

IX. STUDY ON THE PRIORITY PROJECT : M-2

9-1 Outline of the Selected Site : M-2

(1) Location and access

The site of M-2 Industrial Estate (IE) is located about 12 km north of the center of Ma'an City and about 1 km away from the city boundary of Ma'an City. It faces on the Desert Highway and is 500 m to 600 m east from the railroad track of the Hajaj Railway.

(2) Current land use

It is a vacant land along a wadi. Seasonally, Bedouins graze their flocks and herds. No facilities are found in and around the site, except a few service facilities such as automobile repairing workshops and small restaurants located along the Desert Highway on the north side of the interchange of RN 15 and RN 5.

(3) Land ownership

The land of M-2 is owned by the Government.

(4) Topography and geology

The candidate site has several small wadis running eastward and is covered with a shallow alluvium consisting of sand and gravel. Under the alluvium, a phosphate layer and limestone layers are presumed to be existing. There are lots of gravel, 15 cm to 25 cm in diameter probably brought by flood flows. Since the wadi nearby is divided into many small branches, it will not cause serious damage to the IE.

(5) Water resources

The surrounding area of Ma'an City is a dry area with annual rainfall of about 50 mm. The ground water is cultivated in the western mountainous district with the annual rainfall of about 200 mm. The ground water flows eastward in the limestone. In this candidate area, it seems that the ground water will be obtained from wells of 150 to 200m deep, but as to the area about 30 km north of Ma'an City, almost all the existing wells are located more than 10 km west of the Desert Highway. It may be, therefore, necessary to install wells about 10 km westward to obtain a sufficient amount of water.

(6) Electricity and communication

On the west side of the site, the 132 kV transmission line with two circuits connecting the Ma'an - Rashadya substations is laid. No distribution line is found nearby.

(7) Natural and social environment

M-2 is located in the bottom of a hollow. About 120 heads of goat and sheep were grazed there. Since a similar environment is widely extended around there, impacts on the grazing through the change of land utilization in the site seems to be small.

9-2 Estimated Investment Demand and Characteristics of M-2 Industrial Estate

The required area by the investors in the M-2 IE has been estimated by the same method as used for A-2 IE. It is estimated at 25.1 - 54.2 ha of factory lot area in total as shown in Table 7-3-3.

Investment demand survey revealed that the M-2 IE has the following characteristics.

- Jordanian investors being majority : About 91% of the total area of factory lots is for Jordanian investors and the rest for foreign investors (refer to Table 7-3-3).
- Clean industries : Industries for the M-2 IE shown in Table 7-3-3 are not categorized as polluting ones.
- Labor intensive and assembly / processing type : Labor intensive type (wearing apparel, leather products) and assembly / processing type (wood & cork furniture, glass & non-metal mineral, transport equipment) are expected to be located.

9-3 Development Area and Categories of Industries to be Located and Lot Allocation

The additional investment demand should be added for the following reasons:

- More investors are expected to be attracted by the improvement of the investment environment including infrastructure development and reinforcement of incentives that the Study Team recommend to be offered for investors in the IE.
- Investment can be expected from Iraq, Italy, UK., France, Netherlands, and so on, for which investment demand survey had not been conducted.

It is presumed that about 20% or 9.6 ha of the demanded area can be added to the demand identified by the investment demand survey.

Consequently, the net development area of the M-2 IE is estimated to be about 63.8 ha (gross area : 80 ha) as shown in Table 9-3-1 , and summarized by industrial category below.

Net Development Area for M-2 Industrial Estate

Industrial Category		Net Development Area(ha)	Number of Factory Lot
322	Wearing apparel	2.8 (4.4%)	14
323	Leather Products	25.0 (39.2%)	5
331/332	Wood & Cork furniture	10.0 (15.7%)	1
362/369	Glass & Non-metal mineral	20.0 (31.3%)	18
384	Transport equipment	6.0 (9.4%)	6
Total		63.8 (100.0%)	44

9-4 Land Use and Land Preparation

9-4-1 Land Use Plan and Road Plan

(1) Land use

Land use of the M-2 IE has been planned according to the following conditions and basic concept:

- 1) Total area: 80 ha
- 2) Factory lot area: 63.8 ha
- 3) The IE will be surrounded by a fence with one gate leading to the Desert Highway. A green belt will be provided along the inner edge of the fence to improve the environment.
- 4) The IE will have full a range of utilities including water supply, sewage treatment, power supply, and telecommunication facilities. The water supply facility should be located at high elevation to facilitate the distribution of water and the sewage treatment facility should be located at low elevation to facilitate collection of sewage by gravity. Power supply and telecommunication facilities should be located far from each other to prevent mutual interference.
- 5) The M-2 IE will have an administration facility and sports facilities.
- 6) The entire site will be developed in a single phase.

Factory Site Plan

Lot Size (ha/lot)	Number of Factory Lot
10.0	1
5.0	5
2.0	8
1.0	6
0.4	10
0.2	14
Total	44
Factory lot area (ha)	63.8

The land use plan for the M-2 IE is illustrated in Figure 9-4-1 and the planned area distribution of each land use category is shown in Table 9-4-1.

(2) Road plan

The M-2 IE will be located along the Desert Highway, 12 km north of central Ma'an City. A new access road will be built extending west from this Desert Highway to provide access to the M-2 IE. From this road, a main road and collector roads will

extend to form the road network. Similar to the case of the A-2 IE, T-shaped intersections will be adopted in consideration of traffic safety.

The road network of the M-2 IE is shown in Figure 9-4-2.

The following roads are planned for the M-2 IE:

- Access road	(22.0 m wide, 3 lanes)	Total length:	150 m
- Main road	(22.0 m wide, 3 lanes)	Total length:	670 m
- Collector road	(18.0 m wide, 2 lanes)	Total length:	3,030 m

9-4-2 Land Preparation Plan

The elevation of the M-2 IE ranges from 1,087 m to 1,079 m above mean sea level. Namely, land is relatively flat, with only approximately 8.0 m difference between the highest and lowest points and a gradient of 1.0 to 1.5% climbing towards the west.

The land preparation plan is prepared based on the same assumptions as those for the A-2 IE. The cut volume will be 400,000 cubic meters, as shown below.

Earthwork Volume		(m ³)
Earth cut volume	400,000	
Earth fill volume	400,000	

9-4-3 Administration Center and Park

(1) Administration center

The administration center will have the core IE facilities shown below.

Industrial Estate Administration Center Facilities Plan			(m ²)
	Floor Area		Land Area
1. Industrial estate administration building	600	}	3,500
2. Customs and police stations	120		
3. Business center (e.g., bank, post office)	300		
4. Business center (social security office, employment office, conference rooms, offices)	330	}	2,000
5. Restaurants, retail stores	250		
Subtotal	1,600		5,500
6. Hospital	-		1,000
7. Other facilities	-		4,500
8. Parking lots	-		3,000
Total	1,600		14,000

(2) Park

A park with an area of 1.9 ha, accounting for 2.3% of the total area of the IE, will be constructed. The park will have athletic facilities and a public space.

9-5 Requirement for Utilities/Infrastructures

(1) Drainage

Rainwater in the M-2 IE will be collected by U-section flumes and pipes, and then drained off the IE. The expected amount of rainwater would be as follows. As for the rainfall intensity, that at Ma'an which is geographically close to the M-2 IE among the 40 survey points in the report "Rainfall Intensity-Duration Frequency In Jordan" published by the Water Authority in April 1986, has been used:

- Rainfall intensity 7.9 mm/h
- Return period 10 years

(2) Water supply

The total water demand per day in the M-2 IE should be calculated based on the total site area and the water demand per site area. The water demand per site area is the weighted average of unit water demand for industrial categories to be located in the IE

The water demand for each industrial category has been determined according to the same reports referred in 8-5 (2).

The following table shows the water demand for each industrial category.

Water demand per industrial category (M-2)

	Industrial Category	Factor Lot Area (ha)	Unit Water Demand (m ³ /ha/day)	Water Demand (m ³ /day)
322	Wearing Apparel	2.8	10	28
323	Leather Products	25.0	20	500
331/332	Wood & Cork Furniture	10.0	25	250
362/369	Glass & Non-metal Mineral	20.0	181	3,620
384	Transport Equipment	6.0	48	288
	Total	63.8	70*	4,466

*: Weighted average of water consumption

From the table above, it is assumed that the water demand per site area in the M-2 IE will be 70 m³/ha/day, and that the total water demand including the demand for an administration center will be 4,500 m³/day.

(3) Sewerage

Sewage and drain water discharged by the factories should be totally treated by the sewage treatment plant in the IE, and the treated water will be used for irrigation of the

green belt in the IE. For this purpose, drain pipes will be laid under roads to collect wastewater from each factory and transport to the treatment facility.

The planned treated water volume is 4,500 m³ per day, which is equivalent to the consumption volume.

(4) Electricity

The total power demand for the M-2 IE is the sum of power demand of the factories, administration center, utility facilities, street lighting and park lighting. The unit electric power demand is estimated by referring to the following documents and data:

- Report on the Study for the Current Status of Basic Unit for Industrial Location, March 1996, Japan Industrial Location Center;
- Basic Units for Industrial Estates in Asian Countries; and
- Requirement analyzed through survey results on this study.

Estimated on the basis of the unit demand of 268 kW/ha for factories, the total power demand for the M-2 IE would be around 18 MW as shown in the table below.

Electric Demand Projection	
	(MW)
Electric Demand	
1. Factory	17.1
2. Administration center	0.4
3. Utility	0.7
4. Street lighting	0.1
5. Park lighting	0.1
Total	18.4

(5) Telecommunications

The telecommunication demand for the M-2 IE is the total of demand of the factories, administration center, water supply plant, sewage treatment plant. The telecommunication demand rates of factories are presumed based on the following data:

- Basic Units for Industrial Estates in Asian Countries; and
- Current demand for the Amman Industrial Estate.

Total telecommunication demand for the M-2 IE is estimated to be around 250 lines as shown below.

Telephone Demand Projection

	Area (ha)	No. of Factories	Demand Rate (line/ha)	Demand Rate (line/lot)	Required Demand (lines)	Required Demand (lines)	Required*) Capacity (lines)
	(1)	(2)	(3)	(4)	(5)=(1)x(3)	(6)=(2)x(4)	max(5)/(6)
1. Factory	63.8	44	3	4	191	176	191
2. Administration center							50
3. Water supply plant							3
4. Sewerage treatment plant							3
Total							247

*) The larger demand figures are chosen as required capacities.

9-6 Preliminary Design/Principal Dimensions of the Utilities/Infrastructures

(1) Drainage

1) General

Rainwater in the M-2 IE will be collected by U-section flumes and pipes, and then drained off the IE by gravity flow.

The diagram of the drainage system in the M-2 IE is shown in Figure 9-6-1.

2) Basic conditions

The design criteria and planned facilities of the drainage system in the M-2 IE are determined according to the Jordanian and Japanese standards as follows. Rainfall with a 10-year return period is applied in the design of the drainage route.

- Rainfall return period 10 years
- Over land time 10 minutes
- Average flow velocity 1.5 m/sec
- Runoff coefficient 0.65
- Draining facility U-section flumes, concrete pipes
- Roughness coefficient of concrete 0.013
- Interval between manholes pipe diameter 100 m
- Rate of discharge formula Manning's Formula

3) Outline of drainage

The rainwater draining facility is planned to have the following features:

- U-section flumes (Size 400 mm x 400 mm - 500 mm x 500 mm), total length 4,490 m
- Concrete pipe (700 mm -800 mm in diameter), total length 900 m

(2) Water supply

1) General

The facility in the IE will be composed of distributing reservoirs, elevated tanks and distributing pipes.

Water will be supplied from the new well to be dug in the area of existing wells located 11 km of north west of the IE through a 250 mm - diameter conveyance pipe.

The distribution pipe network in the IE is shown in Figure 9-6-2.

2) Basic conditions

The distributing reservoir will be installed in the highest area within the IE. Water will be distributed from the elevated tank by gravity after pumping from the reservoir.

The design criteria and planned facilities of the water facility are determined according to the Jordanian and Japanese standards as follows.

- Volume of reservoir Equivalent to 24-hour supply to cover the maximum daily demand
- Volume of elevated reservoir Equivalent to 30-minute supply to cover the maximum daily demand
- Distributing flow amount Hourly maximum demand
- Time fluctuation coefficient 3
- Maximum flow velocity in a distributing pipe 1.5 m/sec
- Velocity coefficient 110
- Pipe type 50 mm diameter: polyethylene pipe
75 mm diameter or larger: cast iron pipe
- Rate of discharge formula Hazen-Williams Formula

3) Outline of water supply

The conveyance pipes, reservoir, elevated tank and distributing pipes are planned with the following dimensions:

- Construction of new well 1
- Conveyance pipes 250 mm diameter cast iron pipe
total length 12,200 m
- Reservoir capacity 4,500 m³
- Elevated tank capacity 95 m³
- Distributing pipes 50 mm - diameter polyethylene pipe total length 110 m
75 mm to 500 mm diameter cast iron pipe total length 3,460 m

(3) Sewerage

1) General

Sewage and drain water discharged from the factories will be totally treated by the sewage treatment plant in the IE, and the treated water will be used for irrigation of the green belt of the IE.

Each factory must carry out wastewater treatment independently before discharging into the drain water pipes laid in the roads so that the quality of water complies with the industrial wastewater quality standard shown in Table 8-6-1.

The wastewater will be so treated in the sewage treatment plant that the quality of the treated water complies with the quality standard shown in Table 8-6-2 and can be utilized as irrigation water. Sludge remaining in the sewage treatment plant must be buried after sun drying.

The sewage treatment plant will consist of a grit chamber, aeration tanks, sedimentation basin, chlorine mixing reservoir, sludge thickener, and sludge drying bed.

Figure 9-6-3 shows the sewerage system in the IE.

2) Basic conditions

The sewage treatment plant will be installed in the lowest area within the IE, so that the drain water from each factory will be collected by gravity flow through the pipes laid under the roads.

The long-duration aeration method is proposed for the sewage treatment for the following reasons:

- Suitability for a small scale sewage treatment plant
- Water quality complying with the drain water standard
- Dealing effectively with load fluctuation
- Less facility maintenance requirement and, therefore, less cost
- Smaller area requirement than the oxidation ditch method

The planning conditions for the drain and sewage facility were determined according to the Jordanian and Japanese standards as follows:

- | | |
|--|---|
| - Capacity of the sewage treatment plant | Maximum wastewater amount per day |
| - Pipe diameter | To be determined on the basis of maximum wastewater volume per hour |
| - Time fluctuation coefficient | 3 |
| - Pipe margin rate | Pipe diameter 500 mm and smaller: 100% |
| | Pipe diameter 600 mm and larger: 50% |
| - Pipe type | concrete pipe |
| - Roughness coefficient of concrete pipe | 0.013 |
| - Interval between manholes | maximum 50 m |

- Flow formula

Manning's Formula

3) Outline of sewerage

The wastewater and drain water treatment facility is planned to have the following features:

- Sewage treatment plant 4,500 m³
- Sewerage pipes 200 m to 500 mm diameter concrete pipe
total length 2,990 m

(4) Electricity

1) Basic design condition and criteria

Electric power for the M-2 IE will be supplied from the NEPCO's power grid. The power supply system will consist of a distribution system within the IE, and 33 kV distribution lines from Ma'an Substation.

The system has been designed basically in accordance with the NEPCO's design criteria, aiming to enhance the quality of electricity so as to keep voltage fluctuation within an appropriate range.

2) External power transmission system

The 132 kV transmission line is laid on the west side of the M-2 IE, but no distribution line is laid nearby.

The Ma'an Substation, which is one of the main 132/33 kV substations in Ma'an Governorate, is located in Ma'an City about 15 km south from the IE site and supplies power to Ma'an City. Ma'an Substation consists of 2 main transformers of 16 MVA each with a voltage of 132/33 kV. The existing capacity of the Ma'an substation is not enough for the M-2 IE.

The M-2 IE could receive electric power from Ma'an Substation by either one of the two alternatives: through the existing 132 kV transmission line and by the new 33 kV distribution line. The former alternative will require constructing a new 132/33 kV main substation in the M-2 IE. The construction cost of the new main substation is more expensive than the latter alternative by the new 33 kV distribution line. Therefore, the latter alternative by the new 33 kV distribution line is recommendable in view of cost performance.

The new 33 kV distribution lines are planned to be installed connecting to 33 kV indoor switchgear at the Ma'an Substation by double circuits. Also the Ma'an Substation is necessary to be expanded to have 2 feeders at the existing 33 kV switchgear and the existing two transformers should be replaced by two new 63 MVA transformers.

3) Internal power distribution system

A 33 kV distribution system is planned to be constructed to feed power from the new 33 kV distribution line to the factories and users located in the M-2 IE.

An underground distribution line is planned for the IE, since this type has been adopted in high grade industrial estates recently to increase the aesthetic value.

An open loop distribution system should be applied to secure stable power supply. 33 kV ring main units will also be provided to connect to consumers easily at any time without interrupting power distribution.

The proposed 33 kV distribution system is shown in Figure 9-6-4.

(5) Telecommunications

1) Basic design condition and criteria

Telecommunication service for the M-2 IE will be available through TCC. The telecommunication will be basically composed of a transmission line, telephone exchanger facilities, and internal subscriber lines in the M-2 IE.

2) External telecommunication system

At present, there are no telephone exchange stations and/or optical fiber cable lines of TCC near the M-2 IE. The nearest existing exchange office is the Ma'an exchange station (5,440 lines), which is located in Ma'an City, about 15 km from the M-2 IE. The Ma'an exchange station already has been fully connected with 3,913 subscriber lines, and 929 subscribers were waiting for connection as of the end of 1995.

The optical fiber transmission network in Jordan has been implemented based on TCC's 15-year plan at present.

Therefore, it is planned to install new optical fiber cable line to ensure telecommunication service between the Ma'an exchange station and the M-2 IE. A new telephone exchange facility (Remote Line Unit (RLU)) is planned to be installed

within the M-2 IE. RLU will be connected to the Ma'an exchange station by an optical fiber cable line.

3) Internal telecommunications system

Some Splice Boxes (SB) will be installed on the sidewalks and connected to the new RLU by metallic telephone cable lines, so that subscribers can easily be connected to SB at any time.

The cable will be put in plastic sleeve pipes and buried along the roads in the M-2 IE.

9-7 Development Phasing and Implementation Schedule

The schedule of the project implementation is shown in Figure 9-7-1.

The development of the overall site area is planned to be executed at a certain fixed period of time. The project completion is assumed to be at the end of 2005, and the commission at the beginning of 2006.

Completion of the construction, starting from the initiation of the designing, is assumed to take three years, thus, the site acquisition should be completed before the execution of the designing.

9-8 Investment Cost

The investment cost has been estimated based on the same assumptions as those for the A-2 IE.

The investment cost of the M-2 IE is estimated to be JD 11.69 million. The cost for external facilities to be borne by agencies other than JIEC is JD 3.38 million. Details of the estimate are provided in Table 9-8-1.

Summary of Investment Cost for M-2 IE
(Including Tariff and Sales Tax)
(Unit: Million JD)

	Cost
1. Land acquisition cost	0.12
2. Construction cost	9.30
3. Engineering service cost	0.56
4. Administration cost	0.20
5. Contingency cost	1.51
I. Investment cost for M-2 IE (1+2+3+4+5)	11.69
II. Investment cost for external facilities to be borne by agencies other than JIEC	3.38
Total	15.07

Breakdown of the construction cost is shown below.

