XI. STUDY ON THE PRIORITY PROJECT : K-3

11-1 Outline of the Selected Site : K-3 and Current Status

(1) Outline of the selected site : K-3

1) Location and access

The site is located 15 to 17.5 km from Qatrana along the RN 50 that is one of the arterial road in Jordan. It takes about 15 minutes by public bus from Karak City to the site. RN 50 is planned to be expanded to 4 lanes in near future, and in the medium term time frame, it is expected to connect to a port on the Mediterranean coast via Safi. Direct railway access is not available.

2) Land use

The K-3 IE site is a part of the Lajun Grazing Reserve. A native plant species was planted since 1981 and the land has been used for a controlled amount of grazing activities by local herders. The north side of the site is bordered by the RN 50 and the Grazing Reserve continues further north. There is a Wadi at the south border of the site. Large piece of barley field stretches further south. Many rock outcrop is exposed in the site and the land is not suitable for cultivation.

3) Land ownership

The land of K-3 is owned by the Government. An instruction letter has been signed by the cabinet which authorizes the conversion of land use at the site from grazing reserve to industrial use.

4) Topography and geology

The site is on a gentle hill sloping to south: the hill is formed with horizontal-to-gently sloped upper chalk silica quanty rock. The limestone in the site is crystal quality and contains edged chart gravel. The site is located mostly on top of hills and the top soil is expected thinner than 1 m. Relatively large limestone of 1 to 2 m long are exposed at several places. These limestone may be outcrops, but the possibility can not be denied that they are large isolated rocks.

There are basalt rock observed in the site. The basalt is porous and it suggests that the basalt lava flow on the ground surface and flowed toward the ancient valley. Also, "sil" of basalt was seen on the slope across from the RN 50. There could be a layer of basalt under the site at the same altitude with the observed "sil".

The land surface is covered with edged limestone, chart and basalt of various size. It is highly expected that bed rock is found at shallow depth during land preparation.

Also, a good oil shale deposit is reported in the eastern half of the site.

According to the geological map with a scale of 1 to 50,000, the surface geology of the site is reported that un-consolidated Diluvium covers over the Al Hasa Phosphorite. There was no stratum profile exposed on the site and a Diluvium was not observed. Based on the understanding of the map, the rocks on the ground surface are gravel in the Diluvium. Further study is necessary to clarify the problem, however, the edgy rocks generally do not show signs of long transportation by diluvial rivers. The study should include boring and topography measurement.

The site is located on the top of the hills and there is no risk of damage from flash flood.

5) Water resources

There is no possibility of major development of Quaternary deposit aquifer by shallow wells. The Quaternary deposit in this area is shallow and the volume is small; no base flow (surface water flow during dry season) was observed.

It is expected that ground water development of upper chalk quanty rock on the site is possible. Dispersed irrigation wells were found in the surrounding area. The area is expected to be a ground water recharge area with an average annual rainfall of 350 mm and limestone distribution in the surface geology. The capacity of ground water subtracting is, however, expected to be small because the limestone layer is generally horizontal and the rainwater seeps into but will not gather at certain location to form an aquifer. The site also does not have a large watershed.

There are two possibilities to bring water from outside of the site. One possibility is from As Sultani and the other is from Qatrana. The water from As Sultani will reach to the site by constructing a 16-inch branch pipeline with a 10 km length. The transportation of water from Qatrana will be possible on condition that the water currently sent to Amman be turned to Karak and the K-3 IE when Amman can get more water from the Yarmuk River and/or the Disi - Amman water transportation project is materialized, In that case, a construction of a pipeline of 25 km length along the RN 50 is necessary. In 1994, the Water Authority subtracted 2,256,659 m3/day from the wells at Qatrana. The projected development capacity at Qatrana is 5,300,000 m^3/day.

6) Electricity

Any electric distribution line was not observed in and around the K-3 IE site. A 132 kV transmission line is built east-west direction through the northern part of site. The transmission line has two circuits and connects the Karak Power Station and the Qatrana Substation.

The most efficient measure to supply electricity to the K-3 IE will be a diversion from the transmission line.

7) Natural and social environment

The site is a part of the Lajun Grazing Reserve. A native plant species was planted densely since 1981 and it grew to the maximum height of about 1.2m. Other native plant species are also growing on the site. Many beetles and other insects were observed as well as many molehills: relatively rich in small animals and birds. No similar vegetation exists in the area of 5 km radius and many of those insects and animals only exists within the reserve and not outside. Regional extinction of those site is possible by the development of the site.

Prior to commencement of a planning of a development, it is necessary to record the existing condition by conducting a detailed study of flora and fauna during suitable seasons. Once any significance is found on the site, suitable mitigation measures such as collection and re-planting of important species must be taken.

(2) Current Status

As for the K-3 IE, cabinet approval for development of IE has already been obtained. It is also informed that land acquisition cost has fully been paid in 1996.

11-2 Estimated Investment Demand through JICA Investment Demand Survey

The area required by the investors for the K-3 IE has been estimated based on expected factory lot area and preferred candidate site responded by local and foreign potential investors and the expansion coefficient that is equivalent to the reciprocal of the sampling ratio in each category of industry. It is estimated at 5.8 - 11.6 ha of factory lot in total as shown in Table 7-3-3.

Besides Jordan and the eight foreign countries surveyed in the Study, investments can be expected from Iraq, Italy, U.K., France, Netherlands, and so on, which are major trading partners of Jordan. Therefore, overall investment demand estimated by the Study Team might be on conservative side.

Investment demand survey revealed that the K-3 IE has the following characteristics.

- Foreign investors being majority : About 86% of total area of factory lots is for Foreign investors and the rest for local investors (refer to Table 7-3-3).
- Clean industries : Industries shown in Table 7-3-3 are not polluting ones.
- Labor intensive and assembly / processing type : Labor intensive type (wearing apparel) and assembly / processing type (glass & non-metal mineral, iron & steel casting) are expected to be located.

11-3 Role of K-3 Development and Supporting Measures

In the investment demand survey carried out in the Study, demand for the K-2 IE is of limited magnitude, namely 5.8 - 11.6 ha in net (factory lots) or about 20 ha of gross area.

However, if substantial measures are taken to upgrade the investment environment both in terms of infrastructure and institutional framework, development of an industrial estate could be an option. Specific measures / actions are suggested hereunder.

(1) Upgrading of transport infrastructure

A plan has been formulated for upgrading the road network in Karak Governorate which would provide a better access from Karak City to the Desert Highway as well as to the Amman capital region. The planned road would run partly in parallel with the existing RN 50 and partly utilizing the existing route, with 4 lanes of improved alignment. The project comprises three phases, and is intended to be completed within 5 years. Though the first phase has already been initiated, starting from the junction with the Desert Highway, implementation of the subsequent two phases are waiting for finance arrangement.

It is very much desirous that the road project be completed which would enhance the accessibility of Karak both to Amman and Aqaba and thereby increase the investment demand.

(2) Institutional measures

The following institutional measures or provision of additional incentives are advisable to be given to the investors to be located in the K-3 IE.

1) Low lease rate / selling price

Lease rate / selling price of the factory lots and standard factories for the K-3 IE should be substantially lower than for the IEs in the capital region in order to compensate the inferior locational conditions relative to the capital region.

2) Exemption of lease rate

To help the located enterprises financially during the initial period of their business, lease payment should be exempted for several years.

3) Exemption of corporate income tax

It has been proposed in the Study that the current income tax exemption period of 2 years be extended to 5 years, which is applicable to the industries (enterprises) located in IEs implemented and managed by JIEC. It is also proposed that under the Investment Promotion Law, Zone D, under which Karak is categorized, should newly be set up where 15 years of tax exemption be provided for the located industries. All these materialized, the industries located in the K-3 IE to be implemented by JIEC would enjoy the 20 years of income tax exemption.

(3) Profitability / Cost recovery policy

1) Improvement of profitability of the K-3 IE project

Although stimulating industrial activities are of vital importance for the regional development of Karak, low lease rate / selling price of the factory lots would essentially affect the financial viability of the K-3 IE project. With a view to alleviate it, the following measures might be advisable to be considered.

