
- 4) Archaeological Treasures
- 5) Water Pollution

In this section, impacts to the above elements are analyzed and evaluated.

7.1 Resettlement

Planning the location of reservoirs and pumping station requires careful consideration to avoid existing settlements and be as far away as possible from existing houses.

Fundamentally WAJ does not recommend resettlement in any cases. In order to comply with this policy, some locations in the Rusaifa south zone which are hydraulically suitable for

reservoir sites were abandoned and the originally proposed south and north Rusaifa zones were merged into one.

7.2 Impacts on Existing Tenant or Lower Income People

Residential development patterns reflect a separation between the wealthy class and the general population. In general, the residential area for the general population has a relatively high population density and narrow roads (inconvenient situation). The wealthy class has settled down in the hilly area, where open space is still available. The impacts of improving the water supply system are expected to be as follows:

- 1) In the populated area, land prices may not increase.
- 2) The wealthy class will not move to more populated areas.

Thus, we conclude that the negative impacts on existing tenants and lower income people will be minimal is very rare. The improvement of the water system is expected to have socio-economic benefits.

7.3 Traffic and Public Facilities

The pipe-laying works may have negative impacts on the existing traffic and public facilities. Since the soil type of the study area is rock or rocky sand, the open cut method for pipe-laying works will be used.

Most transmission lines will be located under side-walks, or existing rights of way. Most of roads where the lines will run are not subject to heavy traffic except for Wasfi Tal street (800 m, part of the line from Awajan 21 PS to Rusaifa Res 750).

Pipe-laying works will be done with proper traffic control. The section of 800 m in the Wasfi Tal Street shall be considered carefully at the construction stage. This street is a main street between Zarqa and Rusaifa and there are many existing pipes under this road which will require careful survey at the detailed design stage.

7.4 Archaeological Treasures

There is no possibility to damage or destroy antiquities by the proposed construction works. However, it is recommended to have a joint meeting with Department of Antiquities regarding the antiquity near Reservoir 715 to confirm the antiquity's importance.

7.5 Water Pollution

The improvement of the water supply system will increase domestic or industrial wastewater discharges. In this section, the impact on the water quality, especially for rivers and groundwater, is examined.

It is reported that 58 % of the population is seweraged in Zarqa Governorate is. However, in the Study Area, this percentage is higher at about 76 %. WAJ plans 100 % coverage by the year 2000. In the unsewered areas, septic tanks or vacuumed system are commonly in use.