Breakdown of M-2 IE Construction Cost
(Including Tariff and Sales Tax)
(Unit: Million JD)

	Local Portion	Foreign Portion	Total
Cut and fill	0.60	0.00	0.60
Flash Flood	0.00	0.00	0.00
Road	0.61	0.00	0.61
Drainage	0.15	0.00	0.15
Water supply	0.32	0.13	0.45
Sewerage	1.41	2.34	3.75
Electric facility	0.32	2.09	2.41
Telephone facility	0.09	0.12	0.21
Park	0.13	0.00	0.13
Administration center	0.14	0.01	0.15
Miscellaneous	0.38	0.47	0.85
Total	4.15	5.16	9.30

The investment cost for the M-2 IE, less tariff, falls to JD 10.69 million. The investment cost for external facilities to be borne by agencies other than JIEC would be JD 2.55 million. Table 9-8-2 provides the details.

Summary of Investment Cost for M-2 IE
(Excluding Tariff, Including Sales Tax)
(Unit: Million JD)

	Cost
1. Land acquisition cost	0.12
2. Construction cost	8.48
3. Engineering service cost	0.51
4. Administration cost	0.20
5. Contingency cost	1.38
I. Investment cost for M-2 IE (1+2+3+4+5)	10.69
II. Investment cost for external facilities to be borne by agencies other than JIEC	2.55
Total	13.24

Breakdown of the construction cost is shown below.

Breakdown of M-2 IE Construction Cost
(Excluding Tariff, Including Sales Tax)
(Unit: Million JD)

	Local Portion	Foreign Portion	Total
Cut and fill	0.60	0.00	0.60
Flash Flood	0.00	0.00	0.00
Road	0.61	0.00	0.61
Drainage	0.15	0.00	0.15
Water supply	0.32	0.12	0.44
Sewerage	1.41	2.34	3.75
Electric facility	0.32	1.39	1.71
Telephone facility	0.09	0.08	0.17
Park	0.13	0.00	0.13
Administration center	0.14	0.01	0.15
Miscellaneous	0.38	0.39	0.77
Total	4.15	4.33	8.48

9-9 Institutional Framework for Execution and Management of the Industrial Estate

(1) Organization in charge of execution and management

As the execution and management body of the industrial estate, JIEC is regarded to be the most appropriate organization for its experiences and achievement of development of industrial estates. Moreover, it seems that there is no other strong candidate, public or private, comparable to JIEC to develop an industrial estate of public nature at this site with limited industrial accumulation.

(2) Division of responsibilities and cost bearing

Division of responsibilities and cost bearing among relevant organizations for major task items related to construction and management of facilities are in a similar way to the A-2 IE except that roles of ARA in the A-2 IE should be played by relevant utility agencies or local governments.

Regular payment for major facilities is made also as in the case of A-2 IE after the commencement of the operation.

(3) Administration and ancillary functions

The indicative number of staff for administration of the estate is estimated to be approximately 20 as shown in Table 9-9-1, based on the data of the two existing estates.

A committee should be organized to coordinate activities of the industrial estate, involving representatives of the investors and concerned public agencies.

Ancillary functions to support the industries in the estate should also be located in the ancillary buildings.

9-10 Project Evaluation

9-10-1 Financial Evaluation

The financial evaluation of the development of the M-2 IE project was conducted from the point of view of JIEC, the expected executive agency of the project.

(1) Capital cost

The total construction cost including custom duty and sales tax was estimated at JD 11.7 million covering the IE construction cost of JD 11.6 million and the land acquisition cost of JD 0.1 million. The total cost includes a foreign currency portion of JD 6.4 million (US\$9.0 million equivalent). The outsider agency costs for infrastructures of JD 3.4 million is not included in the above amount.

(2) Operation and maintenance (O&M) costs

The same percentage rates of O&M costs to the construction costs of each facility and equipment were applied as those applied for the A-2 IE project.

(3) Replacement cost

The replacement was considered for the water supply facilities and the sewerage plant in the 26th year from their operation start. These were incorporated in the cash flow of FIRR computation table. Other replacements were, due to the length of their economic life, not considered during the evaluation period of 35 years.

(4) Land acquisition

The land with a gross area of 80 ha was assumed to be purchased in 1998 in this Study. The unit price of the land was assumed at JD0.15 /m² in this study.

(5) Revenue

The revenue will be is accrued from the selling and leasing of the factory lots. The selling price of factory lots was set at JD20.0 /m² and the lease rate was set at JD2.0 /m²/year in this study.

(6) FIRR computation

Based on the cost and benefit stated above, the FIRR was calculated for the evaluation period of 35 years as shown in Table 9-10-1 and 9-10-2.

For the generation of benefit, it was assumed that factory lots will be fully sold out within five (5) years after their completion at cumulative rates of 30%, 50%, 70%, 90% and 100% in each year.

The result of computation shows a FIRR of 1.5% for the cost including custom duty and sales tax and 3.1% for the cost including sales tax only. As mentioned in the financial evaluation of the A-2 project, it is desirable that the FIRR value of a project exceed the range from 5.0 to 10.0 % in Jordan in recent years. As presented in this section, the FIRRs for both cases are less than this range.

(7) Sensitivity test of FIRR

A sensitivity test was conducted for the derived two (2) FIRRs by varying both the cost and benefit by 10%. The results are as shown below.

- FIRR with costs including custom duty & sales tax

	cost +10%	cost normal	cost -10%
benefit -10%	N.A.	N.A.	1.5
benefit normal	N.A.	1.5	3.7
benefit +10%	1.5	3.5	5.8

- FIRR with costs including sales tax

	cost +10%	cost normal	cost -10%
benefit -10%	N.A.	0.7	3.1
benefit normal	1.0	3.1	5.4
benefit +10%	3.1	5.2	7.5

Remarks; 1) N.A. stands for "not available".

2) Unit benefit for normal conditions:

- Selling price : JD 20.0/m²

- Lease rate : JD 2.0/m²/year

Under the most advantageous conditions in which cost was reduced by 10% and the benefit was increased by 10%, the FIRR values for the two cases are raised to reach the desired range.

A more drastic change was assumed in the tables below in which the selling price of factory lot was set at JD25 /m² and both the cost and benefit were varied by 20%.

- FIRR with costs including custom duty & sales tax

	cost +20%	cost normal	cost -20%
benefit -20%	N.A.	1.5	6.2
benefit normal	2.3	6.2	11.4
benefit +20%	6.2	10.4	16.2

- FIRR with costs including sales tax

	cost +20%	cost normal	cost -20%
benefit -20%	N.A.	3.1	8.0
benefit normal	4.0	8.0	13.5
benefit +20%	8.0	12.5	18.8

Remarks; 1) N.A. stands for "not available".

2) Unit benefit for normal conditions:

- Selling price : JD 25.0/m²
- Lease rate : JD 2.5/m²/year

Under the conditions in which cost was reduced by 20% or the benefit was increased by 20%, some FIRR values exceed 10%.

Meanwhile, an examination was made to find out what level of selling price can make a FIRR 10%. For the cost including custom duty and sales tax, the FIRR can reach 10% by the selling price of JD29.2 /m² (equalizing rate). And for the cost including sales tax only, the FIRR can reach 10% by the selling price of JD27.3 /m².

9-10-2 Economic Evaluation

(1) Criteria for economic evaluation

The economic evaluation of the M-2 IE project was conducted from the point of view of the Jordan's socio-economy as a whole by the criteria of EIRR. The market price was adopted as the substitute for willingness-to-pay (WTP) of purchasers and was considered as the economic benefit of the project.

(2) Economic cost

The economic cost of the M-2 IE project was estimated based on the financial cost including neither custom duty nor sales tax.

The same assumptions as being made for the A-2 IE project were adopted for the M-2 IE project including the standard conversion factor, shadow wage rate, the value of land and the inclusion of the outsiders cost for infrastructure facilities.

(3) Economic benefit

The WTP index of a factory lot in the M-2 IE was assumed at JD20.0 /m² which was considered as the market selling price of the M-2 factory lots, being adopted as the unit economic benefit in the economic evaluation of the project.

(4) EIRR computation

The result of computation of EIRR is shown in Table 9-10-3 and an EIRR of 6.3% was derived.

As stated in the A-2 IE project evaluation, it is desirable that EIRR lie or exceed the range from 5 to 10% for a project to be justified in Jordan. The above computed EIRR shows that M-2 IE is economically viable from the point of view of the Jordan's socio-economy as a whole.

9-10-3 Socio-economic Evaluation

(1) Prospects for employment creation and resulting population increase

In Table 9-10-4, the expected number of employees in the M-2 IE are calculated as 4,526, based on the data from the Industrial Survey 1993 and the Investment Demand Survey conducted in this Study. It should be noted that this numbers will be realized only when all available spaces in the M-2 IE with 80 ha are sold or leased to the relevant industries and they build factories, employ necessary employees and start operation at a full capacity. Such a time will be some time after the year 2010.

Based on this number of employees, Table 8-10-10 calculated the expected total population increase resulted from the M-2 IE project as 36,505, based on the following two assumptions:

- 1) For one employment created in the manufacturing sector, about 0.56 employment in the service sector will be created. Since there is no data available in Ma'an to calculate this rate, the rate of 0.56 is borrowed from the rate in Aqaba which is obtained from Aqaba Town Master Plan Review prepared by Aqaba Region Authority. So 4,526 employment in the manufacturing sector will create $4,526 \times 0.56 = 2,535$ employment in the service sector.
- 2) The total number of population increase is calculated by multiplying the total number of new employment created by the M-2 IE project (which is the total of employment in the manufacturing sector and employment in the service sector, that

is, $4,526 + 2,535 = 7,061$) by the dependency rate in Ma'an Governorate (which is the rate of the total population to the employed population). Based on the sampling survey in Employment, Unemployment and Income Survey 1995, the dependency rate in Ma'an is calculated as 5.17. So the total population increase is expected to be $7,061 \times 5.17 = 36,505$. But it should be noted that the dependency rate in future will be less than 5.17, because there will be less unemployment due to jobs in the IE and the employees in the modern manufacturing sector tend to have a smaller number of children. So the projected population increase of 36,505 should be considered as the maximum possibility for the sake of impact assessment.

(2) Impacts of employment creation on vulnerable groups

1) Women

Among the employment created in this IE project, the number of female employees is calculated as 266 in Table 9-10-4, based on the assumption that the proportion of female employees in the total employees will be the same by industry, which is calculated from the data in Industrial Survey 1993. In textile, wearing apparel and industrial chemicals (drugs and medicines) industries, the average percentage of the female workers in the total employees is more than 20%, so 14 companies in wearing apparel industry which will invest in the M-2 IE are expected to hire the total of 135 female employees, while 5 companies in leather industry are expected to hire the total of 99 female employees.

Although this number of female employment sounds small, the impact of these employment on women will not be small, because employment opportunities for women have been limited in the conservative Southern Districts. Since in the Islamic society women have difficulties to live away from their families, the most of female workers will be hired from the locality. This new employment opportunities in the manufacturing sector will surely promote women's participation in the society and enhance women's image as equal partners in Jordan's development.

2) Bedouin

In Ma'an Governorate, about 50% of population is considered as Bedouins, which means there are about 40,000 Bedouins scattering mostly in the desert area (Badia) of the 33,163 km². The most of Bedouin population settle down in villages such as Al-Jafr, Al-Mreiqa, Ail, Adruh, Al-Huseinia, Al-Sadqa, Basta, Baer Al-Dabaqat and Al-Fardakh, and only a few families come near Ma'an City for grazing. The settled Bedouins usually move from one place to another place for grazing during the summer, and settle down in

villages for harvesting during the winter. So the loss of grazing land by establishment of the M-2 IE with 80 ha will have the minimal impacts to the Bedouin families, because 80 ha is relatively small area compared with the whole grazing area and the area of the M-2 IE does not have any water well nor have significant number or species of fodder for their livestock.

These days many Bedouin families choose to settle down and look for job opportunities, so employment opportunities created by the M-2 IE project will be very attractive. Bedouin people traditionally tend to prefer jobs like guards and drivers, but since young generation of Bedouins becomes educated, they may have a good chance of getting other types of jobs. More importantly, support to the settled Bedouin families is very important in order to improve their education and health status, and ultimately increase their income generation opportunities. Especially education of Bedouin women is very much needed to enhance their living conditions, because many Bedouin women suffer from illiteracy and ignorance.

Since the M-2 IE is not frequently used by Bedouin people, the companies in the IE will not feel any pressure from the Bedouin to employ unnecessary number of them. But it will be wise for the companies investing in the IE to help to improve the socio-economic conditions of Bedouin people living near the IE by financially and technically supporting Queen Alia Fund's (QAF's) programs to educate Bedouin people, especially females, and help them generate incomes, rather than hiring unnecessary workers. In Al-Sadqa, QAF conducts a rug weaving project using Bedouin women's traditional skill to weave the rug. QAF now markets their products mainly at Ma'an and Amman, but they hope the creation of the M-2 IE will increase the demand for their rugs and other products in Ma'an so that Bedouin people can benefit from this project.

(3) Impacts of population increase on social infrastructure

Projected population increase of 36,505 some time after the year 2010 resulted from the M-2 IE project may sound a big number to a small city of Ma'an which now has a population of about 40,000. Although Ma'an Governorate does not have a long-term housing development plan to cope with this magnitude of population increase, there is still enough time for Ma'an Governorate to study the future balance between the population increase and the necessary housings as well as housing-related infrastructure such as roads, water, electricity, sewage, phones, etc. So it is advised that Ma'an Governorate, in collaboration with Department of Housing and Urban Development, should make a long-term plan to increase the housing capacity in accordance with the projected population increase.

9-10-4 Environmental Evaluation

Environmental impacts from the proposed project were assessed and evaluated for environmental elements that were chosen in the Section 7-4-1(1). In the assessment process, firstly future environmental goal for the particular environmental elements are set. Then, the present and future conditions in the proposed area are studied based on literatures and field survey. Thirdly, the present condition in the Amman Industrial Estate and the performance of environmental management of the factories in the similar categories of industries to be located are studies. Combining the findings in Amman and expected future condition of the proposed project area, environmental impacts from the proposed development and industries are estimated. In conclusion, environmental impacts are evaluated by comparing the future environmental goal and estimated impact.

Among the environmental elements chosen in the Section 7-4-1(1), those related to social impacts are assessed in the previous section.

(1) Possible impacts and environmental goals

The development of the M-2 IE will alter the natural vegetation of the 80 ha site. The possible emission of air pollutants, water pollutants and solid wastes from industries expected to be located are listed in the following table. The development will also generate traffic for commuters, loading and unloading products and wastes.

	Possible gaseous emission, noise, vibration	Generation of liquid waste	Generation of solid waste
Wearing apparel			fabric, thread
Leather products			leather pieces
Wood & cork furniture	odor from paints, solvents, adhesives noise	solvents	wood chips
Glass & non-metal mineral	Cd, Fu, Pb, soot	SS, pH	glass chips, ceramic chips
Transport Equipment	noise	solvents, oil, soda	metal chips
Waste water treatment plant	odor	(treated water to be used for irrigation)	sludge

For the assessment of significance of those impacts, future environmental goals for each environmental element are set and listed in the following table. Those goals aim that the development does not create negative impacts on local natural environment.

Possible Impacts	Future Goals
Disposal of industrial wastes	Appropriate treatment and disposal measures to be taken for municipal and special wastes generated at the Industrial Estate
Possible flood damage	No short-term, long-term impacts from floods
Loss of flora and fauna	No extinction of significant flora, fauna and habitat

(2) Impact assessment

1) Waste generation

According to the Municipal Waste Management Study by JICA in 1996, Ma'an Final Disposal Site is located about 15 km east of Ma'an City. It has a design capacity of 1,250,000 m³ and scheduled to be in operation until the year 2033. The study reports that the condition at the site is the best among the facilities studied in the report, where day-to-day cover of wastes is executed.

By the development of the IE, the amount of wastes received at the Disposal Site will increase. The site has sufficient design capacity and excellent operation: there is no need for urgent extension or operational improvement.

Regarding the management of hazardous wastes such as solvents, the time frame for the completion of the central disposal facility is currently unknown. There is possibility for uncontrolled illegal disposal of hazardous wastes when JIEC and Ma'an City do not provide proper guidance and control.

From the above discussion, it is concluded that the future environmental goal will be achieved except the issue with hazardous wastes.

2) Flood damage

The area the IE is located has several small wadis running eastward and is covered with shallow alluvium consisting of sand and gravel. There are lots of gravel of 15 cm to 25 cm in diameter probably brought by the flood flow.

The site of the IE is decided so that it does not include relatively large wadis in the area. The gravel observed in the site are mostly set in hard alluvium and no sign of recent water flow was observed. Also, the wadis are divided into many branches and it is assumed that flood flows in the area are mainly shallow and velocity is low.

From the above discussion, the future environmental goal is expected to be achieved.

3) Loss of flora and fauna

Even though grazing activity was observed in the area, the area around the IE site supports very scattered vegetation. The vegetation type is typical of the Saharo-Sudanian climate that spreads in the wide area along the Desert Highway. Therefore the impacts of the IE development on the existing flora and fauna will be negligible.

9-10-5 Overall Evaluation

Though the indices for the financial and economic viability are not high, they could be upgraded if selling price/leasing rate is raised and cost is reduced. Meanwhile, considerable socio-economic benefit including employment generation can be expected while no serious environmental impact is anticipated.

It is recommended that the industrial development including the construction of the recommended the A-2 IE in Aqaba be closely monitored and decision be made whether or not the M-2 IE be implemented together with its timing for implementation, considering the function of Ma'an for supporting Aqaba and their close industrial linkage expected in the coming years.

Table 9-3-1 Development Area of M-2 Industrial Estate by Categories of Industry

ISIC	Industrial Category	/1		/1		/2		Total	(Nos. of Factory Lot)
		Jordanian Demand	(Nos. of Factory Lot)	Foreign Demand	(Nos. of Factory Lot)	Additional Demand	(Nos. of Factory Lot)		
31	Food, Beverage and Tobacco								
311/312	Food manufacturing								
313	Beverage								
32	Textile, Apparel & Leather								
321	Textile								
322	Wearing Apparel	2.4	(12)			0.4	(2)	2.8	(14)
323	Leather Products	20.0	(4)			5.0	(1)	25.0	(5)
33	Wood and Wood Products								
331/332	Wood & Cork Furniture	10.0	(1)					10.0	(1)
34	Paper Products								
341	Paper								
342	Printing								
35	Chemicals								
351	Chemical								
356	Plastic Products								
36	Non metallic Mineral Products								
362/369	Glass & Non-Metal Mineral	16.8	(14)			3.2	(4)	20.0	(18)
38	Fabricated Metal, Machinery								
381	Fabricated Metal								
382	Machinery								
383	Electrical Machinery								
384	Transport Equipment			5.0	(5)	1.0	(1)	6.0	(6)
385	Professional Equipment								
	Total	49.2	(31)	5.0	(5)	9.6	(8)	63.8	(44)
	Gross Development Area (ha)							80.0	

/1 Refer to Table 7-3-3

/2 It is presumed that about 20% or 9.6 ha of the demanded area can be added to the demand identified by the investment demand survey.