(a)To construct the external infrastructure / utilities facilities to be provided for the IE at the expense of the Government, and
(b)To exempt the machinery and equipment to be installed in the IE for JIEC from taxes in the similar manner to those for the industries to be located in JIEC's IEs.

2) Policy measures

It might be an essential condition that JIEC adopt "overall self-supporting policy" rather than self-supporting principle for each IE project.

(4) Development condition of K-3 IE

If the K-3 IE should be materialized, it may be advisable to take consideration for the followings.

1) Phased development, keeping in step with the realization of stronger incentives for the investors and improvement of infrastructure, road link in particular,
2) Conservation of groundwater environment at Lajun area, and
3) Oilshale development at Lajun area

11-4 Development Area and Categories of Industries to be Located and Lot Allocation

It is presumed that about 20% or 2.2 ha of the demanded area can be added to the demand identified by the investment demand survey, in consideration of unidentified demand from countries not covered by the survey.

Moreover, in consideration of special incentives granted to the K-3 IE and upgrading the investment environment both in terms of infrastructure and institutional framework, it can be assumed that the total net factory lot area would reach 16.0 - 27.6 ha, which is twice a combined area of the demand identified by the survey and 20% addition for the unidentified demand, namely 8.0 - 13.8 ha.

Consequently, the net development area of the K-3 IE is presumed to be about 28 ha (gross area : 35 ha) as shown in Table 11-4-1, and summarized by industrial category below.

Net Development Area for K-3 Industrial Estate

Industrial Category		Net Development Area(ha)	Number of Factory Lot
322	Wearing apparel	24.0 (87.0%)	12
351	Chemical	1.2 (4.3%)	6
362/369	Glass & Non-metal mineral	0.4 (1.4%)	2
381	Fabricated metal	2.0 (7.3%)	2
	Total	27.6(100.0%)	22

11-5 Land Use and Land Preparation

11-5-1 Land Use and Road Plan

(1) Land use

Land use of the K-3 IE has been planned according to the following conditions and basic concept:

1) Total area: 35 ha
2) Factory lot area: 27.6 ha
3) A relatively flat site was selected along RN 50 for the IE.
4) A green belt will be placed around the IE to improve its environment.
5) 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.
6) The K-3 IE will have an administration facility, service facility, and sports facility.

Factory Site Plan

Lot Size (ha/lot)	Number of Factory Lots
2.0	12
1.0	2
0.2	8
Total	22
Factory lot area (ha)	27.6

The land use plan for the K-3 IE is illustrated in Figure 11-5-1 and the planned area distribution of each land use category is shown in Table 11-5-1.

(2) Road plan

The K-3 IE will be located along RN 50, 12 km east of Karak City. A new access road will be constructed to provide access from RN 50 to the K-3 IE. The space below the high-tension wires crossing the center of the IE will be developed as a road in the IE.

The road network of the K-3 IE is shown in Figure 11-5-2.

The following roads are planned for the K-3 IE:

- Collector road (18.0 m wide, 2 lanes) — Total length: 490 m
- Collector road (30.0 m wide, 2 lanes, with a 10.0 m wide median strip) — Total length: 630 m

11-5-2 Land Preparation Plan

The evaluation of the K-3 IE ranges from 862 m to 842 m above mean sea level. Namely land is hilly, with approximately 20 m difference between the highest and lowest point.

The preparation plan is based on the same assumptions as those for the A-2 IE. The cut volume will be 640,000 cubic meters, as shown below.

Earthwork Volume

	(m^3)
Earth cut volume	640,000
Earth fill volume	640,000

11-5-3 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	200	1,300
2. Customers and police stations	100	
3. Business center (e.g., bank, post office)	150	
4. Business center (social security office, employment office, conference rooms, offices)	150	700
5. Restaurants, retail stores	100	
Sub total	700	2,000
6. Hospital	-	500
7. Other facilities	-	1,500
8. Parking lots	-	1,000
Total	700	5,000

(2) Park

A part with an area of 1.1 ha, accounting for 3.1% of the total area of the IE, will be constructed. The park will have athletic facilities and a public space.

11-6 Requirement for Utilities/Infrastructures

(1) Drainage

Rainwater in the 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 Ain El-Bisas which is geographically close to the IE, among the 40 surrey points in the report "Rainfall Intensity-Duration Frequency in Jordan" published by the Water Authority in April 1986, has been used:

- Rainfall intensity 21.0 mm/h
- Return period 10 years

(2) Water supply

The total water demand per day in the K-3 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 demand of water for each industrial category.

Water demand per industrial category (K-3)

	Industrial Category	Facto Lot Area (ha)	Unit Water Demand (m^3/ha/day)	Water Demand (m^3/day)
322	Wearing Apparel	24.0	10	240
351	Chemical	1.2	50	60
362/369	Glass & Non-metal Mineral	0.4	181	72
381	Fabricated Metal	2.0	66	132
	Total	27.6	20*	552

*: Weighted average of water consumption

From the table above, it is assumed that the water demand per site area in the K-3 IE will be 20 m^3/ha/day, and that the total water demand including the demand for an administration center will be 560 m^3/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 560 m^3 per day, which is equivalent to the consumption volume.

(4) Electricity

The total power demand for the K-3 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 Estate in Asian Countries; and
- Requirement analyzed through the 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 K-3 IE would estimated to be around 10 MW as shown in the table below.

Electric Demand Projection

(MW)

	Electric Demand
1. Factory	8.8
2. Administration center	0.4
3. Utility	0.4
4. Street lighting	0.1
5. Park lighting	0.1
Total	9.8

(5) Telecommunications

The telecommunication demand for the K-3 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 K-3 IE is estimated to be around 140 lines as shown below.

Telephone Demand Projection

	Area (ha) (1)	No. of Factories (2)	Demand Rate (line/ha) (3)	Demand Rate (line/lot) (4)	Required Demand (lines) (5)=(1)x(3)	Required Demand (lines) (6)=(2)x(4)	Required*) Capacity (lines) max(5)/(6)
1. Factory	27.6	22	3	4	83	88	88
2. Administration center							50
3. Water supply plant							3
4. Sewerage treatment plant							3
Total							144

*) The larger demand figures are chosen as required capacities

11-7 Preliminary Design/Principal Dimensions of the Utilities/Infrastructures

(1) Drainage

1) General

Rainwater in the K-3 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 drainage system in the K-3 IE is shown in Figure 11-7-1.

2) Basic conditions

The design criteria and planned facility of the drainage system in the K-3 IE are determined according to the Jordanian and Japanese standards as follows. Rainfall with a 10-year applied in the design of the drainage route.

- Rainfall return period	10 years
- Flow time	10 minutes
- Average flow velocity	1.5 m/sec
- Runoff coefficient	0.65
- Draining facility	U-section flumes, concrete pipes, box culvert
- Roughness coefficient of concrete	0.013
- Interval between manholes	75 m for 600 mm diameter pipe 100 m for 700 mm - 1,000 mm diameter pipe
- 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 880 m
- Concrete pipe (300 mm -1,000 mm in diameter), total length 540 m
- Box culvert (Size 1000 mm x 1000 mm -1,500 mm x 1,500 mm), total length 410 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 a new well to be dug inside or near the IE through a 100 mm diameter conveyance pipe.

The distribution pipe network in the IE will be shown in Figure 11-7-2.

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 flow 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 dimension:

- Conveyance pipes	100 mm diameter cast iron pipe total length 190 m
- Reservoir	560 m^3
- Elevated reservoir	15 m^3
- Distributing pipes	
50 mm diameter polyethylene pipe	total length 100 m
75 mm - 500 mm diameter cast iron pipe	total length 1,710 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 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 compiles 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 11-7-3 shows the sewerage system in the industrial estate.

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 of 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 wastewater 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	500 mm diameter and smaller: 100%
- 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 disposal facility is planned to have the following features:

- Sewage treatment plant	560 m^3
- Sewerage pipes	200 m - 250 mm diameter concrete pipe total length 960 m

(4) Electricity

1) Basic design condition and criteria

Electric power for the K3 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 Karak 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 above the K-3 IE, but no distribution line is laid nearby.

The Karak Substation, which is one of main 132/33 kV substation in Karak Governorate, is located in Karak City about 25 km west from the IE site, and supplies power to entire Karak City. Karak Substation consists of 2 main transformers of 40 MVA each with a voltage of 132/33 kV.

For electric power supply to the K-3 IE, two alternatives are possible. One is to construct a new main substation in the K-3 IE using existing 132 kV transmission

line. The other is to construct new 33 kV double circuit distribution lines from Karak Substation to K-3 IE. The former alternative by the new main substation is more expensive than the latter alternative by the new 33 kV distribution lines. Therefore, the former 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 laid to connect with a 33 kV indoor switchgear at Karak Substation by single circuit. One feeder at existing 33 kV switchgear in the Karak Substation should be expanded.

3) Internal power distribution system

A 33 kV distribution system is planned to be laid to feed power from the new 33 kV distribution lines to the factories and users to be located in the K-3 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 11-7-4.

(5) Telecommunications

1) Basic design condition and criteria

Telecommunication services for the K-3 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 K-3 IE.

2) External telecommunication system

At present, there are no telephone stations and/or optical fiber cable lines of TCC near the K-3 IE. The nearest existing exchange office is the Karak 1 and 2 exchange stations (total 17,474 lines), which is located in Karak City, about 25 km from the K-3 IE. The Karak 1 and 2 exchange stations already have fully connected with 15,802 subscriber lines, and 2,691 subscribers were waiting for connection as of the end of 1995.

The optical fiber transmission network 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 Karak exchange station and the K-3 IE. A new telephone exchange facility (Remote Line Unit (RLU)) is planned to be installed within the K-3 IE. RLU will be connected to the Karak 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 K-3 IE.

11-8 Development Phasing and Implementation Schedule

The schedule of the project implementation is shown in Figure 11-8-1.

The development of the overall site area is planned to execute 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.

The site acquisition has been completed in 1996. Completion of the construction from the initiation of the designing is assumed to take 3 years.

11-9 Investment Cost

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

(1) Earth cutting and filling: There are many boulders on the K-3 IE site. Therefore, it was assumed that some ripper work be necessitated which causes higher unit cost for earth works.

(2) Utilities: Since the area of the K-3 IE is small (35 ha) compared to the A-2 IE (200 ha), unit construction cost for the utility facilities in the K-3 IE is higher than that in the A-2 IE.

The investment cost of the K-3 IE is estimated to be JD 6.29 million. The cost for external facilities to be borne by agencies other than JIEC is JD 1.63 million. Details of the estimate are provided in Table 11-9-1.

Summary of Investment Cost for K-3 IE
(Including Tariff and Sales Tax)
(Unit: Million JD)

	Cost
1. Land acquisition cost	0.05
2. Construction cost	4.93
3. Engineering service cost	0.30
4. Administration cost	0.20
5. Contingency cost	0.81
I. Investment cost for M-2 IE (1+2+3+4+5)	6.29
II. Investment cost for external facilities to be borne by agencies other than JIEC	1.63
Total	7.92

Breakdown of the construction cost is shown below.

Breakdown of K-3 IE Construction Cost
(Including Tariff and Sales Tax)

(Unit: Million JD)

	Local Portion	Foreign Portion	Total
Cut and fill	1.60	0.00	1.60
Flash flood	0.00	0.00	0.00
Road	0.28	0.00	0.28
Drainage	0.12	0.00	0.12
Water supply	0.09	0.02	0.11
Sewerage	0.27	0.45	0.72
Electric facility	0.21	1.09	1.30
Telephone facility	0.09	0.13	0.22
Park	0.08	0.00	0.08
Administration center	0.05	0.00	0.05
Miscellaneous	0.28	0.17	0.45
Total	3.07	1.86	4.93

The investment cost for the K-3 IE, less tariff, falls to JD 5.74 million. The investment cost for external facilities to be borne by agencies other than JIEC would be JD 1.19 million. Table 11-9-2 provides the details.

Summary of Investment Cost for K-3 IE
(Excluding Tariff, Including Sales Tax)

(Unit: Million JD)

	Cost
1. Land acquisition cost	0.05
2. Construction cost	4.48
3. Engineering service cost	0.27
4. Administration cost	0.20
5. Contingency cost	0.74
I. Investment cost for M-2 IE (1+2+3+4+5)	5.74
II. Investment cost for external facilities to be borne by agencies other than JIEC	1.19
Total	6.93

Breakdown of the construction cost is shown below.

Breakdown of K-3 IE Construction Cost
(Excluding Tariff, Including Sales Tax)

(Unit: Million JD)

	Local Portion	Foreign Portion	Total
Cut and fill	1.60	0.00	1.60
Flash flood	0.00	0.00	0.00
Road	0.28	0.00	0.28
Rainwater and drainage	0.12	0.00	0.12
Water supply	0.09	0.01	0.10
Sewerage	0.27	0.45	0.72
Electric facility	0.21	0.73	0.94
Telephone facility	0.09	0.09	0.18
Park	0.08	0.00	0.08
Administration center	0.05	0.00	0.05
Miscellaneous	0.28	0.13	0.41
Total	3.07	1.41	4.48

11-10 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 K-3 IE, JIEC is regarded to be the most appropriate organization because of the highly public nature of the IE as an engine to promote industrial development for the region as well as the organization's experiences and achievement of development of IE.

(2) Division of responsibilities and cost bearing

Division of responsibilities and cost bearing for major task items related to construction and management of facilities are regarded to be similar to those of the other planned IEs.

To attract a sufficient number of investors and to successfully operate the IE, support from relevant public organizations is a key.

(3) Administration and ancillary functions

The indicative number of staff for administration of the IE is estimated to be approximately 10 as shown in Table 11-10-1.

A coordination committee should be organized involving representatives of the investors, JIEC, local administration bodies and relevant line agencies as well as Southern Regional Research and Technology Center, Southern Regional Small and Medium Industrial Center and Mu'tah University.

To support the industries in the IE, various ancillary functions should be accommodated in the ancillary buildings.

11-11 Project Evaluation

11-11-1 Financial Evaluation

The financial evaluation of the development of the K-3 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 6.3 million covering the IE construction cost of JD 6.2 million and the land acquisition cost of JD 0.1 million. The total cost includes a foreign currency portion of JD 2.4 million (US$3.4 million equivalent). The outsider agency costs for infrastructures of JD 1.6 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 35 ha was assumed to be purchased in 1998 in this study.

The unit price of the land was assumed at JD0.15 /m^2 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 /m^2 and the lease rate was set at JD1.5 /m^2/year in this study.

(6) FIRR computation

Based on the cost and benefit stated above, the FIRRs were calculated for the evaluation period of 35 years as shown in Table 11-11-1 and 11-11-2.

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 FIRRs for both the costs were too small to be computed, which shows that the K-3 IE project is not financially viable with its currently planned conditions.

(7) Sensitivity test of FIRR

A sensitivity test was conducted for the derived two 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/m^2 and leasing rate of them at JD1.5 m^2/year. FIRRs derived for both the costs 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%.

A more drastic change was assumed below in which the selling price was set at JD25/m^2 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.	N.A.	2.6
benefit normal	N.A.	2.6	6.8
benefit +20%	2.6	6.0	10.7

- FIRR with costs including sales tax

	cost +20%	cost normal	cost -20%
benefit -20%	N.A.	-0.1	4.1
benefit normal	0.7	4.1	8.6
benefit +20%	4.1	7.7	12.8

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

The FIRR value would come into the desirous range if either the cost is reduced by 20% or the benefit is increased by 20% for both cases.

Meanwhile, an examination was made to find out a 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 JD35.2 /m^2 (equalizing rate). For the cost including sales tax only, the FIRR can reach 10% by the selling price of JD33.0 /m^2.

11-11-2 Economic Evaluation

(1) Criteria for economic evaluation

The economic evaluation of the K-3 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 K-3 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 K-3 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 K-3 IE was assumed at JD15.0 /m^2 which was considered as the market selling price of the K-3 IE 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 11-11-3 and an EIRR of 0.2% 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 the K-3 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 the study prior to Pre-F/S, the K-3 project may not be considered as economically justified nor financially viable.