Table 9-4-1 Land Use Plan of M-2 IE

	Area (ha)	(%)
1.Factory lot	63.8	79.8
2.Road	6.8	8.5
1) Main Road(22.0m)	1.3	
2) Collector Road(18.0m)	5.5	
3.Utility	2.1	2.6
1) Water supply facility	0.4	
2) Sewage treatment plant	1.2	
3) Electric facility	0	
4) Communication facility	0.5	
4.Administration center	1.4	1.8
5.Park	1.9	2.3
6.Others	4.0	5.0
1) Buffer zone(10.0)	3.9	
2) Pedestrian(6.0m)	0.1	
Total	80.0	100.0

Table 9-8-1 Investment Costs for M-2 IE
(inclusion of custom duties and general sales tax)

Unit: JD 1,000

Item	Local	Foreign	Total	Other agency	(%)
(1) Land acquisition cost	120	0	120	0	(0)
(2) Compensation cost	0	0	0	0	(0)
(3) Construction cost					
3-1 Cut and fill	600	0	600		(0)
3-2 Flash Flood	0	0	0	0	(0)
3-3 Road	609	0	609	0	(0)
3-4 Drainage	148	0	148	0	(0)
3-5 Water supply					
1) Conveyance pipe	31	32	63	630	(91)
2) Distribution pipe	90	93	183	0	(0)
3) Reservoir	196	8	204	0	(0)
3-6 Sewerage					
1) Sewer	146	0	146	0	(0)
2) Sewage treatment	1,260	2,340	3,600	0	(0)
3-7 Electric facility					
1) Distribution system	321	2,094	2,415	0	(0)
2) Extension of existing substation	0	0	0	1,587	(100)
3) Transmission line	0	0	0	696	(100)
3-8 Telephone facility	90	118	208	159	(43)
3-9 Park	133	0	133	0	(0)
3-10 Administration center	142	8	150	0	(0)
3-11 Miscellaneous (10%)	377	469	846	307	(27)
Sub-total (3)	4,143	5,162	9,305	3,379	(27)
(4) Engineering services	112 ^{*1}	446 ^{*2}	558 ^{*3}	0	-
(5) Administration cost	200	0	200	0	-
(6) Contingency ((3)+(4)+(5)) x 15%	668	841	1,509	0	-
Total Construction Cost ((3)+(4)+(5)+(6))	5,123	6,450	11,572	3,379	(23)
Total of the foreign portion in US\$ (1,000)	-	9,094	-	-	-

Remarks: *3=Subtotal(3) x 6%, *1=*3 x 20%, *2=*3 x 80%

Total construction cost	Total	include other agency	Total construction cost	Total	include other agency
net: JD/sq.m =	18.14	23.44	net: US\$/sq.m =	25.58	33.04
gross: JD/sq.m =	14.47	18.69	gross: US\$/sq.m =	20.40	26.35

Table 9-8-2 Investment Costs for M-2 IE
(exemption from custom duties and inclusion of general sales tax)

Unit: JD 1,000

Item	Local	Foreign	Total	Other agency	(%)
(1) Land acquisition cost	120	0	120	0	(0)
(2) Compensation cost	0	0	0	0	(0)
(3) Construction cost					
3-1 Cut and fill	600	0	600		(0)
3-2 Flash Flood	0	0	0	0	(0)
3-3 Road	609	0	609	0	(0)
3-4 Drainage	148	0	148	0	(0)
3-5 Water supply					
1) Conveyance pipe	31	31	62	617	(91)
2) Distribution pipe	90	87	177	0	(0)
3) Reservoir	196	8	204	0	(0)
3-6 Sewerage					
1) Sewer	146	0	146	0	(0)
2) Sewage treatment	1,260	2,340	3,600	0	(0)
3-7 Electric facility					
1) Distribution system	321	1,396	1,717	0	(0)
2) Extension of existing substation	0	0	0	1,075	(100)
3) Transmission line	0	0	0	497	(100)
3-8 Telephone facility	90	78	168	131	(44)
3-9 Park	133	0	133	0	(0)
3-10 Administration center	142	5	147	0	(0)
3-11 Miscellaneous (10%)	377	395	771	232	(23)
Sub-total (3)	4,143	4,340	8,482	2,552	(23)
(4) Engineering services	102 ^{*1}	407 ^{*2}	509 ^{*3}	0	-
(5) Administration cost	200	0	200	0	-
(6) Contingency ((3)+(4)+(5)) x 15%	667	712	1,379	0	-
Total Construction Cost ((3)+(4)+(5)+(6))	5,111	5,458	10,570	2,552	(19)
Total of the foreign portion in US\$ (1,000)	-	7,696	-	-	-

Remarks: *3=Sub-total(3) x 6%, *1=*3 x 20%, *2=*3 x 80%

Total construction cost	Total	include other agency	Total construction cost	Total	include other agency
net: JD/sq.m =	16.57	20.57	net: US\$/sq.m =	23.36	29.00
gross: JD/sq.m =	13.21	16.40	gross: US\$/sq.m =	18.63	23.13

Table 9-9-1 Number of Staff for Administration at M-2 Industrial Estate

Tasks	No. of Staff
1. Overall management & office administration	7
- General manager (1)	
- Information specialist (1)	
- Clerks (1)	
- Secretary (1)	
- Drivers (1)	
- Laborers(2)	
2. Accounting & financial management	2
- Director / accountant (1)	
- Secretary (1)	
3. Promotion of investment	2
- Director (1)	
- Clerk (1)	
4. Water supply & waste water treatment	2
- Director / engineer (1)	
- Technician (1)	
5. Environmental protection	2
- Director / engineer (1)	
- Technician (1)	
6. Maintenance	3
- Technicians (2)	
- Laborer (1)	
7. Planting	2
- Technician (1)	
- Laborer (1)	
Total	20

Table 9-10-1 Computation of FIRR for M-2 IE Project
(With costs including custom duty and sales tax)

No.	Year	Capital Cost (JD10 ³)	O&M Costs		Land Cost (JD10 ³)	Total Cost (JD10 ³)	Land for Sale (sqm.)	Land for Lease (sqm.)	Benefit		Total Benefit (JD10 ³)	B - C (JD10 ³)
			O & M Costs (JD10 ³)	Personnel Cost (JD10 ³)					Selling (JD10 ³)	Leasing (JD10 ³)		
1	1998	186			120	306					0	-306
2	1999	3,857				3,857					0	-3,857
3	2000	7,529				7,529					0	-7,529
4	2001		73	27		100	9,5700	9,5700	1,914	191	2,105	2,006
5	2002		122	45		166	63800	159500	1,276	319	1,595	1,429
6	2003		170	62		232	63800	223300	1,276	447	1,723	1,490
7	2004		219	80		299	63800	287100	1,276	574	1,850	1,551
8	2005		243	89		332	319000	319000	638	638	1,276	941
9	2006		243	89		332		319000		638	638	306
10	2007		243	89		332		319000		638	638	306
11	2008		243	89		332		319000		638	638	306
12	2009		243	89		332		319000		638	638	306
13	2010		243	89		332		319000		638	638	306
14	2011		243	89		332		319000		638	638	306
15	2012		243	89		332		319000		638	638	306
16	2013		243	89		332		319000		638	638	306
17	2014		243	89		332		319000		638	638	306
18	2015		243	89		332		319000		638	638	306
19	2016		243	89		332		319000		638	638	306
20	2017		243	89		332		319000		638	638	306
21	2018		243	89		332		319000		638	638	306
22	2019		243	89		332		319000		638	638	306
23	2020		243	89		332		319000		638	638	306
24	2021		243	89		332		319000		638	638	306
25	2022		243	89		332		319000		638	638	306
26	2023	2,350	243	89		2,682		319000		638	638	-2,044
27	2024		243	89		332		319000		638	638	306
28	2025		243	89		332		319000		638	638	306
29	2026		243	89		332		319000		638	638	306
30	2027		243	89		332		319000		638	638	306
31	2028		243	89		332		319000		638	638	306
32	2029		243	89		332		319000		638	638	306
33	2030		243	89		332		319000		638	638	306
34	2031		243	89		332		319000		638	638	306
35	2032		243	89		332		319000		638	638	306
NPV (10%) =						11,361					7,695	-3,666
Notes:											FIRR=	1.5%

- 1) The cost is estimated based on 1996 constant prices including the custom duty and sales tax.
- 2) O&M: Operation and maintenance

Table 9-10-2 Computation of FIRR for M-2 IE Project
(With costs including sales tax)

No.	Year	O&M Costs				Benefit				Total Benefit	B - C		
		Capital Cost	O & M Costs	Personnel Cost	Land Cost	Total Cost	Land for Sale	Land for Lease	Selling			Leasing	
		(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	(sqm.)	(sqm.)	(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	
1	1998	170			120	290					0	-290	
2	1999	3,524				3,524					0	-3,524	
3	2000	6,878				6,878					0	-6,878	
4	2001		67	27		93	95700	95700	1,914	191	2,105	2,012	
5	2002		111	45		155	63800	152500	1,276	319	1,595	1,440	
6	2003		155	62		218	63800	223300	1,276	447	1,723	1,505	
7	2004		200	80		280	63800	287100	1,276	574	1,850	1,570	
8	2005		222	89		311	31900	319000	638	638	1,276	965	
9	2006		222	89		311		319000		638	638	327	
10	2007		222	89		311		319000		638	638	327	
11	2008		222	89		311		319000		638	638	327	
12	2009		222	89		311		319000		638	638	327	
13	2010		222	89		311		319000		638	638	327	
14	2011		222	89		311		319000		638	638	327	
15	2012		222	89		311		319000		638	638	327	
16	2013		222	89		311		319000		638	638	327	
17	2014		222	89		311		319000		638	638	327	
18	2015		222	89		311		319000		638	638	327	
19	2016		222	89		311		319000		638	638	327	
20	2017		222	89		311		319000		638	638	327	
21	2018		222	89		311		319000		638	638	327	
22	2019		222	89		311		319000		638	638	327	
23	2020		222	89		311		319000		638	638	327	
24	2021		222	89		311		319000		638	638	327	
25	2022		222	89		311		319000		638	638	327	
26	2023	2,350	222	89		2,661		319000		638	638	-2,023	
27	2024		222	89		311		319000		638	638	327	
28	2025		222	89		311		319000		638	638	327	
29	2026		222	89		311		319000		638	638	327	
30	2027		222	89		311		319000		638	638	327	
31	2028		222	89		311		319000		638	638	327	
32	2029		222	89		311		319000		638	638	327	
33	2030		222	89		311		319000		638	638	327	
34	2031		222	89		311		319000		638	638	327	
35	2032		222	89		311		319000		638	638	327	
NPV (10%) =						10,452						7,695	-2,757
Notes:												FIRR=	3.1%

Notes:

- 1) The cost is estimated based on 1996 prices including the sales tax.
- 2) O&M: Operation and maintenance

Table 9-10-3 Computation of EIRR for M-2 IE Project

No.	Year	Capital Cost (JD10 ³)	O&M Costs		Total Cost (JD10 ³)	Land for Sale (sqm.)	Land for Lease (sqm.)	Benefit		Total Benefit (JD10 ³)	B - C (JD10 ³)
			O & M Costs (JD10 ³)	Personnel Cost (JD10 ³)				Selling (JD10 ³)	Leasing (JD10 ³)		
1	1998	145			145					0	-145
2	1999	3,633			3,633					0	-3,633
3	2000	7,121			7,121					0	-7,121
4	2001		13	27	40	95700	95700	1,914	191	2,105	2,066
5	2002		22	45	66	63800	159500	1,276	319	1,595	1,529
6	2003		31	62	93	63800	223300	1,276	447	1,723	1,630
7	2004		39	80	119	63800	287100	1,276	574	1,850	1,731
8	2005		44	89	133	319000	319000	638	638	1,276	1,143
9	2006		44	89	133		319000		638	638	505
10	2007		44	89	133		319000		638	638	505
11	2008		44	89	133		319000		638	638	505
12	2009		44	89	133		319000		638	638	505
13	2010		44	89	133		319000		638	638	505
14	2011		44	89	133		319000		638	638	505
15	2012		44	89	133		319000		638	638	505
16	2013		44	89	133		319000		638	638	505
17	2014		44	89	133		319000		638	638	505
18	2015		44	89	133		319000		638	638	505
19	2016		44	89	133		319000		638	638	505
20	2017		44	89	133		319000		638	638	505
21	2018		44	89	133		319000		638	638	505
22	2019		44	89	133		319000		638	638	505
23	2020		44	89	133		319000		638	638	505
24	2021		44	89	133		319000		638	638	505
25	2022		44	89	133		319000		638	638	505
26	2023	2,021	44	89	2,154		319000		638	638	-1,516
27	2024		44	89	133		319000		638	638	505
28	2025		44	89	133		319000		638	638	505
29	2026		44	89	133		319000		638	638	505
30	2027		44	89	133		319000		638	638	505
31	2028		44	89	133		319000		638	638	505
32	2029		44	89	133		319000		638	638	505
33	2030		44	89	133		319000		638	638	505
34	2031		44	89	133		319000		638	638	505
35	2032		44	89	133		319000		638	638	505
NPV (10%) =					9,469					7,695	-1,774
Notes:										EIRR =	6.3%

1) The economic cost is estimated based on the financial cost of 1996 price level.

2) O&M: Operation and maintenance

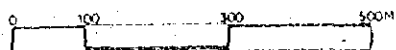
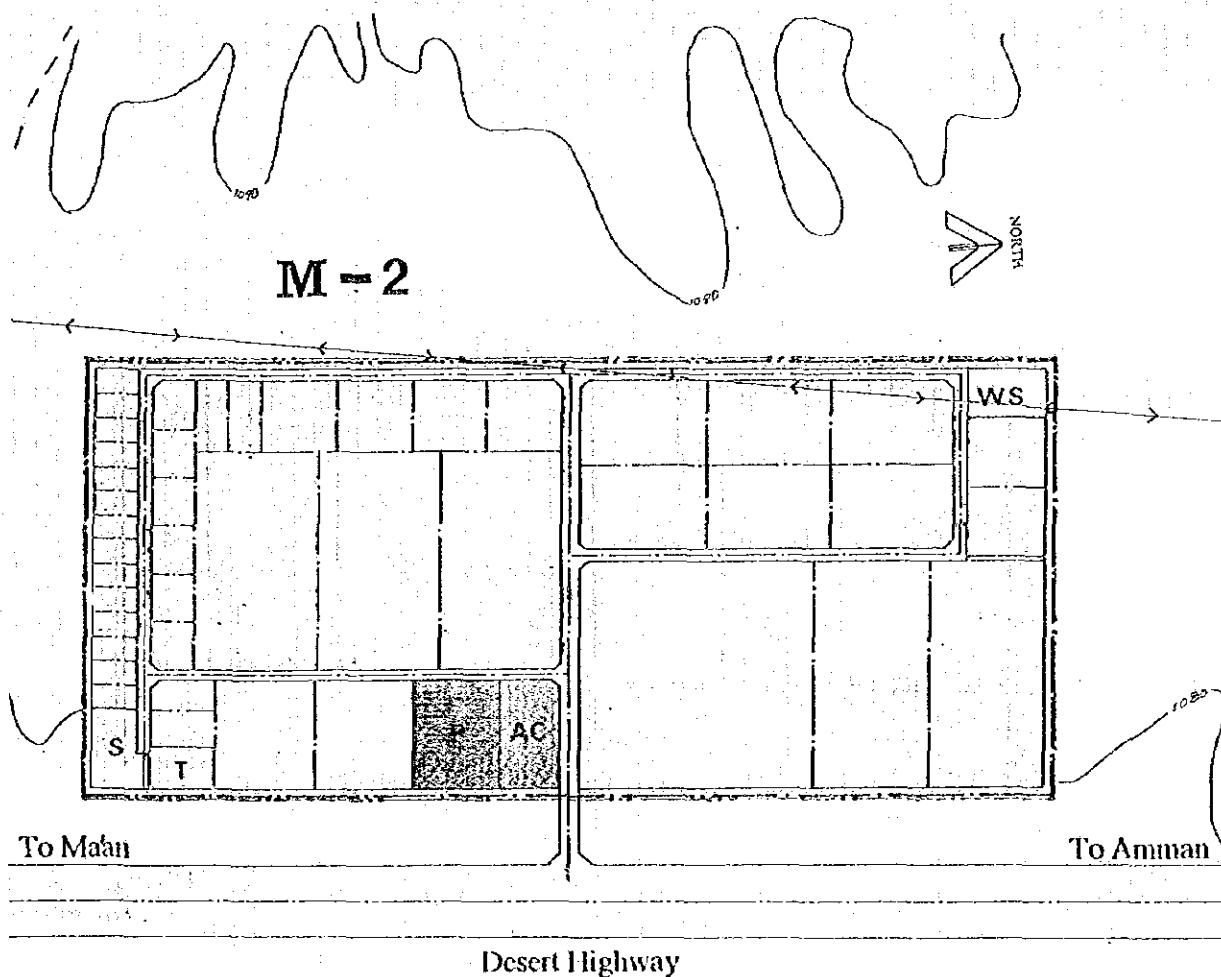
Table 9-10-4 Estimated Number of Employees in M-2 IE

ISIC Code	Industry	No. of employees per ha (persons)	Percentage of female employees (%)	No. of firms (ha)	Factory area (ha)	No. of employees (persons)	No. of female employees (persons)
311+312	Food manufacturing	94	5.0%				
313	Beverage	27	8.6%				
321	Textile	49	24.8%				
322	Wearing apparel	207	23.3%	14	2.8	580	135
323	Leather products	52	7.6%	5	25.0	1,300	99
331+332	Wood & w. products	117	0.7%	1	10.0	1,170	8
342	Printing	333	3.5%				
351+352	Industrial chemicals	75	20.3%				
356	Plastics	33	3.8%				
36-	Glass & non-metal	57	0.8%	18	20.0	1,140	9
381	Fabricated metals	138	1.1%				
382	Machinery	93	2.7%				
383	Electrical machinery	160	8.1%				
384	Transport equipment	56	4.3%	6	6.0	336	14
Total				44	63.8	4,526	266

Source: Industrial Survey 1993 (Department of Statistics, 1994)

Note:

- (1) "No. of employees per ha" and "Percentage of female employees" are calculated from the data in Industrial Survey 1993.
- (2) "No. of firms" and "Factory area (net)" are obtained from the Investment Demand Survey by this Study.
- (3) "No. of employees" is calculated by multiplying "No. of employees per ha" by "Factory area (net)".
- (4) "No. of female employees" is calculated by multiplying "No. of employees" by "Percentage of female employees".



LEGEND	
	Factory Lot
	Road
	Administration Center
	Park
	Sport Park
	Water Supply Facility
	Telecommunication Facility
	Electric Facility
	Sewage Treatment Plant
	Buffer Green, Pedestrian Way
	J/E Boundary

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Figure 9-4-1 Land Use Plan of M-2 Industrial Estate

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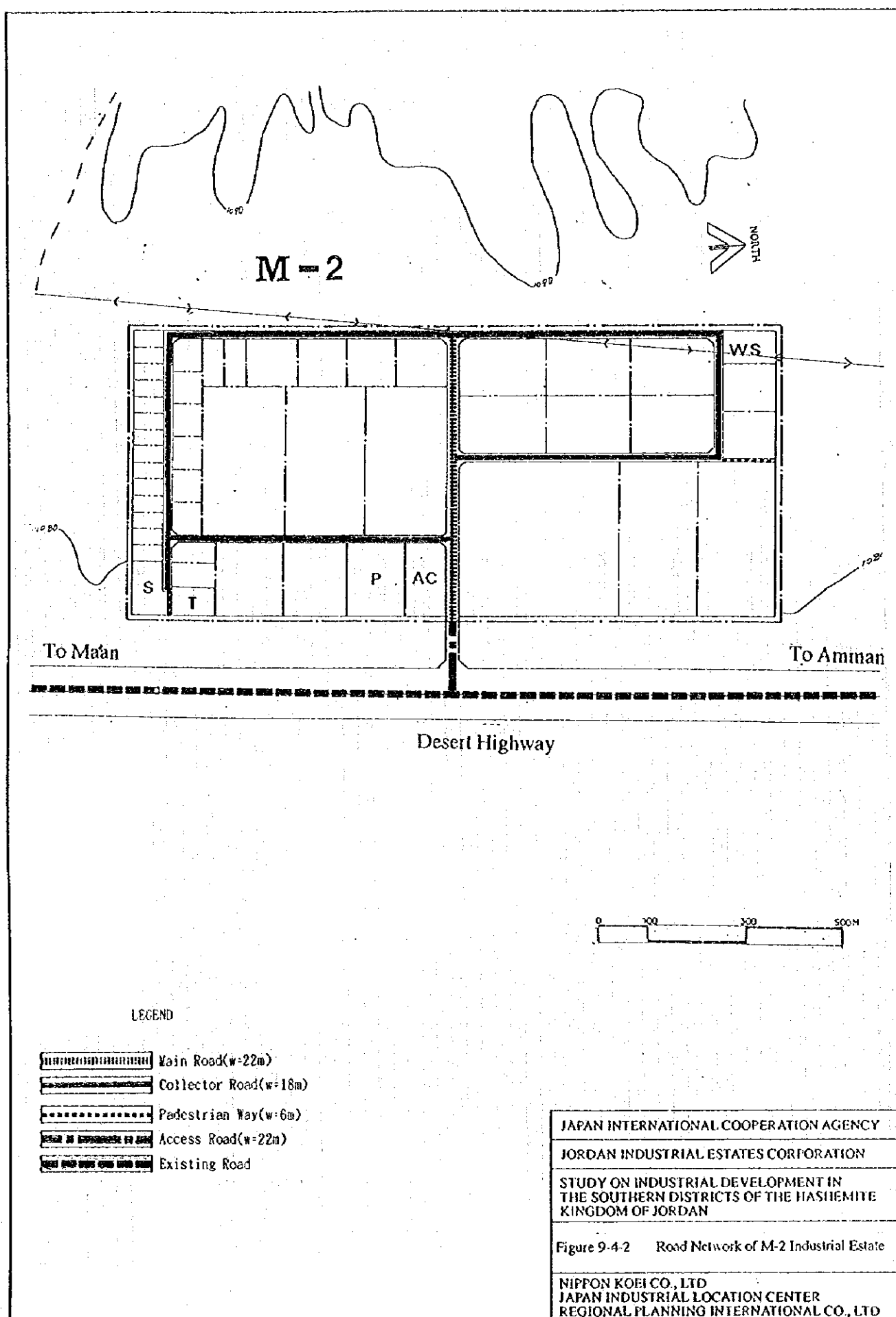
Page 2

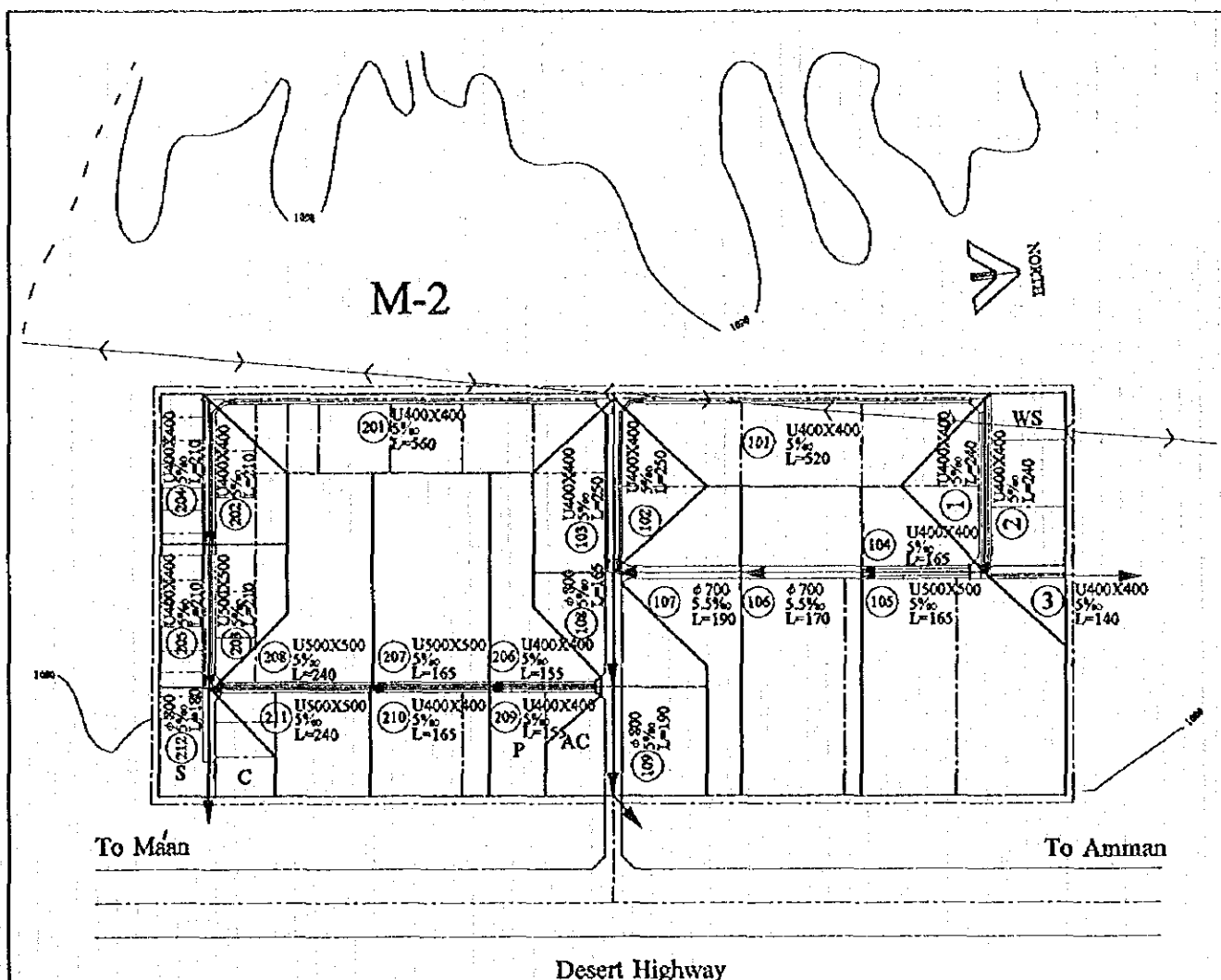


70. Answer

Desert Highway

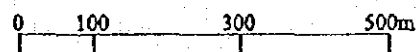
DEPARTMENT OF
ECONOMIC AFFAIRS
ECONOMIC PLANNING COMMISSION





LEGEND

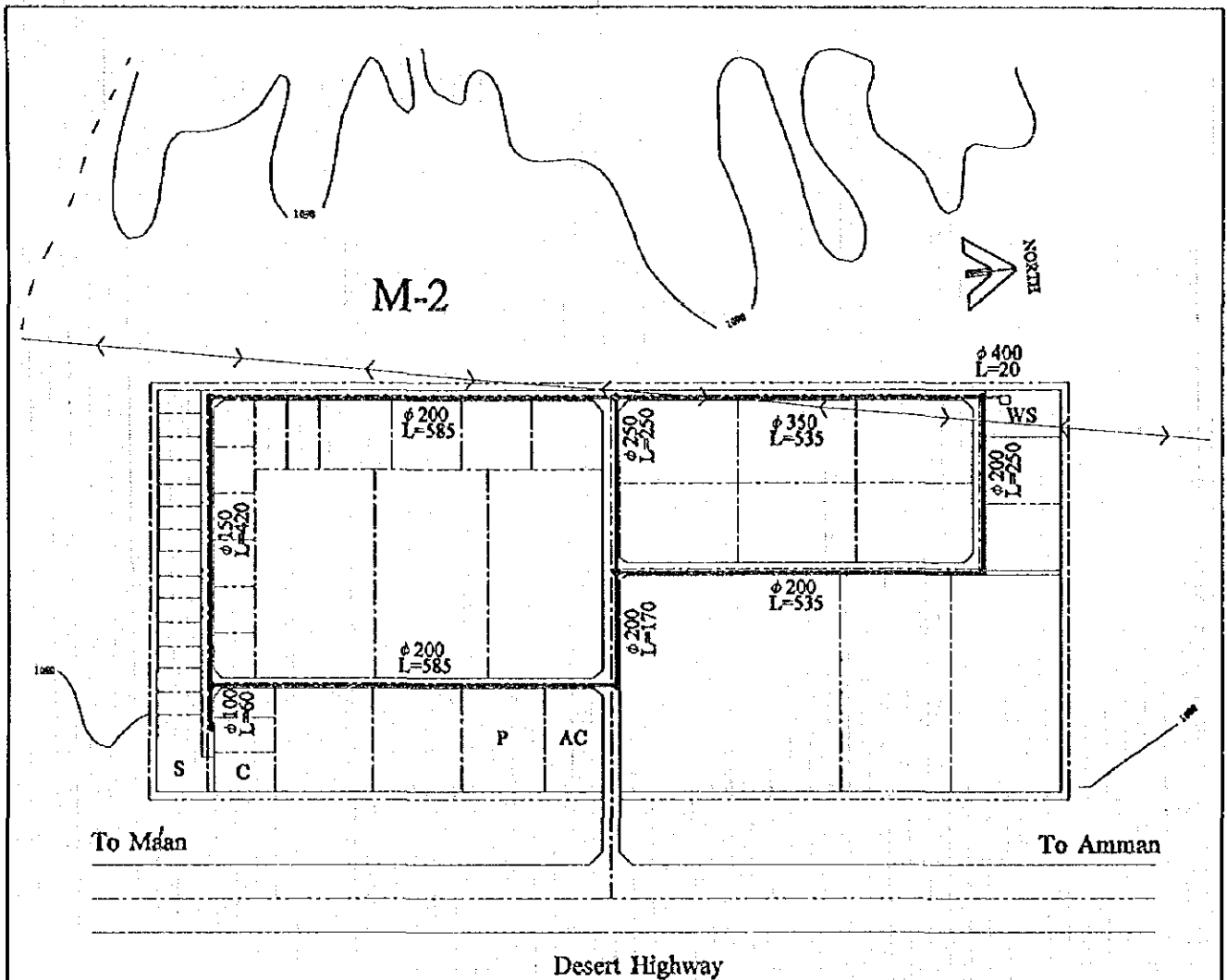
- ① Line Number
- U400X400 U-Section Flume (mm)
- φ 800 Pipe Size (mm)
- 5‰ Slope(1/1000)
- L=200 Pipe Length (m)
- AC Administration Center
- P Park
- WS Water Supply Facility
- C Communication Facility
- S Sewage Treatment Plant
- Drainage Line
- Basin Boundary



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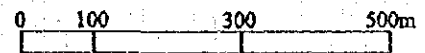
Figure 9-6-1 Drainage System in M-2 Industrial Estate

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 REGIONAL PLANNING INTERNATIONAL CO.,LTD



LEGEND

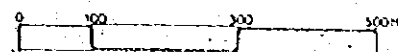
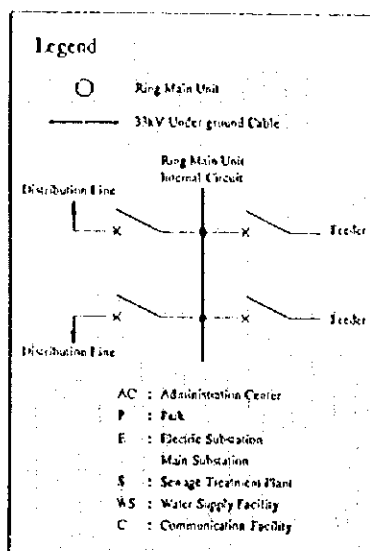
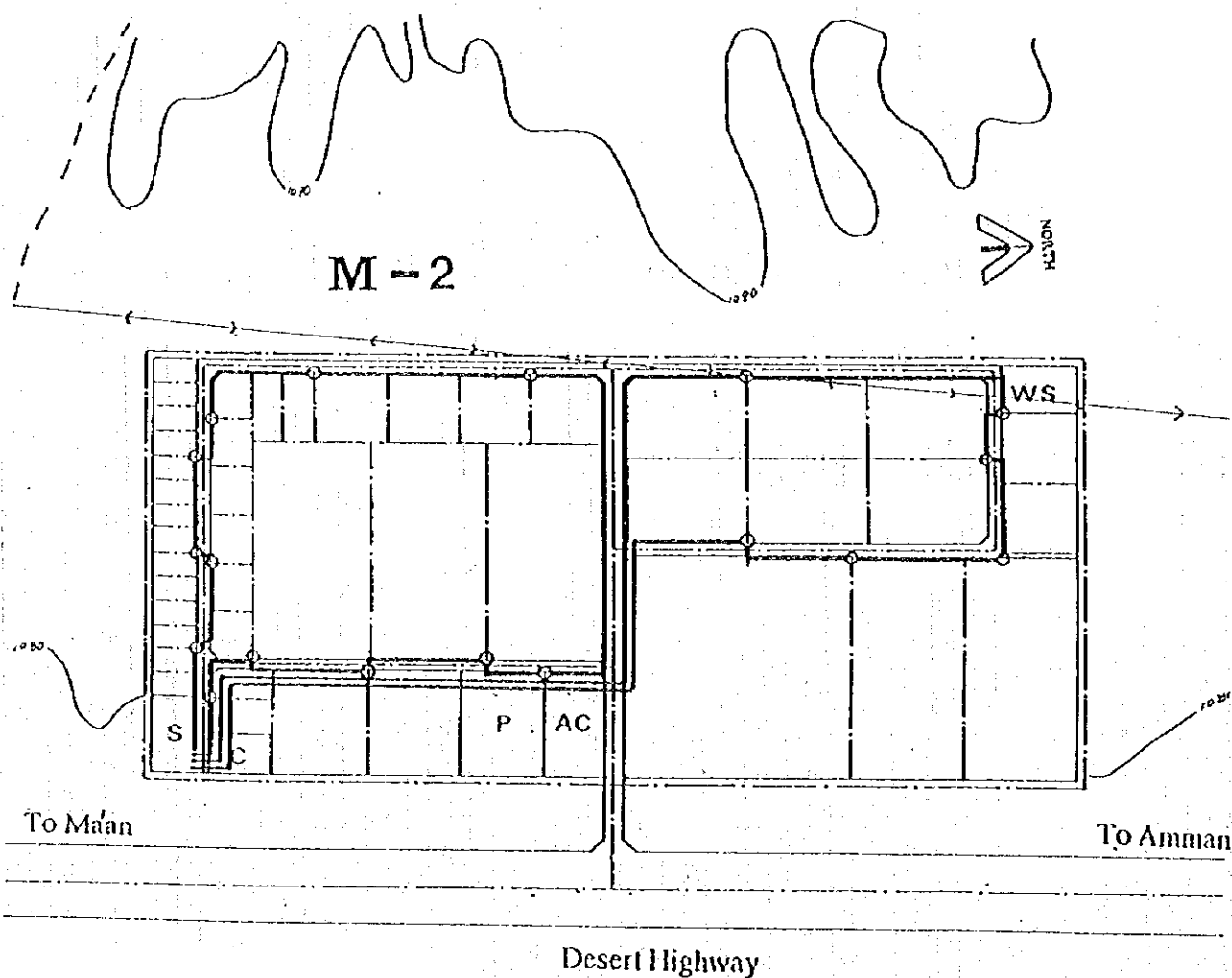
φ 200	Pipe Size (mm)
L=200	Pipe Length (m)
AC	Administration Center
P	Park
WS	Water Supply Facility
C	Communication Facility
S	Sewage Treatment Plant
—	Distribution Pipe



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Figure 9-6-2 Water Supply Networks
 in M-2 Industrial Estate

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Figure 9-6-4
Preliminary Plan of 33 kV Distribution System
in M-2 Industrial Estate

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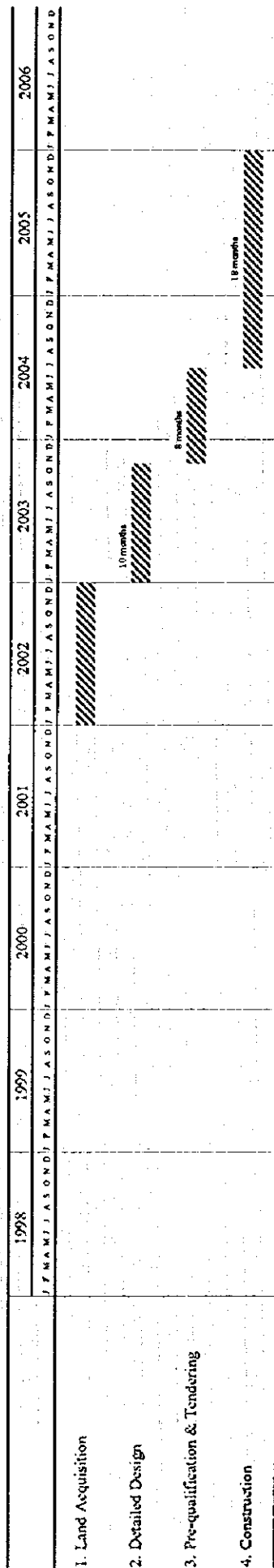


Figure 9-7-1 Overall Implementation Schedule for M-2 IE

1

1

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X. STUDY ON THE PRIORITY PROJECT : T-2

10-1 Outline of the Selected Site : T-2

(1) Location and access

The site of T-2 Industrial Estate (IE) is located in the boundary of Al Hasa mine operated by the Jordan Phosphate Mines Company. It is about 1.5 km east of the Al Hasa interchange of the Desert Highway. The distances from Amman and the Queen Alia International Airport are 125 km and 95 km, respectively. The distance to the Port of Aqaba is 140 km. The Hijaj Railway that connects the site with Ma'an and the port of Aqaba runs between the site and the interchange.

A new arterial road, the Tafila Highway, is under construction, and the construction is planned to be finished by the year 1998. The highway will directly connect Al Hasa and Tafila with a travel distance of 35 km, almost half of the route via Darawish, that is 65 km.

(2) Land use

The site is idle land in the boundary of the Al Hasa mine. The mine is planned to scale down and eventually closed within 10 to 15 years.

There is old Al Hasa town with a population of 2,000 on the southwest of the site. The old town and the site share the same access road from the interchange. On the west side of the Desert Highway, the residential zone for the mine workers is located. There are public facilities such as school, hospital, mosque, shops in the residential zone.

(3) Land ownership

The land of T-2 is owned by the Government.

(4) Topography and geology

The surface geology of the area surrounding the site is the Al Hasa Phosphorite. The topography of the site is flat with small dents at small scale wadis. The sign of recent surface water flow was found in the wadi. The limited section of the bottom of the wadi is covered by alluvial deposit. In some area outside of the site, peat rock covers over the Phosphorite.

The site is generally flat. When land preparation is necessary, heavy machines used in the mine can be utilized.

(5) Water resources

There are twenty-two (22) wells that use aquifer at upper chalk quantity rock in the Al Hasa mine. The depth of the wells varies between 100 m and 210 m. Most of the wells have depth around 150 m. Out of twenty-two, six wells are under operation presently and other sixteen wells are not used. The total subtraction from the six wells is about 5 million m^3 / year. When it is assumed that all the wells have the same capacity and from those which are not in operation the same amount of water can be subtracted, average subtraction per well is 830,000 m^3 / year and the total subtraction from the all twenty- two wells can reach 18.3 million m^3 / year.