11-11-3 Socio-economic Evaluation

(1) Prospects for employment creation and resulting population increase

In Table 11-11-4, the expected number of employees in the K-3 IE are calculated as 5,357, based on the data from the Industrial Survey 1993 and the Investment Demand Survey conducted in this Study. It should be noted that this number will be realized only when planned spaces in the K-3 IE with 35 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 K-3 IE project as 41,033, 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 Karak 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 5,357 employment in the manufacturing sector will create 5,357 x 0.56 = 3,000 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 K-3 IE project (which is the total of employment in the manufacturing sector and employment in the service sector, that is, 5,357 + 3,000 = 8,357) by the dependency rate in Karak 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 Karak is calculated as 4.91. So the total population increase is expected to be 8,357 x 4.91 = 41,033. But it should be noted that the dependency rate in future will be less than 4.91 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 41,033 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 K-3 IE project, the number of female employees is calculated as 1,179 in Table 11-11-4, 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 12 companies in wearing apparel industry which will invest in the K-3 IE are expected to hire the total of 1,158 female employees, while 6 companies in chemical industry are expected to hire the total of 18 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

Since there are no Bedouins in Lajun, the effect by establishment of the K-3 IE will have no impacts to the Bedouin people.

(3) Impacts of population increase on social infrastructure

Projected population increase of 41,033 some time after the year 2005 resulted from the K-3 IE project may sound a big number to Karak Governorate which now has a population of about 170,000. Although Karak Governorate does not have a long-term housing development plan to cope with this magnitude of population increase, there is still enough time for Karak 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 Karak 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.

11-11-4 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 K-3 IE will alter the natural vegetation of the 35 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.

Industry	Possible gaseous emission, noise, vibration	Generation of liquid waste	Generation of solid waste
Wearing apparel			fabric, thread
Chemical	odor, dust	ABS, BOD, oil	sludge
Glass & non-metal mineral	Cd, Fu, Pb, soot	SS, pH	glass chips, ceramic chips
Fabricated metal	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 adjacent Grazing Reserve and the proposed Abu Rukbah Nature Reserve. Figure 3-1-8 shows the location and area of the proposed Nature Reserve.

The Abu Rukbah Nature Reserve was proposed in the Proposal for Wildlife Reserves in Jordan, prepared in 1979 by IUCN/WWF and the Royal Society for Conservation of

Nature. Special features of the site are mostly little known Roman antiquity and no specific natural features such as mammals and vegetation are specified in the report.

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 the Grazing Reserve and the proposed Nature Reserve
Ground water and surface water pollution	No significant impacts on the Grazing Reserve and the proposed Nature Reserve
Pollution of soil in the Grazing Reserve	No soil contamination in the Grazing Reserve from pollutants and treated waste water
Loss of flora and fauna	No extinction of significant flora, fauna and habitat
Impacts on surrounding Grazing Reserve and proposed Abu Rukbah Nature Reserve	No soil erosion in the Grazing Reserve and no loss of habitats in the proposed Nature Reserve

(2) Impact Assessment

1) Disposal of industrial waste

According to the Municipal Waste Management Study by JICA in 1996, Lajun Final Disposal Site in Karak Governorate is located about 27 km east of Karak City, and about 12 km east of the proposed IE site. It has a design capacity of 883,500 m^3 and scheduled to be in operation until the year 2010.

The construction of the IE is planned to be completed by the year 2005. By the time of completion, the disposal site will be near to its maximum capacity. In addition, the amount of wastes received daily at the disposal site will increase by the development of the IE. It is necessary to plan an extension or new construction of disposal site in the near future.

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 prompt action for expansion of the municipal disposal site and proper management and control of hazardous waste are necessary to achieve the future environmental goal.

2) Air pollution, odor, noise, vibration

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 the Amman IE, major impacts will not be felt outside of the K-3 IE. Daily monitoring will still be necessary to prevent damage on the Grazing Reserve and the proposed Nature Reserve.

3) Ground water and surface water pollution

The area around the site is expected to be a ground water recharge area with average annual rainfall of 350 mm and limestone distribution in the surface geology.

Considering the types of industry expected to be located, liquid wastes including hazardous wastes and treated waste water will be generated in the IE.

Assuming that the JIEC will monitor and manage the quality of wastewater as they do at the Amman IE, wastewater will be treated to the level suitable for irrigation. The site is located on the top of a hill and surrounded by a 10 m-wide greenbelt. The greenbelt will be irrigated by the treated wastewater. It is not likely that large amount of irrigation water spills outside of the site and contaminates adjacent land with pathogen and fecal organisms, heavy metals, and other hazardous materials. There is no risk of damage from flash flood because of the topography of the site.

4) Pollution of soil in the Grazing Reserve

As discussed in the above sections, no significant pollution of air and no significant release of polluted water from the IE is expected. Therefore, there will be no pollution of the soil in the Grazing Reserve from the IE.

5) Loss of flora and fauna within the site

The proposed site for the IE was a part of the Grazing Reserve where native plant species including introduced one grows rather densely. During a field observation conducted February 1996, many beetles and other insects were observed as well as many molehills. Even though the type of vegetation is typical for the area, similar

vegetation does not exists today within the area of about 5 km radius because of heavy grazing activity.

The Lajun Grazing Reserve has a total area of 1,100 ha. The proposed IE is planed on 35 ha of the total area. Although the project will alter the vegetation within the area, there will be no loss of significant flora and fauna by the project.

6) Impacts on surrounding Grazing Reserve and proposed Abu Rukbah Nature Reserve

From the previous discussion, the development of the IE is expected to generate no significant impacts on air quality, water quality, and flora and fauna. Although the site is located upstream of some part of the Grazing Reserve, drainage is designed so that rain water will flow to the water treatment plant. Some overflow from the drainage system will reach the greenbelt and will be partly absorbed in the strip, and partly flow slowly to downstream. Therefore, the development will not cause soil erosion in the down stream.

The traffic generated by the IE will use the RN 50 as the major access road. This road does not cross the area of the proposed Nature Reserve: traffic increase on the RN 50 will not affect the environment of the Nature Reserve.

From above discussion, no significant impact from the development of the IE is expected on the Grazing Reserve and the Nature Reserve.

11-11-5 Overall Evaluation

K-3 IE project may not be justified for implementation from the viewpoints of financial and economic viability which no serious environmental impact are expected. From the social and regional viewpoints, however, he project would greatly contribute to the welfare of the residents and regional development of Karak.
It is concluded that, therefore, the project is worth further detailed studying and it is advised that detailed engineering as well as institutional studies toward the implementation be conducted.

Table 11-4-1 Development Area of K-3 Industrial Estate by Categories of Industry

ISIC	Industrial Category	/1 Jordanian Demand	/1 (Nos. of Factory Lot)	/1 Foreign Demand	/1 (Nos. of Factory Lot)	/2 Additional Demand	/2 (Nos. of Factory Lot)	/3 Expansion Factor	Total	(Nos. of Factory Lot)
31	Food, Beverage and Tobbaco									
311/312	Food manufacturing									
313	Beverage									
32	Textile, Apparel & Leather									
321	Textile									
322	Wearing Apparel			10.0	(5)	2.0	(1)	2	24.0	(12)
323	Leather Products									
33	Wood and Wood Products									
331/332	Wood & Cork Furniture									
34	Paper Products									
341	Paper									
342	Printing									
35	Chemicals									
351	Chemical	0.4	(2)			0.2	(1)	2	1.2	(6)
356	Plastic Products									
36	Non metallic Mineral Products									
362/369	Glass & Non-Metal Mineral	0.2	(1)					2	0.4	(2)
38	Fabricated Metal, Machinery									
381	Fabricated Metal	1.0	(1)					2	2.0	(2)
382	Machinery									
383	Electrical Machinery									
384	Transport Equipment									
385	Professional Equipment									
	Total	1.6	(4)	10.0	(5)	2.2	(2)	2	27.6	(22)
	Gross Development Area (ha)								35.0	

/1 Refer to Table 7-3-3

/2 It is presumed that about 20% or 2.2 ha of the demanded area can be added as a factory lot area in addition to the demand identified by the investment demand survey, for unidentified demand from countries not covered by the survey.

/3 It is consideration of special incentives granted to the K-3 IE and upgrading the investment environment both in terms of infrastructure and institutional framework, total net factory lot area is assumed to be twice the sum of actual investment demand and additional demand.