When looking at salinity of the ground water in this area, however, large increase of water subtraction may lead a significant salinization and must be avoided. The salinity of ground water (TDS) is usually 500 ppm. But water from one well counts 3,500 ppm and several others counts 1,000 ppm. Small increase will be possible with a careful location plan of the wells.

The community at the west side of the Desert Highway receives water from the mine company. The old Al Hasa town is provided water from the Tafila Water Authority: the amount of water was 123,240 m^3 / year in 1994.

The area has sufficient ground water resource for the size of population and industrial activities. The water supply system of the mine can be utilized in the future.

(6) Electricity

There is a 132 kV transmission line in the site running north to south. The Al Hasa substation is located nearby. On the west side of the Desert Highway, there is a 33 kV electric distribution line in the new community.

For electric supply on the site, two measures are possible. One is to build a new substation on the site using the existing transmission line and the other is to lay a new transmission line or a distribution line from the existing substation.

(7) Natural and social environment

The site is located close to residential areas which are already suffering from dust emission of the mine. It is necessary to prevent pollution such as air pollution and odor to preserve decent living environment in those communities.

10-2 Estimated Investment Demand of T-2 Industrial Estate

Taking economic efficiency into account, the development of T-2 IE is expected in a long term in order to utilize the land of Al Hasa mine and the existing facilities although prospective investors for the T-2 IE is nil at present.

10-3 Development Area and Categories of Industries to be Located and Lot Allocation

As for the T-2 IE, industrial categories to be located is proposed on the basis of the following criteria since the prospective investors for the T-2 IE site is zero at present. Details are shown in Table 10-3-1.

- Appropriate category of industries for the T-2 IE site
- Appropriate category of industries for utilization of adequate water
- Industrial categories to be attracted for the M-2 IE site in consideration of its similar locational conditions as the T-2 IE site

Consequently, the net development area of the T-2 IE is estimated to be about 67.2 ha (gross area : 80 ha) as shown in Table 10-3-1 , and summarized by industrial category below.

Net Development Area for T-2 Industrial Estate

Industrial Category	Net Development Area(ha)	Number of Factory Lot
311/312 Food manufacturing	6.0 (8.9%)	6
313 Beverage	18.0 (26.8%)	6
321 Textile	2.4 (3.6%)	6
322 Wearing apparel	1.2 (1.8%)	6
323 Leather Products	1.2 (1.8%)	6
331/332 Wood & Cork furniture	2.4 (3.6%)	6
351 Chemical	12.0 (17.8%)	6
362/369 Glass & Non-metal mineral	18.0 (26.8%)	18
384 Transport equipment	6.0 (8.9%)	6
Total	67.2(100.0%)	66

10-4 Land Use and Land Preparation

10-4-1 Land Use Plan and Road Plan

(1) Land use

Land use of the T-2 IE has been planned according to the following conditions and basic concept:

- 1) Total area: 80 ha
- 2) Factory lot area: 67.2 ha
- 3) A flat site was selected for the IE to minimize the need for improvement.
- 4) A green belt will be placed around the IE to improve its environment.
- 5) The IE will have a full range of utilities including water supply, sewage treatment, power supply, and telecommunication facilities. The water supply facility should be located at high elevation to facilitate the distribution of water and the sewage treatment facility should be located at low elevation to facilitate collection of sewage by gravity. Power supply facility and telecommunication facility should be located far from each other to prevent mutual interference.
- 6) The T-2 IE will have an administration facility, service facility, and sports facility.

Factory Site Plan

Lot Size (ha/lot)	Number of Factory Lot
3.0	6
2.0	6
1.0	30
0.4	12
0.2	12
Total	66
Factory lot area (ha)	67.2

The land use plan for the T-2 IE is illustrated in Figure 10-4-1 and the planned area distribution of each land category is shown in Table 10-4-1.

(2) Road plan

The T-2 IE will be located in the Al Hasa mine managed by the Jordan Phosphate Mines Company, approximately 1.5 km east of the Al Hasa Interchange on the Desert Highway. A new access road will be constructed from the existing road to the T-2 IE. In the T-2 IE, a main road and collector roads will form the road network. T-shaped

intersections will be adopted in consideration of traffic safety, similar the cases of the A-2 IE and the M-2 IE.

The road network of the T-2 IE is shown in Figure 10-4-2.

The following roads are planned for the T-2 IE:

- Access road	(22.0 m wide, 3 lanes)	Total length: 100 m
- Main road	(22.0 m wide, 3 lanes)	Total length: 760 m
- Collector road	(18.0 m wide, 2 lanes)	Total length: 2,310 m

10-4-2 Land Preparation Plan

The elevation of T-2 IE ranges from 876 m to 887 m above mean sea level. Namely land is relatively flat, with only approximately 11.0 m of difference between the highest and lowest points and a gradient of 1.0 to 1.5% climbing towards the south.

The land preparation plan is prepared based on the same assumptions as those for the A-2 IE. The cut volume will be 400,000 cubic meters, as shown below.

Earthwork Volume		(m ³)
Earth cut volume	400,000	
Earth fill volume	400,000	

10-4-3 Administration Center and Park

(1) Administration center

The administration center will have the core IE facilities shown below.

Industrial Estate Administration Center Facilities Plan			(m ²)
	Floor Area	Land Area	
1. Industrial estate administration building	600	3,500	
2. Customs and police stations	120		
3. Business center (e.g., bank, post office)	300		
4. Business center (social security office, employment office, conference rooms, offices)	330	2,000	
5. Restaurants, retail stores	250		
Subtotal	1,600	5,500	
6. Hospital	-	1,000	
7. Other facilities	-	3,500	
8. Parking lots	-	2,000	
Total	1,600	12,000	

(2) Park

A park with an area of 0.9 ha, accounting for 1.1% of the total industrial estate area, will be constructed. The park will have athletic facilities and a public space.

10-5 Requirement for Utilities/Infrastructures

(1) Drainage

Rainwater in the T-2 IE will be collected by U-section flumes, pipes and box culverts, and then drained off the IE. The expected amount of rainwater would be as follows. As for the rainfall intensity, that at Tafila which is geographically close to the T-2 IE, among the 40 survey point in the report "Rainfall Intensity-Duration Frequency in Jordan" published by the Water Authority in April, 1986 has been used:

- Rainfall intensity 12.8 mm/h
- Return period 10 years

(2) Water supply

The total water demand per day in the T-2 IE should be calculated based on the total site area and the water demand per site area. The water demand per site area is the weighted average of unit water demand for industrial categories to be located in the IE.

The water demand for each industrial category has been determined according to the same report used in 8-5 (2).

The following table shows the water demand for each industrial category.

Water demand per industrial category (T-2)

	Industrial Category	Facto Lot Area (ha)	Unit Water Demand (m ³ /day)	Water Demand (m ³ /day)
311/312	Food Manufacturing	6.0	80	480
313	Beverage	18.0	35	630
321	Textile	2.4	50	120
322	Wearing Apparel	1.2	10	12
323	Leather Products	1.2	20	24
331/332	Wood & Cork Furniture	2.4	25	60
351	Chemical	12.0	50	600
362/369	Glass & Non-metal Mineral	18.0	181	3,258
384	Transport Equipment	6.0	48	288
	Total	67.2	80*	5,376

*: Weighted average of water consumption

From the table above, it is assumed that the water demand per site area in the T-2 IE will be 80 m³/ha/day, and that the total water demand including the demand for an administration center will be 5,400 m³/day.

(3) Sewerage

Sewage and drain water discharged by the factories should be totally treated by the sewage treatment plant in the IE, and the treated water will be used for irrigation of the green belt of the IE. For this purpose, drain pipes will be laid under roads to collect wastewater from each factory and transport to the treatment facility.

The planned treated water volume is 5,400 m³ per day, which is equivalent to the consumption volume.

(4) Electricity

The total power demand for the T-2 IE is the sum of power demand of the factories, administration center, utility facilities, street lighting and park lighting. The unit electric power demand is estimated by referring to the following documents and data:

- Report on the Study for the Current Status of Basic Unit for Industrial Location, March 1996, Japan Industrial Location Center;
- Basic Units for Industrial Estates in Asian Countries; and
- Requirement analyzed through survey results on this study

Estimated on the basis of the unit demand of 320 kW/ha for factories, the total power demand for the T-2 IE would be around 23 MW as shown below.

Electric Demand Projection

	(MW)
Electric Demand	
1. Factory	21.5
2. Administration center	0.4
3. Utility	0.7
4. Street lighting	0.1
5. Park lighting	0.1
Total	22.8

(5) Telecommunications

The telecommunication demand for the T-2 IE is the total of demand of the factories, administration center, water supply plant, sewage treatment plant. The telecommunication demand rates of factories are presumed based on the following data:

- Basic Units for Industrial Estates in Asian Countries; and
- Current demand for the Amman Industrial Estate.

Total telecommunication demand for the T-2 Industrial Estate is estimated to be around 320 lines as shown below.

Telephone Demand Projection

	Area (ha)	No. of Factories	Demand Rate (line/ha)	Demand Rate (line/lot)	Required Demand (lines)	Required Demand (lines)	Required*) Capacity (lines)
	(1)	(2)	(3)	(4)	(5)=(1)x(3)	(6)=(2)x(4)	max(5)/(6)
1. Factory	67.2	66	3	4	202	264	264
2. Administration center							50
3. Water supply plant							3
4. Sewerage treatment plant							3
Total							320

*) The larger demand figures are chosen as required capacities.

10-6 Preliminary Design/Principal Dimensions of the Utilities/Infrastructures

(1) Drainage

1) General

Rainwater in the T-2 IE will be collected by U-section flumes, pipes and box culverts, and then drained off the IE by gravity flow.

The diagram of the rainwater draining facility in the T-2 IE is shown in Figure 10-6-1.

2) Basic conditions

The design criteria and planned facility for the drainage system in the T-2 IE are determined according to the Jordanian and Japanese standards as follows. Rainfall with a 10-year return period is applied in the design of the drainage route.

- | | |
|-------------------------------------|---|
| - Rainfall return period | 10 years |
| - Over land time | 10 minutes |
| - Average flow velocity | 1.5 m/sec |
| - Runoff coefficient | 0.65 |
| - Draining facility | U-section flumes, concrete pipes,
box culverts |
| - Roughness coefficient of concrete | 0.013 |
| - Interval between manholes | 100 m |
| - Rate of discharge formula | Manning's Formula |

3) Outline of drainage

The rainwater draining facility is planned to have the following features:

- | | |
|--------------------|--|
| - U-section flumes | 400 mm x 400 mm - 500 mm x 500 mm,
total length 3,370 m |
| - Concrete pipe | Inner diameter 700 mm -900 mm, total length 1,570 m |
| - Box culvert | 1000 mm x 1000 mm, total length 90 m |

(2) Water supply

1) General

The facility in the IE will be composed of distributing reservoirs, elevated tanks and distributing pipes.

Water will be supplied to the IE from the existing wells of Al Hasa located 3 km east of the IE through a 250 mm-diameter conveyance pipe.

The distribution pipe network in the IE is shown in Figure 10-6-2.

2) Basic conditions

The distributing reservoir will be installed in the highest area within the IE. Water will be distributed from the elevated tank by gravity after pumping from the reservoir.

The design criteria and planned facility of the water facility are determined according to the Jordanian and Japanese standards as follows.

- | | |
|--|---|
| - Volume of reservoir | Equivalent to 24-hour supply to cover the maximum daily demand |
| - Volume of elevated reservoir | Equivalent to 30-minute supply to cover the maximum daily demand |
| - Distributing flow amount | Hourly maximum demand |
| - Time fluctuation coefficient | 3 |
| - Maximum flow velocity in a distributing pipe | 1.5 m/sec |
| - Velocity coefficient | 110 |
| - Pipe type | 50 mm diameter: polyethylene pipe
75 mm diameter or larger: cast iron pipe |
| - Rate of discharge formula | Hazen-Williams Formula |

3) Outline of water supply

The conveyance pipes, reservoir, elevated tank and distributing pipes are planned with the following features:

- | | |
|---|--|
| - Conveyance pipes | 250 mm diameter cast iron pipe
total length 3,800 m |
| - Reservoir capacity | 5,400 m ³ |
| - Elevated tank capacity | 115 m ³ |
| - Distributing pipes | |
| 50 mm diameter polyethylene pipe | total length 120 m |
| 75 mm to 500 mm diameter cast iron pipe | total length 3,160 m |

(3) Sewerage

1) General

Sewage and drain water discharged by the factories will be totally treated by the sewage treatment plant in the IE, and the treated water will be used for irrigation of the green belt of the IE.

Each factory must carry out waste water treatment independently before draining off into the drain water pipes laid in the roads so that the quality of water complies with the industrial wastewater quality standard shown in Table 8-6-1.

The wastewater will be so treated in the sewage treatment plant that the quality of the treated water complies with the quality standard shown in Table 8-6-2 and can be utilized as irrigation water. Sludge remaining in the sewage treatment plant must be buried after sun drying.

The sewage treatment plant will consist of a chamber, aeration tanks, sedimentation basin, chlorine mixing reservoir, sludge thickener, and sludge drying bed.

Figure 10-6-3 shows the sewerage system in the IE.

2) Basic conditions

The sewage treatment plant will be installed in the lowest area within the IE, so that the drain water from each factory will be collected by gravity flow through the pipes laid under the roads.

The long-duration aeration method is proposed for sewage treatment for the following reasons:

- Suitability for a small scale sewage treatment plant
- Water quality complying with the drain water standard
- Dealing effectively with load fluctuation
- Less facility maintenance requirement and, therefore, less cost
- Smaller area requirement than the oxidation ditch method

The planning conditions for the drain and sewage facility were determined according to the Jordanian and Japanese standards as follows:

- Capacity of the sewage disposal plant Maximum wastewater amount per day

- Pipe diameter	To be determined on the basis of maximum wastewater volume per hour
- Time fluctuation coefficient	3
- Pipe margin rate	Pipe diameter 500 mm and smaller: 100%
	Pipe diameter 600 mm and larger: 50%
- Pipe type	concrete pipe
- Roughness coefficient of concrete pipe	0.013
- Interval between manholes	maximum 50 m
- Flow formula	Manning's Formula

3) Outline of sewerage

The wastewater and drain water treatment facility is planned to have the following features:

- Sewage treatment plant 5,400 m³
- Sewerage pipes 200 m - 500 mm diameter concrete pipe total length 2,970 m

(4) Electricity

1) Basic design condition and criteria

Electric power for the T-2 IE will be supplied from the NEPCO's power grid. The power supply system will consist of a distribution system within the IE, and 33 kV distribution lines from Al Hasa Substation.

The system has been designed basically in accordance with the NEPCO's design criteria, aiming to enhance the quality of electricity so as to keep voltage fluctuation within an appropriate range.

2) External power transmission system

The 132 kV transmission line is laid on the east side of T-2 IE, but no distribution line is laid nearby.

The Al Hasa Substation which is one of main 132/33 kV substation is located near the T-2 IE, and supplies power mainly to the Al Hasa mine. Al Hasa Substation consists of 2 main transformers of 25 MVA each with a voltage of 132/33 kV.

For electric power supply to the T-2 IE, two measures are possible. One is to construct a new main substation in the T-2 IE using the existing 132 kV transmission line. And the other is to construct a new 33 kV double circuit distribution line from the Al Hasa Substation to the T-2 IE. The former measure by the new main substation is more expensive than the latter measure by the new 33 kV distribution line. Therefore, the latter measure by the new 33 kV distribution lines is recommendable in view of cost performance.

New 33 kV distribution lines are planned to be constructed and connected to 33 kV indoor switchgear at the Al Hasa Substation by double circuits. Also the Al Hasa Substation is necessary to be expanded to have 2 feeders at the existing 33 kV switchgear and the existing 2 transformers should be replaced by two new 63 MVA transformers.

When the T-2 IE will be developed after the Al Hasa mine is closed, it is not necessary to expand the existing 33 kV switchgear in the Al Hasa Substation.

3) Internal power distribution system

A 33 kV distribution system is planned to be constructed to feed power from the new 33 kV distribution lines to the factories and users to be located in the T-2 IE.

An underground distribution line is planned for the IE, since this type has been adopted in high grade industrial estates recently to increase the aesthetic value.

An open loop distribution system should be applied to secure stable power supply. 33 kV ring main units will also be provided to connect to consumers easily at any time without interrupting power distribution.

The proposed 33 kV distribution system is shown in Figure 10-6-4.

(5) Telecommunications

1) Basic design condition and criteria

Telecommunication service for the T-2 IE will be available through TCC. The telecommunication will be basically composed of a transmission line, telephone exchanger facilities, and internal subscriber lines in the T-2 IE.

2) External telecommunication system

At present, there are no telephone exchange stations and/or optical fiber cable lines of TCC near the T-2 IE. The nearest existing exchange office is the Al Hasa remote line unit (RLU) station.

The optical fiber transmission network in Jordan has been implemented based on TCC's 15-year plan at present.

Therefore, it is planned to install new optical fiber cable line to ensure telecommunication service between the Al Hasa RLU station and the T-2 IE. A new telephone exchange facility (Remote Line Unit (RLU)) is planned to be installed within the T-2 IE. RLU will be connected to the Al Hasa RLU station by an optical fiber cable line.

3) Internal telecommunications system

Some Splice Boxes (SB) will be installed on the sidewalks and connected to the new-RLU by metallic telephone cable lines, so that subscribers can easily be connected to SB at any time.

The cable will be put in plastic sleeve pipes and buried along the roads in the T-2 IE.

10-7 Development Phasing and Implementation Schedule

The schedule of the project implementation is shown in Figure 10-7-1.

The development of the overall site area is planned to be executed at a certain fixed period of time. The project completion is assumed to be at the end of 2010, and the commission at the beginning of 2011.

Completion of the construction, starting from the initiation of the designing, is assumed to take three years, thus, the site acquisition should be completed before the execution of the designing.

10-8 Investment Cost

The investment cost has been estimated based on the same assumptions as those for the A-2 IE.

The investment cost of the T-2 IE is estimated to be JD 12.94 million. The cost for external facilities to be borne by agencies other than JIEC is JD 2.13 million. Details of the estimate are provided in Table 10-8-1.

Summary of Investment Cost for T-2 IE
(Including Tariff and Sales Tax)
(Unit: Million JD)

	Cost
1. Land acquisition cost	0.12
2. Construction cost	10.33
3. Engineering service cost	0.62
4. Administration cost	0.20
5. Contingency cost	1.67
I. Investment cost for T-2 IE (1+2+3+4+5)	12.94
II. Investment cost for external facilities to be borne by agencies other than JIEC	2.13
Total	15.09

Breakdown of the construction cost is shown below.

Breakdown of T-2 IE Construction Cost
(Including Tariff and Sales Tax)
(Unit: Million JD)

	Local Portion	Foreign Portion	Total
Cut and fill	0.60	0.00	0.60
Flash Flood	0.00	0.00	0.00
Road	0.55	0.00	0.55
Drainage	0.21	0.00	0.21
Water supply	0.33	0.11	0.44
Sewarage	1.64	2.81	4.45
Electric facility	0.38	2.30	2.68
Telephone facility	0.10	0.15	0.25
Park	0.06	0.00	0.06
Administration center	0.14	0.01	0.15
Miscellaneous	0.40	0.54	0.94
Total	4.41	5.92	10.33

The investment cost for the T-2 IE, less tariff, falls to JD 11.83 million. The investment cost for external facilities to be borne by agencies other than JIEC would be JD 1.53 million. Table 10-8-2 provides the details.