Table 11-5-1 Land Use Plan of K-3 IE

	Area (ha)	(%)
1.Factory lot	27.6	78.9
2.Road	2.5	7.1
1) Collector Road(18.0m)	0.8	
2) Collector Road(30.0m)	1.7	
3.Utility	1.0	2.9
1) Water supply facility	0.1	
2) Sewage treatment plant	0.5	
3) Electric facility	0	
4) Communication facility	0.4	
4.Administration center	0.6	1.7
5.Park	1.1	3.1
6.Others	2.2	6.3
1) Buffer zone(10.0)	2.1	
2) Pedestrian(6.0m)	0.1	
Total	35.0	100.0

Table 11-9-1 Investment Costs for K-3
(inclusion of custom duties and general sales tax)

Unit: JD 1,000

Item	Local	Foreign	Total	Other agency	(%)
(1) Land acquisition cost	53	0	53	0	(0)
(2) Compensation cost	0	0	0	0	(0)
(3) Construction cost					
3-1 Cut and fill	1,600	0	1,600		(0)
3-2 Flash Flood	0	0	0	0	(0)
3-3 Road	279	0	279	0	(0)
3-4 Drainage	118	0	118	0	(0)
3-5 Water supply					
1) Conveyance pipe	1	1	2	24	(92)
2) Distribution pipe	21	20	41	0	(0)
3) Reservoir	64	1	65	0	(0)
3-6 Sewerage					
1) Sewer	24	0	24	0	(0)
2) Sewage treatment	245	455	700	0	(0)
3-7 Electric facility					
1) Distribution system	215	1,091	1,306	0	(0)
2) Extension of existing substation	0	0	0	126	(100)
3) Transmission line	0	0	0	1,012	(100)
3-8 Telephone facility	90	129	219	318	(59)
3-9 Parks	77	0	77	0	(0)
3-10 Administration	47	3	50	0	(0)
3-11 Miscellaneous (10%)	278	170	448	148	(25)
Sub-total (3)	3,059	1,870	4,929	1,628	(25)
(4) Engineering services	59*1	237*2	296*3	0	-
(5) Administration cost	200	0	200	0	-
(6) Contingency ((3)+(4)+(5)) x 15%	498	316	814	0	-
Total Construction Cost ((3)+(4)+(5)+(6))	3,816	2,423	6,239	1,628	(21)
Total of the foreign portion in US$ (1,000)	-	3,417	-	-	-

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 =	22.60	28.50	net: US$/sq.m =	31.87	40.19
gross: JD/sq.m =	17.83	22.48	gross: US$/sq.m =	25.13	31.69

Table 11-9-2 Investment Costs for K-3
(exemption from custom duties and inclusion of general sales tax)

Unit: JD 1,000

Item	Local	Foreign	Total	Other agency	(%)
(1) Land acquisition cost	53	0	53	0	(0)
(2) Compensation cost	0	0	0	0	(0)
(3) Construction cost					
3-1 Cut and fill	1,600	0	1,600		(0)
3-2 Flash Flood	0	0	0	0	(0)
3-3 Road	279	0	279	0	(0)
3-4 Drainage	118	0	118	0	(0)
3-5 Water supply					
1) Conveyance pipe	1	1	2	24	(92)
2) Distribution pipe	21	16	37	0	(0)
3) Reservoir	64	1	65	0	(0)
3-6 Sewerage					
1) Sewer	24	0	24	0	(0)
2) Sewage treatment	245	455	700	0	(0)
3-7 Electric facility					
1) Distribution system	215	728	943	0	(0)
2) Extension of existing substation	0	0	0	85	(100)
3) Transmission line	0	0	0	708	(100)
3-8 Telephone facility	90	86	176	261	(60)
3-9 Parks	77	0	77	0	(0)
3-10 Administration	47	2	49	0	(0)
3-11 Miscellaneous (10%)	278	129	407	108	(21)
Sub-total (3)	3,059	1,418	4,477	1,186	(21)
(4) Engineering services	54*1	215*2	269*3	0	-
(5) Administration cost	200	0	200	0	-
(6) Contingency ((3)+(4)+(5)) x 15%	497	245	742	0	-
Total Construction Cost ((3)+(4)+(5)+(6))	3,810	1,878	5,688	1,186	(17)
Total of the foreign portion in US$ (1,000)	-	2,648	-	-	-

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 =	20.61	24.90	net: US$/sq.m =	29.06	35.12
gross: JD/sq.m =	16.25	19.64	gross: US$/sq.m =	22.91	27.69

Table 11-10-1 Number of Staff for Administration at K-3 Industrial Estate

Tasks	No. of Staff
1. Overall management & office administration - General manager (1) - Information specialist / clerk (1) - Secretary (1) - Drivers (1)	4
2. Accounting & financial management - Accountant (1)	1
3. Promotion of investment - Clerk (1)	1
4. Water supply & waste water treatment - Engineer / technician (1)	1
5. Environmental protection - Engineer / technician (1)	1
6. Maintenance - Technician (1)	1
7. Planting - Technician (1)	1
Total	10

Table 11-11-1 Computation of FIRR for K-3 IE Project
(With costs including custom duty and sales tax)

No.	Year	Capital Cost	O&M Costs		Land Cost	Total Cost	Land for Sale	Land for Lease	Benefit		Total Benefit	B - C
			O & M Costs	Personnel Cost					Selling	Leasing		
		(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	(sqm.)	(sqm.)	(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)
1	1998	99	0	0	52.5	151			0	0	0	-151
2	1999	2,080	0	0	0	2,080			0	0	0	-2,080
3	2000	4,061	0	0	0	4,061			0	0	0	-4,061
4	2001	0	39	15	0	55	41400	41400	621	62	683	628
5	2002	0	66	26	0	91	27600	69000	414	104	518	426
6	2003	0	92	36	0	127	27600	96600	414	145	559	431
7	2004	0	118	46	0	164	27600	124200	414	186	600	436
8	2005	0	131	51	0	182	13800	138000	207	207	414	232
9	2006	0	131	51	0	182		138000	0	207	207	25
10	2007	0	131	51	0	182		138000	0	207	207	25
11	2008	0	131	51	0	182		138000	0	207	207	25
12	2009	0	131	51	0	182		138000	0	207	207	25
13	2010	0	131	51	0	182		138000	0	207	207	25
14	2011	0	131	51	0	182		138000	0	207	207	25
15	2012	0	131	51	0	182		138000	0	207	207	25
16	2013	0	131	51	0	182		138000	0	207	207	25
17	2014	0	131	51	0	182		138000	0	207	207	25
18	2015	0	131	51	0	182		138000	0	207	207	25
19	2016	0	131	51	0	182		138000	0	207	207	25
20	2017	0	131	51	0	182		138000	0	207	207	25
21	2018	0	131	51	0	182		138000	0	207	207	25
22	2019	0	131	51	0	182		138000	0	207	207	25
23	2020	0	131	51	0	182		138000	0	207	207	25
24	2021	0	131	51	0	182		138000	0	207	207	25
25	2022	0	131	51	0	182		138000	0	207	207	25
26	2023	292	131	51	0	474		138000	0	207	207	-267
27	2024	0	131	51	0	182		138000	0	207	207	25
28	2025	0	131	51	0	182		138000	0	207	207	25
29	2026	0	131	51	0	182		138000	0	207	207	25
30	2027	0	131	51	0	182		138000	0	207	207	25
31	2028	0	131	51	0	182		138000	0	207	207	25
32	2029	0	131	51	0	182		138000	0	207	207	25
33	2030	0	131	51	0	182		138000	0	207	207	25
34	2031	0	131	51	0	182		138000	0	207	207	25
35	2032	0	131	51	0	182		138000	0	207	207	25
NPV(10%)=		4,884	806	314	48	6,051			1,224	1,273	2,497	-3,554
											FIRR=	#NUM!

Notes :

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

Table 11-11-2 Computation of FIRR for K-3 IE Project
(With costs including sales tax)

No.	Year	Capital Cost	O&M Costs		Land Cost	Total Cost	Land for Sale	Land for Lease	Benefit		Total Benefit	B - C
			O & M Costs	Personnel Cost					Selling	Leasing		
		(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	(sqm.)	(sqm.)	(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)
1	1998	90		0	52.5	142					0	-142
2	1999	1,896		0		1,896					0	-1,896
3	2000	3,702		0		3,702					0	-3,702
4	2001		36	15		51	41400	41400	621	62	683	632
5	2002		60	26		85	27600	69000	414	104	518	432
6	2003		84	36		119	27600	96600	414	145	559	440
7	2004		108	46		153	27600	124200	414	186	600	447
8	2005		119	51		170	13800	138000	207	207	414	244
9	2006		119	51		170		138000		207	207	37
10	2007		119	51		170		138000		207	207	37
11	2008		119	51		170		138000		207	207	37
12	2009		119	51		170		138000		207	207	37
13	2010		119	51		170		138000		207	207	37
14	2011		119	51		170		138000		207	207	37
15	2012		119	51		170		138000		207	207	37
16	2013		119	51		170		138000		207	207	37
17	2014		119	51		170		138000		207	207	37
18	2015		119	51		170		138000		207	207	37
19	2016		119	51		170		138000		207	207	37
20	2017		119	51		170		138000		207	207	37
21	2018		119	51		170		138000		207	207	37
22	2019		119	51		170		138000		207	207	37
23	2020		119	51		170		138000		207	207	37
24	2021		119	51		170		138000		207	207	37
25	2022		119	51		170		138000		207	207	37
26	2023	292	119	51		462		138000		207	207	-255
27	2024		119	51		170		138000		207	207	37
28	2025		119	51		170		138000		207	207	37
29	2026		119	51		170		138000		207	207	37
30	2027		119	51		170		138000		207	207	37
31	2028		119	51		170		138000		207	207	37
32	2029		119	51		170		138000		207	207	37
33	2030		119	51		170		138000		207	207	37
34	2031		119	51		170		138000		207	207	37
35	2032		119	51		170		138000		207	207	37
NPV (10%) =						5,550					2,497	-3,054
Notes :											FIRR=	-6.9%

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

Table 11-11-3 Computation of EIRR for K-3 IE Project

			O&M Cost					Benefit			
No.	Year	Capital Cost	O & M Costs	Personnel Cost	Total Cost	Land for Sale	Land for Lease	Selling	Leasing	Total Benefit	B - C
		(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)	(sqm.)	(sqm.)	(JD10^3)	(JD10^3)	(JD10^3)	(JD10^3)
1	1998	80		0	80					0	-80
2	1999	1,898		0	1,898					0	-1,898
3	2000	3,716		0	3,716					0	-3,716
4	2001		7	15	22	41400	41400	621	62	683	661
5	2002		11	26	37	27600	69000	414	104	518	481
6	2003		16	36	52	27600	96600	414	145	559	507
7	2004		20	46	66	27600	124200	414	186	600	534
8	2005		23	51	74	13800	138000	207	207	414	340
9	2006		23	51	74		138000		207	207	133
10	2007		23	51	74		138000		207	207	133
11	2008		23	51	74		138000		207	207	133
12	2009		23	51	74		138000		207	207	133
13	2010		23	51	74		138000		207	207	133
14	2011		23	51	74		138000		207	207	133
15	2012		23	51	74		138000		207	207	133
16	2013		23	51	74		138000		207	207	133
17	2014		23	51	74		138000		207	207	133
18	2015		23	51	74		138000		207	207	133
19	2016		23	51	74		138000		207	207	133
20	2017		23	51	74		138000		207	207	133
21	2018		23	51	74		138000		207	207	133
22	2019		23	51	74		138000		207	207	133
23	2020		23	51	74		138000		207	207	133
24	2021		23	51	74		138000		207	207	133
25	2022		23	51	74		138000		207	207	133
26	2023	252	23	51	326		138000		207	207	-119
27	2024		23	51	74		138000		207	207	133
28	2025		23	51	74		138000		207	207	133
29	2026		23	51	74		138000		207	207	133
30	2027		23	51	74		138000		207	207	133
31	2028		23	51	74		138000		207	207	133
32	2029		23	51	74		138000		207	207	133
33	2030		23	51	74		138000		207	207	133
34	2031		23	51	74		138000		207	207	133
35	2032		23	51	74		138000		207	207	133
NPV (10%) =					4,908					2,497	-2,411
Notes :										EIRR=	0.2%

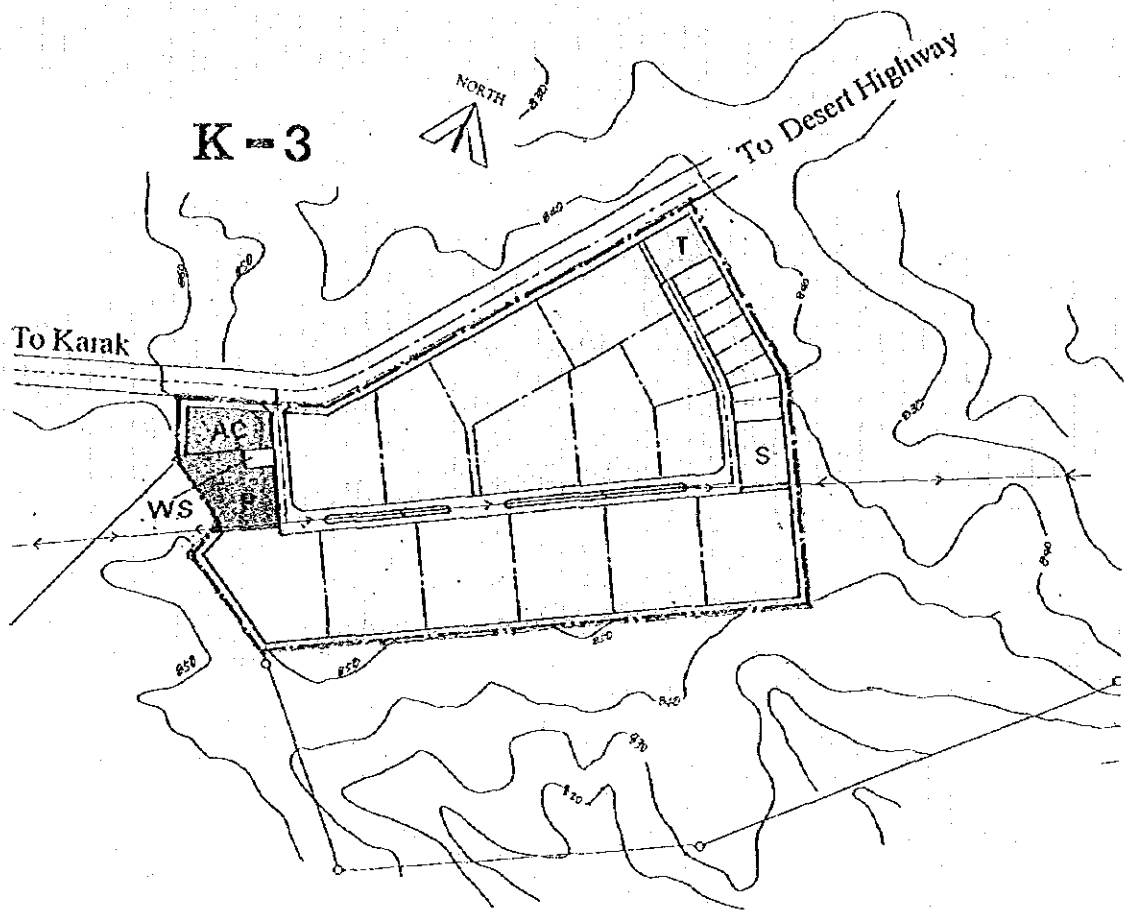
1) The economic cost is estimated based on the financial cost of 1996 prices level.
2) O&M : Operation and maintenance

Table 11-11-4 Estimated Number of Employees in K-3 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 (persons)
311+312	Food manufacturing	94	5.0%				
313	Beverage	27	8.6%				
321	Textile	49	24.8%				
322	Wearing apparel	207	23.3%	12	24.0	4,968	1158
323	Leather products	52	7.6%				
331+332	Wood & w. products	117	0.7%				
342	Printing	333	3.5%				
351+352	Industrial chemicals	75	20.3%	6	1.2	90	18
356	Plastics	33	3.8%				
36-	Glass & non-metal	57	0.8%	2	0.4	23	0
381	Fabricated metals	138	1.1%	2	2.0	276	3
382	Machinery	93	2.7%				
383	Electrical machinery	160	8.1%				
384	Transport equipment	56	4.3%				
Total				22	27.6	5,357	1179