Summary of Investment Cost for T-2 IE
(Excluding Tariff, Including Sales Tax)
(Unit: Million JD)

	Cost
1. Land acquisition cost	0.12
2. Construction cost	9.42
3. Engineering service cost	0.56
4. Administration cost	0.20
5. Contingency cost	1.53
I. Investment cost for T-2 IE (1+2+3+4+5)	11.83
II. Investment cost for external facilities to be borne by agencies other than JIEC	1.53
Total	13.36

Breakdown of the construction cost is shown below.

Breakdown of T-2 IE Construction Cost
(Excluding Tariff, Including Sales Tax)
(Unit: Million JD)

	Local Portion	Foreign Portion	Total
Cut and fill	0.60	0.00	0.60
Flash Flood	0.00	0.00	0.00
Road	0.55	0.00	0.55
Drainage	0.21	0.00	0.21
Water supply	0.33	0.10	0.43
Sewarage	1.64	2.81	4.45
Electric facility	0.38	1.53	1.91
Telephone facility	0.10	0.10	0.20
Park	0.06	0.00	0.06
Administration center	0.14	0.01	0.15
Miscellaneous	0.40	0.46	0.86
Total	4.41	5.01	9.42

10-9 Institutional Framework for Execution and Management of the Industrial Estate

(1) Organization in charge of execution and management

As the execution and management body of the T-2 IE, JIEC is regarded to be the most appropriate organization for its experiences and achievement of development of IE. On the other hand, positive cooperation of Jordan Phosphate Mines Company (JPMC) is expected through provision of existing facilities.

(2) Division of responsibilities and cost bearing

Division of responsibilities and cost bearing among relevant organizations for major task items related to construction and management of facilities are in a similar way to the A-2 IE except that roles of JPMC are important instead of ARA.

Regular payment for major facilities will be made as in the case of A-2 site or M-2 site after the commencement of the operation except that JPMC can be involved in water supply.

(3) Administration and ancillary functions

The indicative number of staff for administration of the IE is estimated to be approximately 20 as shown in Table 10-9-1.

A coordination committee involving JPMC in addition to representatives of the investors, the corporation, local administration bodies and relevant line agencies should be established.

Various ancillary functions should be located as in the other planned industrial estates.

10-10 Project Evaluation

10-10-1 Financial Evaluation

The financial evaluation of the development of the T-2 IE project was conducted from the point of view of JIEC, the expected executive agency of the project.

(1) Capital cost

The total construction cost including custom duty and sales tax was estimated at JD 12.9 million covering the IE construction cost of JD 12.8 million and the land acquisition cost of JD 0.1 million. The total cost includes a foreign currency portion of JD 7.4 million (US\$10.4 million equivalent). The outsider agency costs for infrastructures of JD 2.1 million is not included in the above amount.

(2) Operation and maintenance (O&M) costs

The same percentage rates of O&M costs to the construction costs of each facility and equipment were applied as those applied for the A-2 IE project.

(3) Replacement cost

The replacement was considered for the water supply facilities and the sewerage plant in the 26th year from their operation start. These were incorporated in the cash flow of FIRR computation table. Other replacements were, due to the length of their economic life, not considered during the evaluation period of 35 years.

(4) Land acquisition

The land with a gross area of 80 ha was assumed to be purchased in 1998 in this Study.

The unit price of the land was assumed at JD0.15 /m² in this Study.

(5) Revenue

The revenue will be accrued from the selling and leasing of the factory lots. The selling price of factory lots was set at JD15.0 /m² and the lease rate was set at JD1.5 /m² /year in this study.

(6) FIRR computation

Based on the cost and benefit stated above, the FIRR was calculated for the evaluation period of 35 years as shown in Tables 10-10-1 and 10-10-2.

For the generation of benefit, it was assumed that factory lots will be fully sold out within five (5) years after their completion at cumulative rates of 30%, 50%, 70%, 90% and 100% in each year.

The result of computation shows that the FIRR for costs including custom duty and sales tax was too small to be computed and the FIRR for costs including sales tax only was negative value, which shows that T-2 IE project is not financially viable with its currently planned conditions.

(7) Sensitivity test of FIRR

A sensitivity test was conducted for FIRRs by varying both the cost and benefit by 10%, under the conditions in which selling price of factory lots is set at JD15.0/m² and leasing rate of them at JD 1.5m²/year. The results are as follows:

- FIRRs, with costs including custom duty and sales tax, were too small to be computed and the project is not financially viable, even under the most advantageous conditions in which the cost is reduced by 10% and the benefit is increased by 10%.
- FIRR with costs including sales tax only was changed to 0.2% that was far less than the estimated cut-off rate of 5-10%, under the most advantageous conditions in which the cost is reduced by 10% and the benefit is increased by 10%. FIRRs were too small to be computed for other changes. Therefore, the project is not financially viable under such conditions.

A more drastic change was assumed in the table below in which the selling price of factory lots was set at JD25 /m² and lease rate of them at JD 2.5/m²/year, and both the cost and benefit were varied by 20%.

- FIRR with costs including custom duty & sales tax

	cost +20%	cost normal	cost -20%
benefit -20%	N.A.	0.4	5.2
benefit normal	1.3	5.2	10.2
benefit +20%	5.2	9.3	14.9

- FIRR with costs including sales tax

	cost +20%	cost normal	cost -20%
benefit -20%	N.A.	2.2	7.1
benefit normal	3.1	7.1	12.4
benefit +20%	7.1	11.4	17.4

Remarks: 1) N.A. stands for "not available".
2) Unit benefit for normal conditions:
- Selling price : JD 25.0/m²
- Lease rate : JD 2.5/m²/year

With these selling and leasing conditions, FIRRs come into the range of 5-10%. If cost is reduced by 20% or the benefit is increased by 20%, some FIRR values reach more than 10%.

Meanwhile, an examination was made to find out the level of selling price which can make FIRR exceed 10%. For the cost including custom duty and sales tax, the FIRR can reach 10% by the selling price of JD30.6 /m² (equalizing rate). For the cost including sales tax only, the FIRR can reach 10% by the selling price of JD28.1 /m².

10-10-2 Economic Evaluation

(1) Criteria for economic evaluation

The economic evaluation of the T-2 IE project was conducted from the point of view of the Jordan's socio-economy as a whole by the criteria of EIRR. The market price was adopted as the willingness-to-pay (WTP) index of purchasers and was considered as the economic benefit of the project.

(2) Economic cost

The economic cost of the T-2 IE project was estimated based on the financial cost including neither custom duty nor sales tax.

The same assumptions as being made for the A-2 IE project were adopted for the T-2 project including the standard conversion factor, shadow wage rate, the value of land and the inclusion of the outsiders cost for infrastructure facilities.

(3) Economic benefit

The WTP index of a factory lot in the T-2 IE was assumed at JD15.0 /m² which was considered as the market selling price of the T-2 factory lots and was adopted as the unit economic benefit in the economic evaluation of the project.

(4) EIRR computation

The computation of EIRR is shown in Table 10-10-3 and an EIRR of 2.0% was derived.

As stated in the A-2 IE project evaluation, it is desirous that EIRR lie or exceed the range from 5% to 10% for a project to be justified in Jordan. The above computed low EIRR shows that T-2 IE project with its currently planned conditions is not economically viable from the point of view of the Jordan's socio-economy as a whole.

At the present stage of a study prior to Pre-F/S, the T-2 IE project may not be economically justified nor financially viable.

10-10-3 Socio-economic Evaluation

(1) Prospects for employment creation and resulting population increase

In Table 10-10-4, the expected number of employees in the T-2 IE is calculated as 4,021, based on the data from the Industrial Survey 1993 and the Investment Demand Survey conducted in this Study. It should be noted that this numbers will be realized only when all available spaces in the T-2 IE with 80 ha are sold or leased to the relevant industries and they build factories, employ necessary employees and start operation at a full capacity. Such a time will be some time after the year 2015.

Based on this number of employees, Table 8-10-10 calculated the expected total population increase resulted from the T-2 IE project as 37,262, based on the following two assumptions:

- 1) For one employment created in the manufacturing sector, about 0.56 employment in the service sector will be created. Since there is no data available in Tafila to calculate this rate, the rate of 0.56 is borrowed from the rate in Aqaba which is obtained from Aqaba Town Master Plan Review prepared by Aqaba Region Authority. So 4,021 employment in the manufacturing sector will create $4,021 \times 0.56 = 2,252$ employment in the service sector.

2) The total number of population increase is calculated by multiplying the total number of new employment created by the T-2 IE project (which is the total of employment in the manufacturing sector and employment in the service sector, that is, $4,021 + 2,252 = 6,273$) by the dependency rate in Tafila Governorate (which is the rate of the total population to the employed population). Based on the sampling survey in Employment, Unemployment and Income Survey 1995, the dependency rate in Tafila is calculated as 5.94. So the total population increase is expected to be $6,273 \times 5.94 = 37,262$. But it should be noted that the dependency rate in future will be less than 5.94, because there will be less unemployment due to jobs in the IE and the employees in the modern manufacturing sector tend to have a smaller number of children. So the projected population increase of 37,262 should be considered as the maximum possibility for the sake of impact assessment.

(2) Impacts of employment creation on vulnerable groups

1) Women

Among the employment created in the T-2 IE project, the number of female employees is calculated as 369 in Table 10-10-4, based on the assumption that the proportion of female employees in the total employees will be the same by industry, which is calculated from the data in Industrial Survey 1993. In textile, wearing apparel and industrial chemicals (drugs and medicines) industries, the average percentage of the female workers in the total employees is more than 20%, so 6 companies in industrial chemicals industry which will invest in T-2 IE are expected to hire the total of 183 female employees, while 6 companies in wearing apparel industry are expected to hire the total of 58 female employees.

Although this number of female employment sounds small, the impact of these employment on women will not be small, because employment opportunities for women have been limited in the conservative Southern Districts. Since in the Islamic society women have difficulties to live away from their families, the most of female workers will be hired from the locality. This new employment opportunities in the manufacturing sector will surely promote women's participation in the society and enhance women's image as equal partners in Jordan's development.

2) Bedouin

In Al Hasa, there are about 5,000 Bedouins and they are engaged in livestock raising and agriculture. They graze livestock around their villages, and only a few families come near Aqaba City for grazing. So the loss of grazing land by

establishment of the T-2 IE with 80 ha will have the minimal impacts to the Bedouin families, because 80 ha is relatively small area compared with the whole grazing area and the area of the T-2 IE does not have any water well nor have significant number or species of fodder for their livestock.

These days many Bedouin families choose to settle down and look for job opportunities, so employment opportunities created by the T-2 IE project will be very attractive. Bedouin people traditionally tend to prefer jobs like guards and drivers, but since young generation of Bedouins becomes educated, they may have a good chance of getting other types of jobs. More importantly, support to the settled Bedouin families is very important in order to improve their education and health status, and ultimately increase their income generation opportunities. Especially education of Bedouin women is very much needed to enhance their living conditions, because many Bedouin women suffer from illiteracy and ignorance.

Since the T-2 IE is not frequently used by Bedouin people, the companies in the IE will not feel any pressure from the Bedouin to employ unnecessary number of them. But it will be wise for the companies investing in the IE to help to improve the socio-economic conditions of Bedouin people living near the IE by financially and technically supporting Queen Alia Fund's (QAF's) programs to educate Bedouin people, especially females, and help them generate incomes, rather than hiring unnecessary workers.

(3) Impacts of population increase on social infrastructure

Projected population increase of 37,262 some time after the year 2010 resulted from the T-2 IE project may sound a big number to a small city of Tafila which now has a population of about 37,000. Although Tafila Governorate does not have a long-term housing development plan to cope with this magnitude of population increase, there is still enough time for Tafila Governorate to study the future balance between the population increase and the necessary housings as well as housing-related infrastructure such as roads, water, electricity, sewage, phones, etc. So it is advised that Tafila Governorate, in collaboration with Department of Housing and Urban Development, should make a long-term plan to increase the housing capacity in accordance with the projected population increase.

10-10-4 Environmental Evaluation

Environmental impacts from the proposed project were assessed and evaluated for environmental elements that were chosen in the Section 7-4-1 (1). In the assessment process, firstly future environmental goal for the particular environmental elements are set. Then, the present and future conditions in the proposed area are studied based on literatures and field survey. Thirdly, the present condition in the Amman Industrial Estate and the performance of environmental management of the factories in the similar categories of industries to be located are studied. Combining the findings in Amman and expected future condition of the proposed project area, environmental impacts from the proposed development and industries are estimated. In conclusion, environmental impacts are evaluated by comparing the future environmental goal and estimated impact.

Among the environmental elements chosen in the Section 7-4-1 (1), those related to social impacts are assessed in the previous section.

(1) Possible impacts and environmental goals

The development of the T-2 IE will alter the natural vegetation of the 80 ha site. The possible emission of air pollutants, water pollutants and solid wastes from industries expected to be located are listed in the following table. The development will also generate traffic for commuters, loading and unloading products and wastes.

	Possible gaseous emission, noise, vibration	Generation of liquid waste	Generation of solid waste
Food manufacturing	SOx, soot, odor from organic waste	BOD, SS, oil, fat, grease, color	garbage, containers, sludge
Beverage	SOx, soot, odor from organic waste	BOD, SS, oil, fat, grease, color	garbage, containers, sludge
Textile			fabric, thread
Wearing apparel			fabric, thread
Leather products			leather pieces
Wood and cork furniture	odor from paints, solvents, adhesives noise	solvents	wood chips
Chemical	odor, dust	ABS, BOD, oil	sludge
Glass and non-metal mineral	Cd, Cu, Pb, soot	SS, pH	glass chips, ceramic chips
Transport equipment	noise	solvents, oil, soda	metal chips
Waste water treatment plant	odor	(treated water to be used for irrigation)	sludge

For the assessment of significance of those impacts, future environmental goals for each environmental element are set and listed in the following table. Those goals aim that the development does not create negative impacts on the residents and amenity of the old Al Hasa town, as well as on the important bird habitat at the ORE-3 pond in the mining area.

Possible Impacts	Future Goals
Disposal of industrial wastes	Appropriate treatment and disposal measures to be taken for municipal and special wastes generated at the Industrial Estate
Air pollution, odor, noise, vibration	No significant impacts on residential area of Al Hasa Town
Impacts on important bird habitat at ORE-3 pond	No significant impacts on the bird habitat

(2) Impact Assessment

1) Waste generation

According to the Municipal Waste Management Study by JICA in 1996, Tafila Final Disposal Site is located about 20 km southeast of Tafila City. It has a design area of 454,815 m² and scheduled to be in operation until the year 2049.

By the development of the IE, the amount of wastes received at the Disposal Site will increase. The Site has sufficient design capacity for long term.

Regarding the management of hazardous wastes such as solvents, the time frame for the completion of the central disposal facility is currently unknown. There is possibility for uncontrolled illegal disposal of hazardous wastes when JIEC and Tafila City do not provide proper guidance and control.

From the above discussion, it is concluded that the future environmental goal will be achieved except the issue with hazardous wastes.

2) Air pollution, odor, noise, vibration

An old Al Hasa town, with a population of 2,000 is located on the southeast of the IE site. The distance between the southeast corner of the IE site to the nearest houses is about 500 m. According to the Meteorological Data of Jordan 1994, the prevailing wind direction at Al Hasa is west to southwest throughout the year. In case air pollution occurs at the IE, the Al Hasa town will be affected.

Considering the types of industry to be located, there is possibility of air pollution, odor, noise to be generated in the IE. Observations made at the Amman Industrial Estate suggests that when the same level of environmental management with Amman IE, major impacts will not be felt outside of the T-2 IE. Daily monitoring will still be necessary to prevent damage on the health and amenity at Al Hasa town.

3) Impacts on an important bird habitat

The artificial ponds at the Al Hasa mine are located about 2.5 km east of the IE site.

Although the IE is located windward of the ponds, the distance is so long that gaseous emissions, dust, and noise will not affect the bird habitat. Also there will not be any water discharge from the IE site into any of those ponds.

From the above discussion, it is concluded that the IE will not affect the bird habitat.

10-10-5 Overall Evaluation

Though the indices for the financial and economic viability are low, they could be upgraded if selling price/leasing rate is raised substantially. Meanwhile, considerable socio-economic benefit including employment generation can be generated while no serious environmental impact is anticipated.

At the stage of preliminary study, it is recommended that T-2 IE project be kept as an option for long-term perspective and the further study be conducted at proper timing, including the followings.

- Possibility of the degree utilization of the existing facilities at the Al Hasa mine including water wells, housing structures and other infrastructure facilities, and resulting cost minimization,
- Impact of the implementation of the T-2 IE project on the development of the Al Hasa area

Table 10-3-1 Categories of Industries to be Attracted and Development Area for T-2 Industrial Estate

ISIC	Industrial Category	Appropriate Industries for T-2 Site	Industries for Utilization of Water	Industries to be Attracted for M-2 Site	Nos. of Jordanian & Foreign Investors	Unit Area (ha)	Development Area of T-2 Site
31	Food, Beverage and Tobacco						
311/312	Food manufacturing		○		6	1.0	6.0
313	Beverage		○		6	3.0	18.0
32	Textile, Apparel & Leather						
321	Textile		○		6	0.4	2.4
322	Wearing Apparel			○	6	0.2	1.2
323	Leather Products			○	6	0.2	1.2
33	Wood and Wood Products						
331/332	Wood & Cork Furniture			○	6	0.4	2.4
34	Paper Products						
341	Paper						
342	Printing						
35	Chemicals						
351	Chemical		○		6	2.0	12.0
356	Plastic Products						
36	Non-metallic Mineral Products						
362/369	Glass & Non-Metal Mineral	○	○	○	18	1.0	18.0
38	Fabricated Metal, Machinery						
381	Fabricated Metal						
382	Machinery						
383	Electrical Machinery						
384	Transport Equipment			○	6	1.0	6.0
385	Professional Equipment						
	Total				66	-	67.2
	Gross Development Area (ha)						80.0

11 Refer to section 7-1-1

Table 10-4-1 Land Use Plan of T-2 IE

	Area (ha)	(%)
1.Factory lot	67.2	84.0
2.Road	5.3	6.6
1) Main Road(22.0m)	1.5	
2) Collector Road(18.0m)	3.8	
3.Utility	2.2	2.8
1) Water supply facility	0.4	
2) Sewage treatment plant	1.4	
3) Electric facility	0	
4) Communication facility	0.4	
4.Administration center	1.2	1.5
5.Park	0.9	1.1
6.Others	3.2	4.0
1) Buffer zone(10.0)	3.0	
2) Pedestrian(6.0m)	0.2	
Total	80.0	100.0

Table 10-8-1 Investment Costs for T-2 IE
(inclusion of custom duties and general sales tax)

Unit: JD 1,000

Item	Local	Foreign	Total	Other agency (%)	
(1) Land acquisition cost	120	0	120	0	(0)
(2) Compensation cost	0	0	0	0	(0)
(3) Construction cost					
3-1 Cut and fill	600	0	600		(0)
3-2 Flash Flood	0	0	0	0	(0)
3-3 Road	549	0	549	0	(0)
3-4 Drainage	206	0	206	0	(0)
3-5 Water supply					
1) Conveyance pipe	21	22	43	163	(79)
2) Distribution pipe	77	79	156	0	(0)
3) Reservoir	235	8	243	0	(0)
3-6 Sewerage					
1) Sewer	137	0	137	0	(0)
2) Sewage treatment	1,512	2,808	4,320	0	(0)
3-7 Electric facility					
1) Distribution system	377	2,300	2,677	0	(0)
2) Extension of existing substation	0	0	0	1,335	(100)
3) Transmission line	0	0	0	278	(100)
3-8 Telephone facility	95	150	245	159	(39)
3-9 Park	63	0	63	0	(0)
3-10 Administration Center	142	8	150	0	(0)
3-11 Miscellaneous (10%)	401	538	939	194	(17)
Sub-total (3)	4,415	5,913	10,328	2,129	(17)
(4) Engineering services	124 ^{*1}	496 ^{*2}	620 ^{*3}	0	-
(5) Administration cost	200	0	200	0	-
(6) Contingency ((3)+(4)+(5)) x 15%	711	961	1,672	0	-
Total Construction Cost ((3)+(4)+(5)+(6))	5,450	7,370	12,820	2,129	(14)
Total of the foreign portion in US\$ (1,000)	-	10,391	-	-	-