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
- AC — Administration Center
- P — Park
- SP — Sport Park
- WS — Water Supply Facility
- T — Telecommunication Facility
- E — Electric Facility
- S — Sewage Treatment Plant
- Buffer Green, Pedestrian Way
- I/E Boundary

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Figure 11-5-1 Land Use Plan of K-3 Industrial Estate

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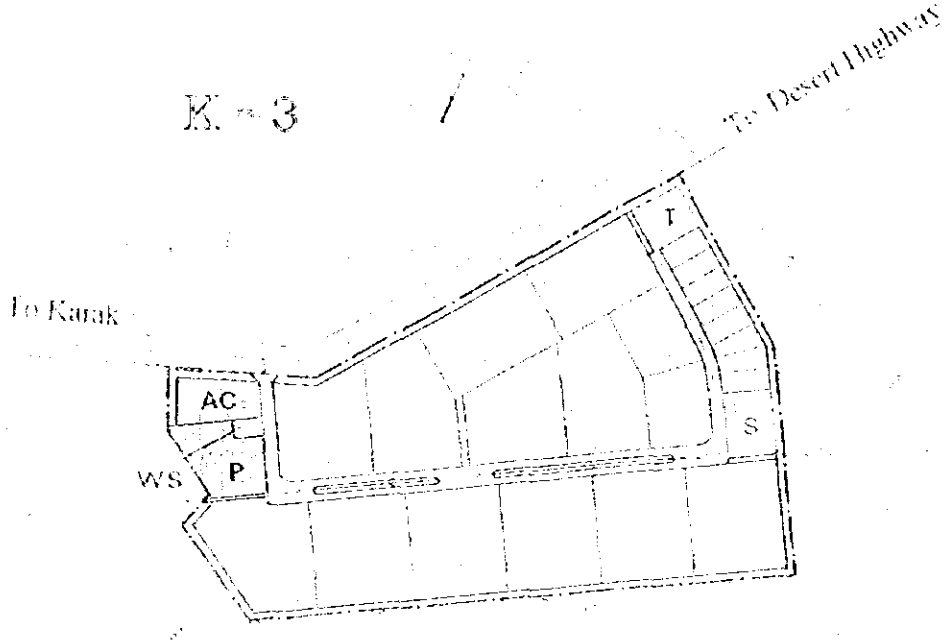
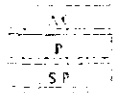
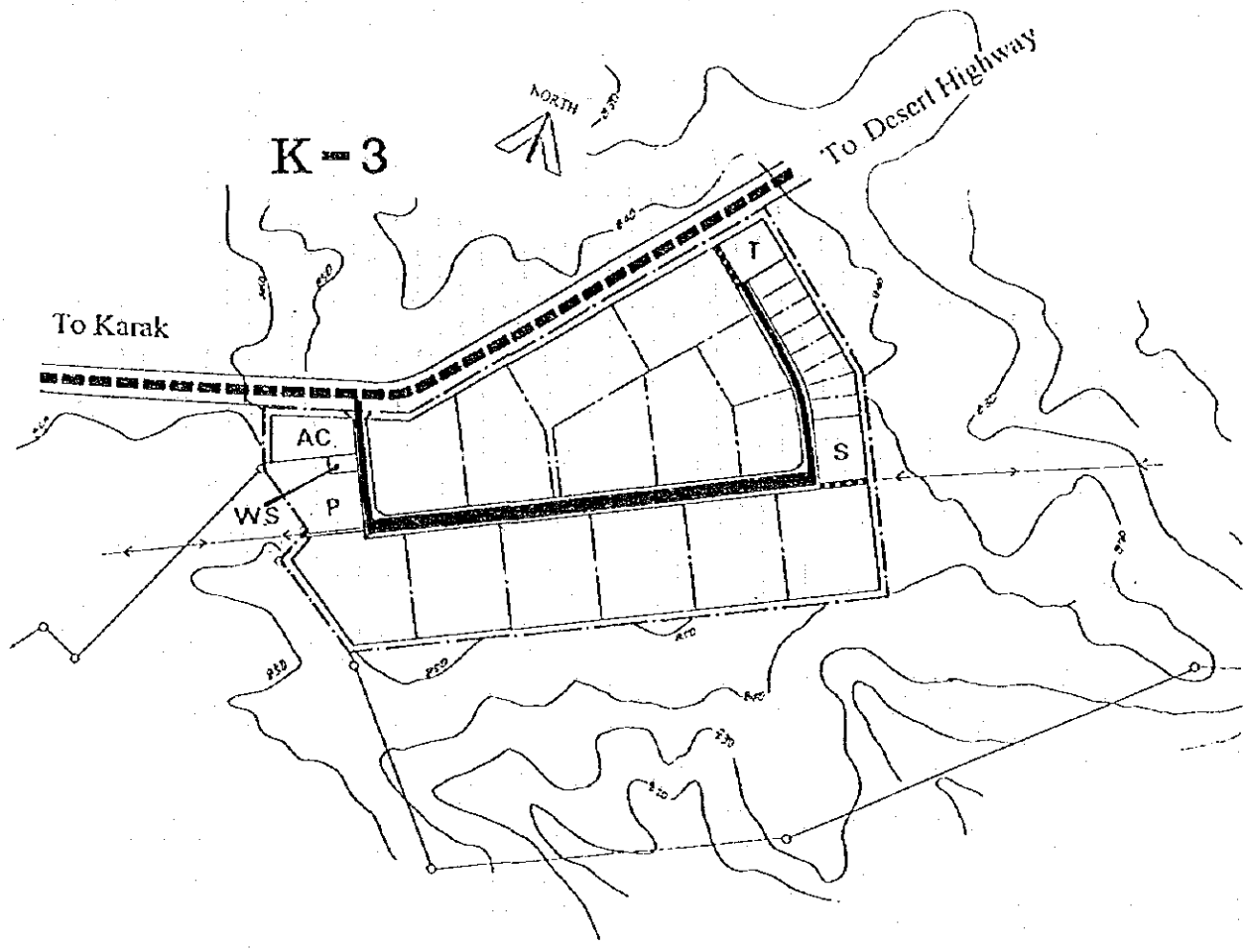

K - 3
To Desert Highway
To Karak
T
AC
P
WS
S


AC
P
SP



LEGEND

- Collector Road(w=18m)
- Collector Road(w=30m)
- Pedestrian Way(w=6m)
- Access Road(w=22m)
- Existing Road