Remarks: *3=Sub-total(3) x 6%, *1=*3 x 20%, *2=*3 x 80%

Total construction cost	Total	include other agency	Total construction cost	Total	include other agency
net: JD/sq.m =	19.08	22.24	net: US\$/sq.m =	26.90	31.37
gross: JD/sq.m =	16.03	18.69	gross: US\$/sq.m =	22.60	26.35

Table 10-8-2 Investment Costs for T-2
(exemption from custom duties and inclusion of general sales tax)

Unit: JD 1,000

Item	Local	Foreign	Total	Other agency (%)	
(1) Land acquisition cost	120	0	120	0	(0)
(2) Compensation cost	0	0	0	0	(0)
(3) Construction cost					
3-1 Cut and fill	600	0	600		(0)
3-2 Flash Flood	0	0	0	0	(0)
3-3 Road	549	0	549	0	(0)
3-4 Drainage	206	0	206	0	(0)
3-5 Water supply					
1) Conveyance pipe	21	21	42	159	(79)
2) Distribution pipe	77	73	150	0	(0)
3) Reservoir	235	8	243	0	(0)
3-6 Sewerage					
1) Sewer	137	0	137	0	(0)
2) Sewage treatment	1,512	2,808	4,320	0	(0)
3-7 Electric facility					
1) Distribution system	377	1,533	1,910	0	(0)
2) Extension of existing substation	0	0	0	904	(100)
3) Transmission line	0	0	0	199	(100)
3-8 Telephone facility	95	100	195	131	(40)
3-9 Park	63	0	63	0	(0)
3-10 Administration Center	142	5	147	0	(0)
3-11 Miscellaneous (10%)	401	455	856	139	(14)
Sub-total (3)	4,415	5,003	9,418	1,532	(14)
(4) Engineering services	113 ^{*1}	452 ^{*2}	565 ^{*3}	0	-
(5) Administration cost	200	0	200	0	-
(6) Contingency ((3)+(4)+(5)) x 15%	709	818	1,527	0	-
Total Construction Cost ((3)+(4)+(5)+(6))	5,438	6,273	11,711	1,532	(12)
Total of the foreign portion in US\$ (1,000)	-	8,845	-	-	-

Remarks: *3=Sub-total(3) x 6%, *1=*3 x 20%, *2=*3 x 80%

Total construction cost	Total	include other agency	Total construction cost	Total	include other agency
net: JD/sq.m =	17.43	19.71	net: US\$/sq.m =	24.57	27.79
gross: JD/sq.m =	14.64	16.55	gross: US\$/sq.m =	20.64	23.34

Table 10-9-1 Number of Staff for Administration at T-2 Industrial Estate

Tasks	No. of Staff
1. Overall management & office administration	7
- General manager (1)	
- Information specialist (1)	
- Clerks (1)	
- Secretary (1)	
- Drivers (1)	
- Laborers(2)	
2. Accounting & financial management	2
- Director / accountant (1)	
- Secretary (1)	
3. Promotion of investment	2
- Director (1)	
- Clerk (1)	
4. Water supply & waste water treatment	2
- Director / engineer (1)	
- Technician (1)	
5. Environmental protection	2
- Director / engineer (1)	
- Technician (1)	
6. Maintenance	3
- Technicians (2)	
- Laborer (1)	
7. Planting	2
- Technician (1)	
- Laborer (1)	
Total	20

Table 10-10-1 Computation of FIRR for T-2 IE Project
(With costs including custom duty and sales tax)

No.	Year	O&M Costs			Land Cost	Total Cost	Land for Sale (sqm.)	Land for Lease (sqm.)	Benefit		Total Benefit	B - C
		Capital Cost (JD10^3)	O & M Costs (JD10^3)	Personnel Cost (JD10^3)					Selling (JD10^3)	Leasing (JD10^3)		
1	1998	207			120	327					0	-327
2	1999	4,273				4,273					0	-4,273
3	2000	8,340				8,340					0	-8,340
4	2001		81	27		107	100800	100800	1,512	151	1,663	1,556
5	2002		135	45		179	67200	168000	1,008	252	1,260	1,081
6	2003		188	62		251	67200	235200	1,008	353	1,361	1,110
7	2004		242	80		322	67200	302400	1,008	454	1,462	1,139
8	2005		269	89		358	33600	336000	504	504	1,008	650
9	2006		269	89		358		336000		504	504	146
10	2007		269	89		358		336000		504	504	146
11	2008		269	89		358		336000		504	504	146
12	2009		269	89		358		336000		504	504	146
13	2010		269	89		358		336000		504	504	146
14	2011		269	89		358		336000		504	504	146
15	2012		269	89		358		336000		504	504	146
16	2013		269	89		358		336000		504	504	146
17	2014		269	89		358		336000		504	504	146
18	2015		269	89		358		336000		504	504	146
19	2016		269	89		358		336000		504	504	146
20	2017		269	89		358		336000		504	504	146
21	2018		269	89		358		336000		504	504	146
22	2019		269	89		358		336000		504	504	146
23	2020		269	89		358		336000		504	504	146
24	2021		269	89		358		336000		504	504	146
25	2022		269	89		358		336000		504	504	146
26	2023	2,818	269	89		3,176		336000		504	504	-2,672
27	2024		269	89		358		336000		504	504	146
28	2025		269	89		358		336000		504	504	146
29	2026		269	89		358		336000		504	504	146
30	2027		269	89		358		336000		504	504	146
31	2028		269	89		358		336000		504	504	146
32	2029		269	89		358		336000		504	504	146
33	2030		269	89		358		336000		504	504	146
34	2031		269	89		358		336000		504	504	146
35	2032		269	89		358		336000		504	504	146
NPV (10%) =						12,533					6,079	-6,455
Notes:											FIRR =	#NUM!

- 1) The cost is estimated based on 1996 constant prices including the custom duty and sales tax.
- 2) O&M: Operation and maintenance

Table 10-10-2 Computation of FIRR for T-2 IE Project
(With costs including sales tax)

No.	Year	Capital Cost (JD10 ³)	O&M Costs		Land Cost (JD10 ³)	Total Cost (JD10 ³)	Land for Sale (sqm.)	Land for Lease (sqm.)	Benefit		Total Benefit (JD10 ³)	B - C (JD10 ³)
			O & M Costs (JD10 ³)	Personnel Cost (JD10 ³)					Selling (JD10 ³)	Leasing (JD10 ³)		
1	1998	188			120	308					0	-308
2	1999	3,903				3,903					0	-3,903
3	2000	7,618				7,618					0	-7,618
4	2001		73	27		99	100800	100800	1,512	151	1,663	1,564
5	2002		121	45		165	67200	168000	1,008	252	1,260	1,095
6	2003		169	62		232	67200	235200	1,008	353	1,361	1,129
7	2004		218	80		298	67200	302400	1,008	454	1,462	1,164
8	2005		242	89		331	33600	336000	504	504	1,008	677
9	2006		242	89		331		336000		504	504	173
10	2007		242	89		331		336000		504	504	173
11	2008		242	89		331		336000		504	504	173
12	2009		242	89		331		336000		504	504	173
13	2010		242	89		331		336000		504	504	173
14	2011		242	89		331		336000		504	504	173
15	2012		242	89		331		336000		504	504	173
16	2013		242	89		331		336000		504	504	173
17	2014		242	89		331		336000		504	504	173
18	2015		242	89		331		336000		504	504	173
19	2016		242	89		331		336000		504	504	173
20	2017		242	89		331		336000		504	504	173
21	2018		242	89		331		336000		504	504	173
22	2019		242	89		331		336000		504	504	173
23	2020		242	89		331		336000		504	504	173
24	2021		242	89		331		336000		504	504	173
25	2022		242	89		331		336000		504	504	173
26	2023	2,818	242	89		3,149		336000		504	504	-2,615
27	2024		242	89		331		336000		504	504	173
28	2025		242	89		331		336000		504	504	173
29	2026		242	89		331		336000		504	504	173
30	2027		242	89		331		336000		504	504	173
31	2028		242	89		331		336000		504	504	173
32	2029		242	89		331		336000		504	504	173
33	2030		242	89		331		336000		504	504	173
34	2031		242	89		331		336000		504	504	173
35	2032		242	89		331		336000		504	504	173

NPV (10%) = 11,501
FIRR = 6.079
B-C = -5.423

Notes:

- 1) The cost is estimated based on 1996 constant prices including the sales tax.
- 2) O&M: Operation and maintenance

Table 10-10-3 Computation of EIRR for T-2 IE Project

No.	Year	Capital Cost (JD10 ³)	O&M Costs		Total Cost (JD10 ³)	Land for Sale (sqm.)	Land for Lease (sqm.)	Benefit		Total Benefit (JD10 ³)	B - C (JD10 ³)
			O & M Costs (JD10 ³)	Personnel Cost (JD10 ³)				Selling (JD10 ³)	Leasing (JD10 ³)		
1	1998	168			168					0	-168
2	1999	3,761			3,761					0	-3,761
3	2000	7,353			7,353					0	-7,353
4	2001		14	27	40	100800	100800	1,512	151	1,663	1,623
5	2002		23	45	67	67200	168000	1,008	252	1,260	1,193
6	2003		32	62	94	67200	235200	1,008	353	1,361	1,267
7	2004		41	80	121	67200	302400	1,008	451	1,462	1,341
8	2005		45	89	134	33600	336000	504	504	1,008	874
9	2006		45	89	134		336000		504	504	370
10	2007		45	89	134		336000		504	504	370
11	2008		45	89	134		336000		504	504	370
12	2009		45	89	134		336000		504	504	370
13	2010		45	89	134		336000		504	504	370
14	2011		45	89	134		336000		504	504	370
15	2012		45	89	134		336000		504	504	370
16	2013		45	89	134		336000		504	504	370
17	2014		45	89	134		336000		504	504	370
18	2015		45	89	134		336000		504	504	370
19	2016		45	89	134		336000		504	504	370
20	2017		45	89	134		336000		504	504	370
21	2018		45	89	134		336000		504	504	370
22	2019		45	89	134		336000		504	504	370
23	2020		45	89	134		336000		504	504	370
24	2021		45	89	134		336000		504	504	370
25	2022		45	89	134		336000		504	504	370
26	2023	2,424	45	89	2,558		336000		504	504	-2,054
27	2024		45	89	134		336000		504	504	370
28	2025		45	89	134		336000		504	504	370
29	2026		45	89	134		336000		504	504	370
30	2027		45	89	134		336000		504	504	370
31	2028		45	89	134		336000		504	504	370
32	2029		45	89	134		336000		504	504	370
33	2030		45	89	134		336000		504	504	370
34	2031		45	89	134		336000		504	504	370
35	2032		45	89	134		336000		504	504	370

NPV (10%) =

9,813

6,079

-3,735

Notes:

EIRR=

2.0%

1) The economic cost is estimated based on the financial cost of 1996 price level.

2) O&M: Operation and maintenance

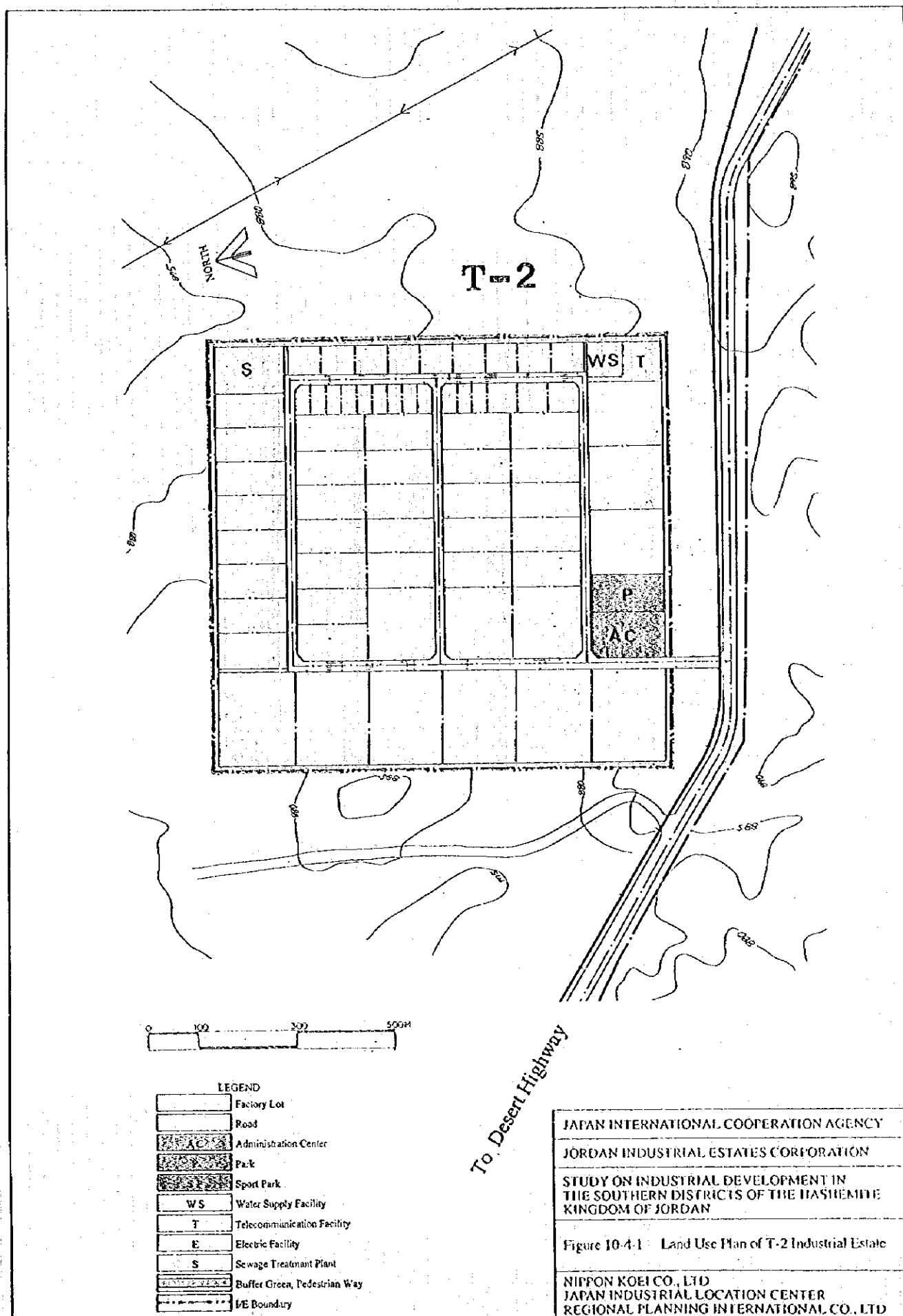
Table 10-10-4 Estimated Number of Employees in T-2 IE

ISIC Code	Industry	No. of employees per ha (persons)	Percentage of female employees (%)	No. of firms	Factory area (net) (ha)	No. of employees (persons)	No. of female employees
311+312	Food manufacturing	94	5.0%	6	6.0	564	28
313	Beverage	27	8.6%	6	18.0	486	42
321	Textile	49	24.8%	6	2.4	118	29
322	Wearing apparel	207	23.3%	6	1.2	248	58
323	Leather products	52	7.6%	6	1.2	62	5
331+332	Wood & w. products	117	0.7%	6	2.4	281	2
342	Printing	333	3.5%				
351+352	Industrial chemicals	75	20.3%	6	12.0	900	183
356	Plastics	33	3.8%				
36-	Glass & non-metal	57	0.8%	18	18.0	1,026	8
381	Fabricated metals	138	1.1%				
382	Machinery	93	2.7%				
383	Electrical machinery	160	8.1%				
384	Transport equipment	56	4.3%	6	6.0	336	14
Total				66	67.2	4,021	369

Source: Industrial Survey 1993 (Department of Statistics, 1994)

Note:

- (1) "No. of employees per ha" and "Percentage of female employees" are calculated from the data in Industrial Survey 1993.
- (2) "No. of firms" and "Factory area (net)" are obtained from the Investment Demand Survey by this Study.
- (3) "No. of employees" is calculated by multiplying "No. of employees per ha" by "Factory area (net)".
- (4) "No. of female employees" is calculated by multiplying "No. of employees" by "Percentage of female employees".

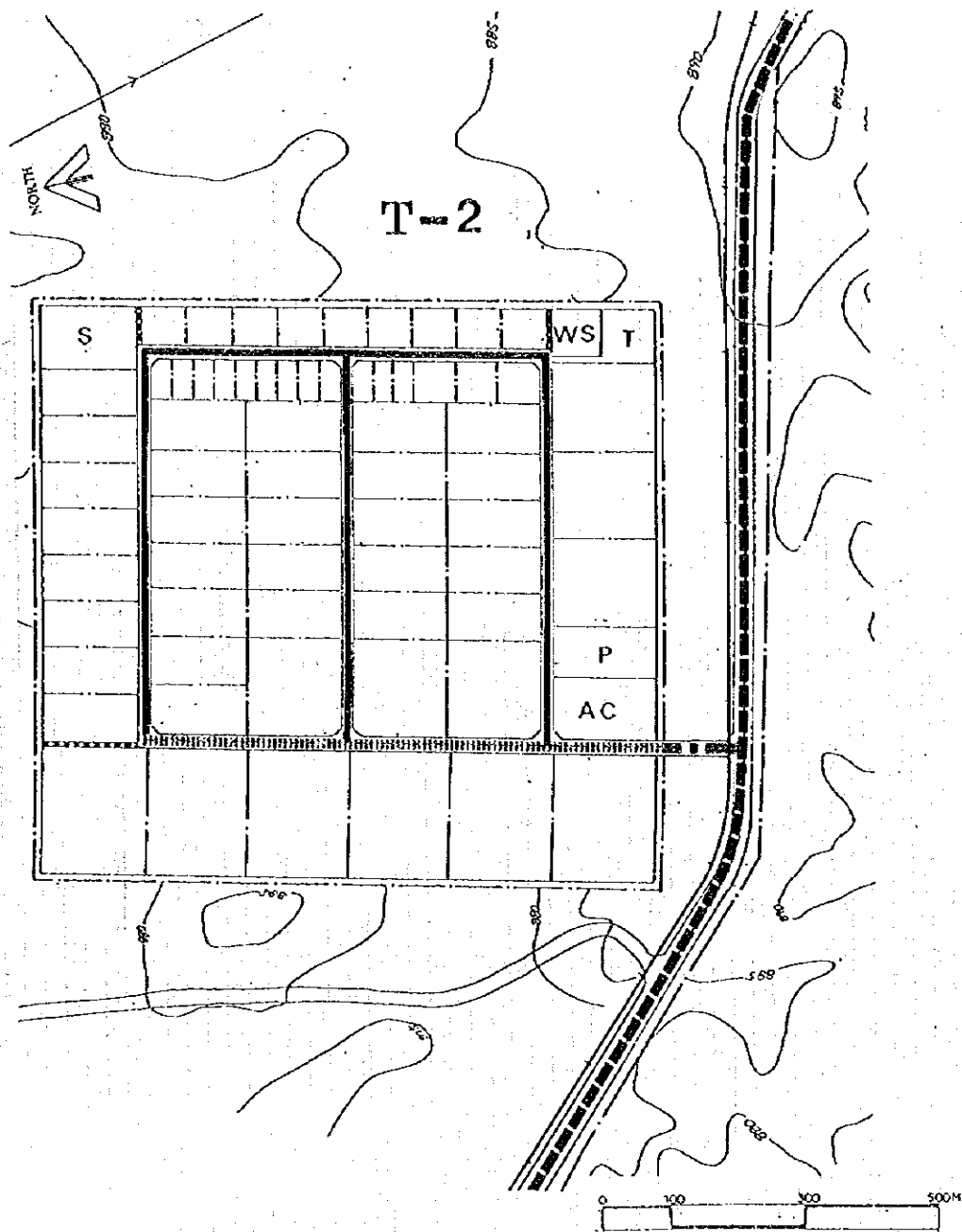


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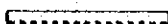
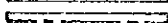
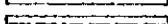
To Desert Highway

Figure 1: A schematic diagram of a 1D lattice chain. The chain consists of sites labeled 1, 2, 3, ..., N. Site 1 is occupied by a spin-1/2 particle (represented by a circle with a dot). Site 2 is occupied by a spin-1/2 particle (represented by a circle with a dot). Site 3 is occupied by a spin-1/2 particle (represented by a circle with a dot). Site N is occupied by a spin-1/2 particle (represented by a circle with a dot). The sites are connected by horizontal lines representing bonds. The diagram is labeled 'Figure 1' at the bottom.

103 392



LEGEND

-  Main Road(w=22m)
-  Collector Road(w=18m)
-  Pedestrian Way(w=6m)
-  Access Road(w=22m)
-  Existing Road

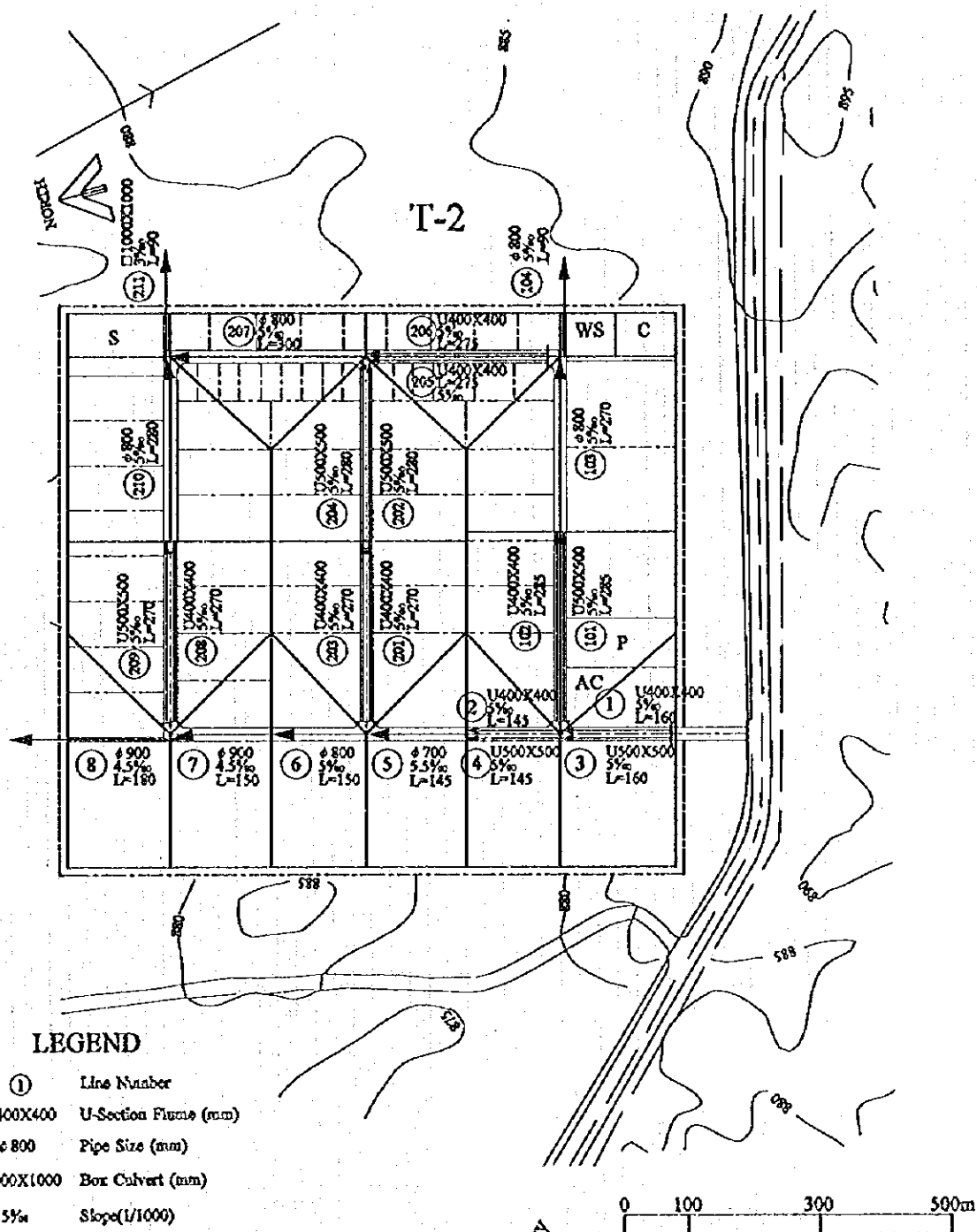
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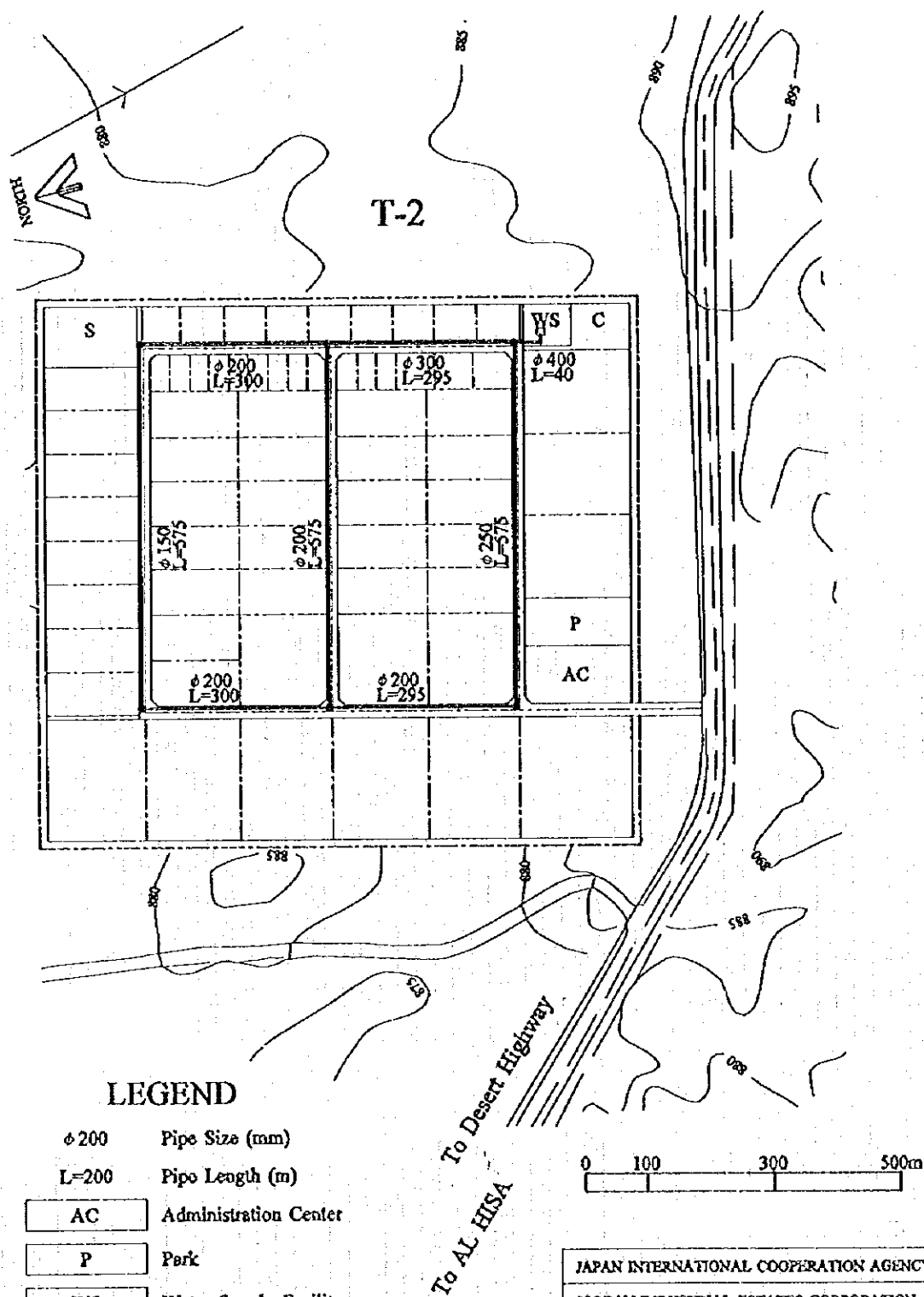
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Figure 10-4-2 Road Network of T-2 Industrial Estate

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REGIONAL PLANNING INTERNATIONAL CO., LTD



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Figure 10-6-1 Drainage System in T-2 Industrial Estate
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REGIONAL PLANNING INTERNATIONAL CO., LTD.



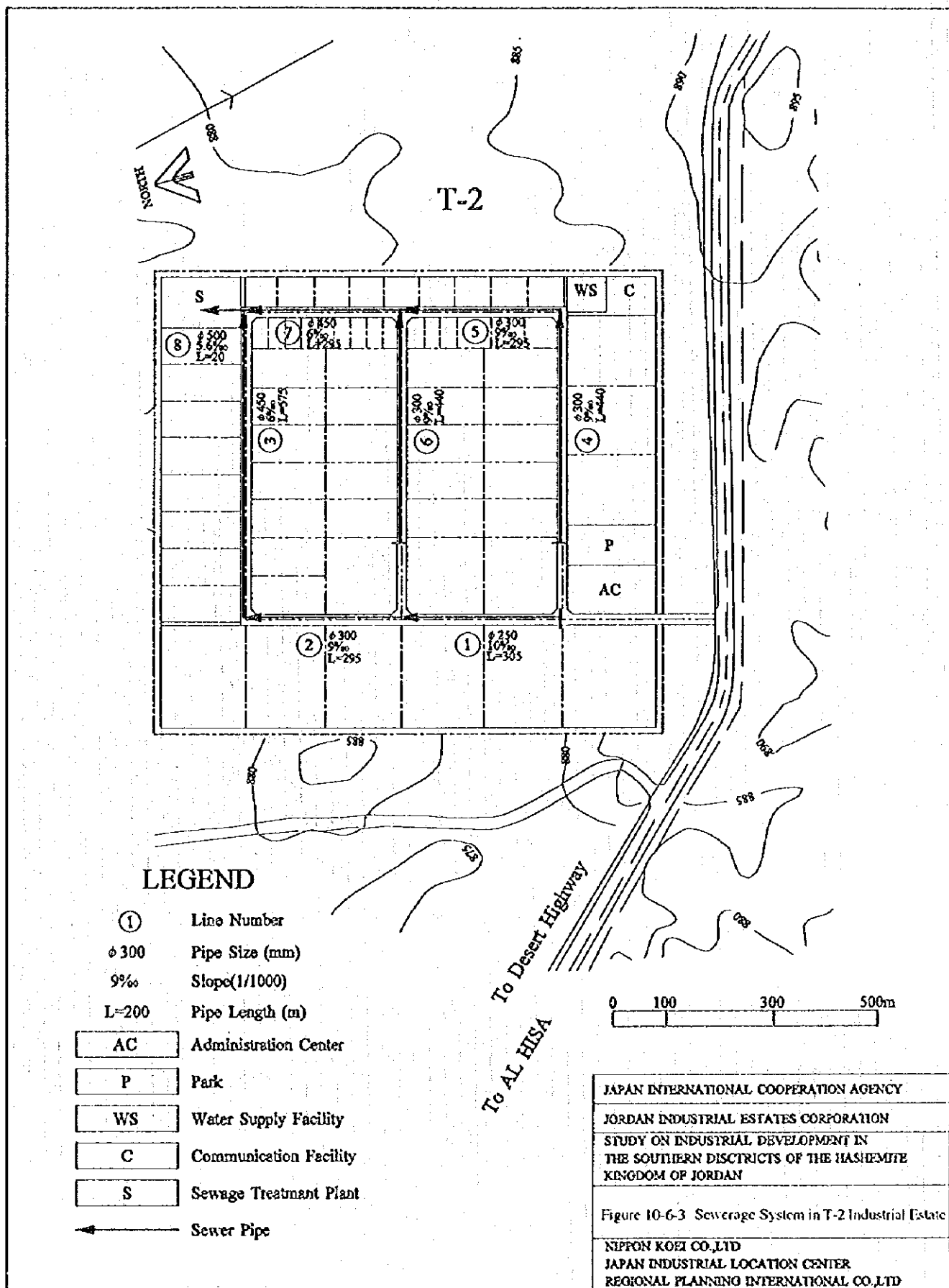
JAPAN INTERNATIONAL COOPERATION AGENCY

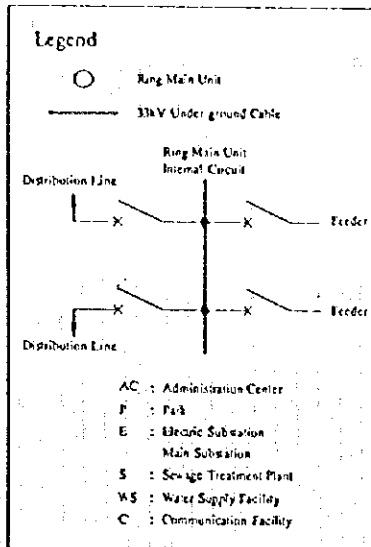
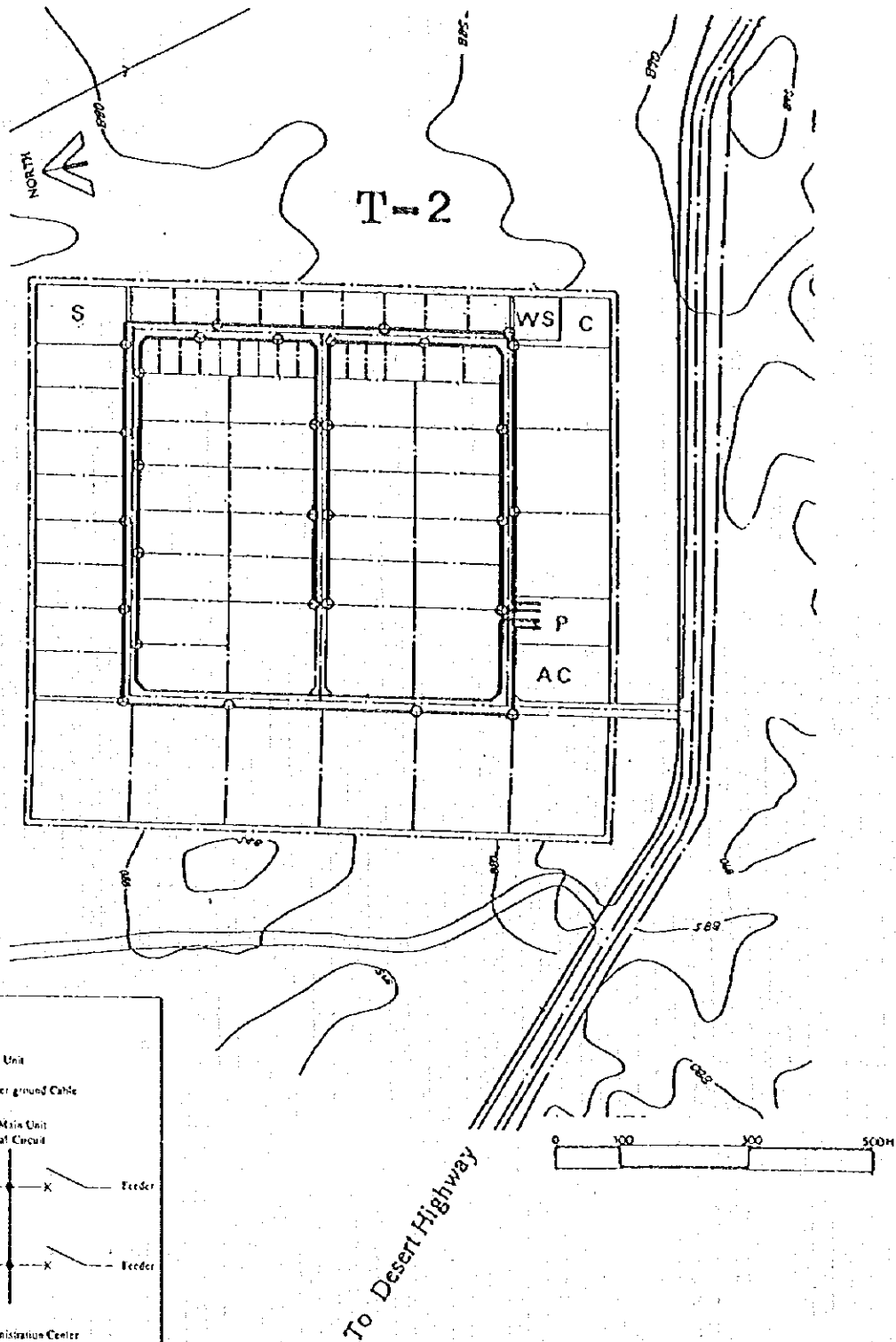
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Figure 10-6-2
Water Supply Networks in T-2 Industrial Estate

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Figure 10-6-4
Preliminary Plan of 33 kV Distribution System
in T-2 Industrial Estate

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REGIONAL PLANNING INTERNATIONAL CO., LTD.

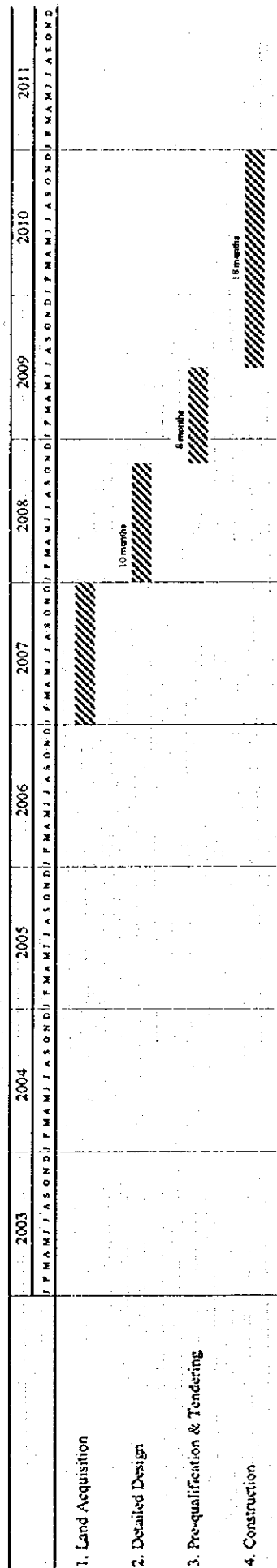


Figure 10-7-1 Overall Implementation Schedule for T-2 IE

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