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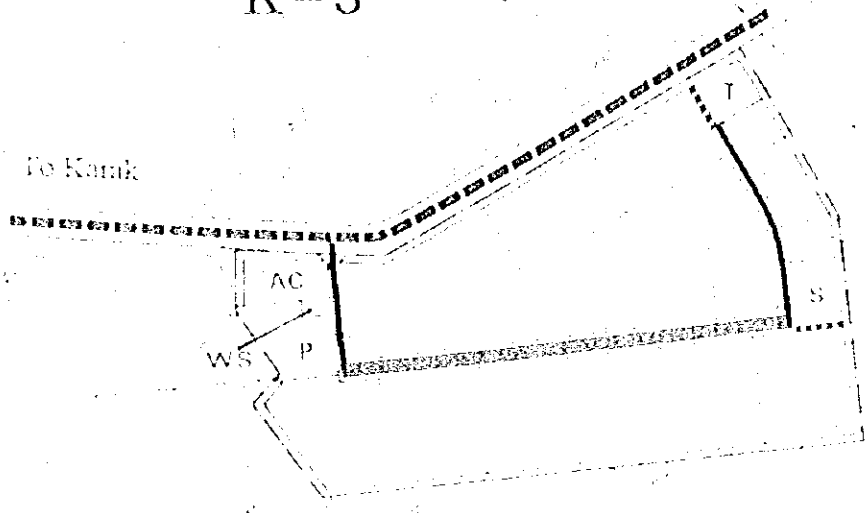
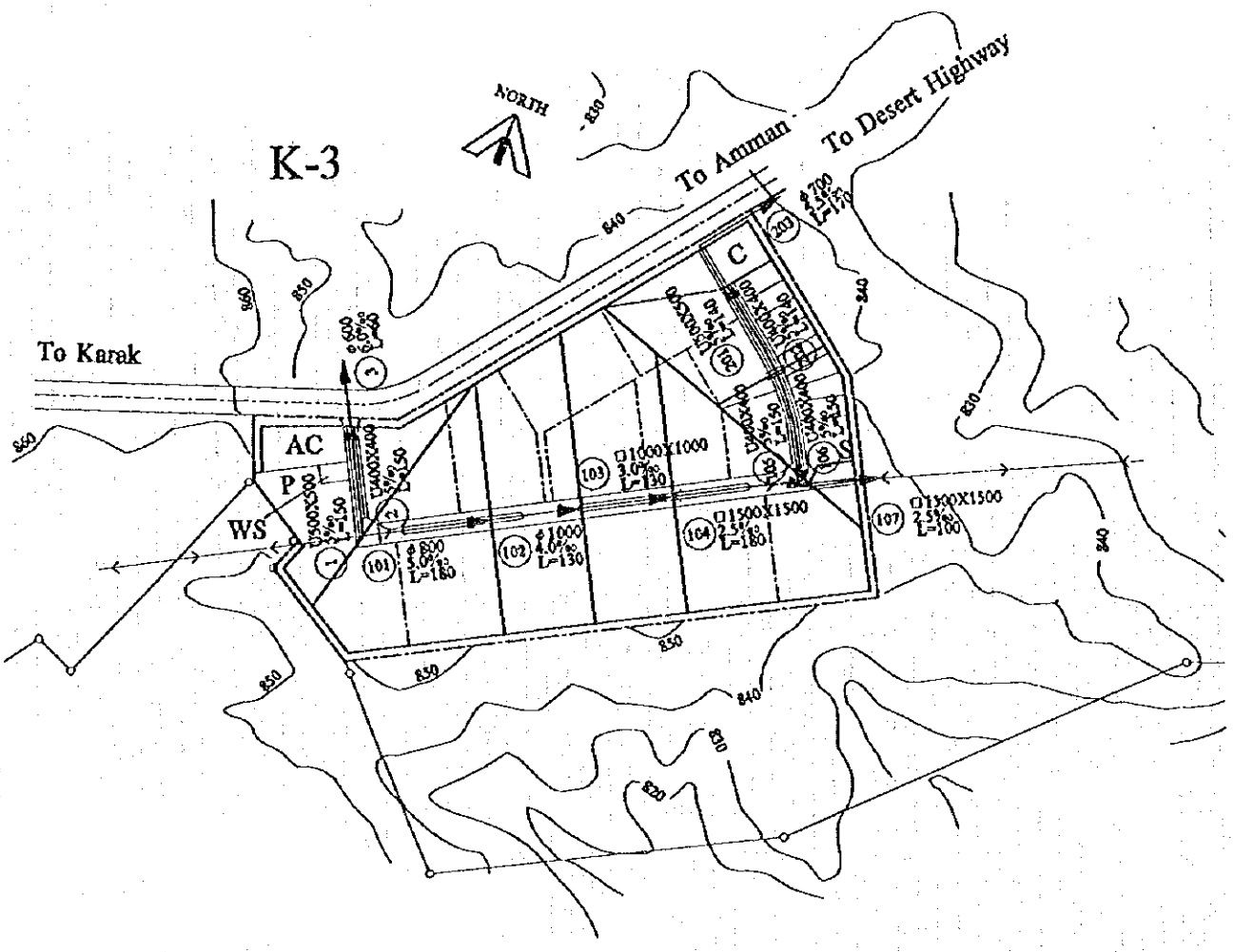
Figure 11-5-2 Road Network of K-3 Industrial Estate
NIPPON KOEI CO., LTD JAPAN INDUSTRIAL LOCATION CENTER REGIONAL PLANNING INTERNATIONAL CO., LTD

K - 3





LEGEND

①	Line Number
U400X400	U-Section Flume (mm)
ϕ800	Pipe Size (mm)
□1000X1000	Box Culvert (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 11-7-1 Drainage System in K-3 Industrial Estate

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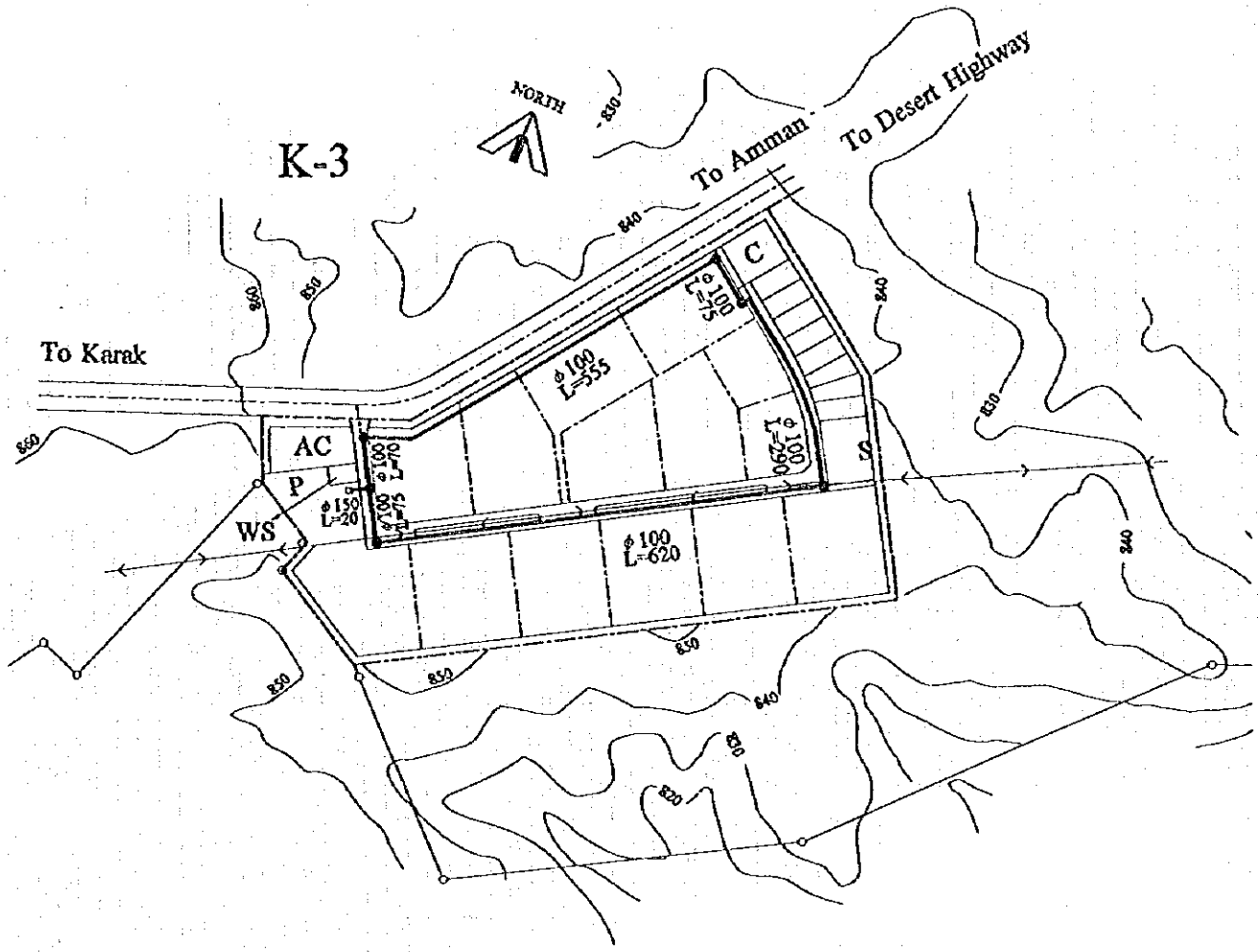
REGIONAL PLANNING INTERNATIONAL CO.,LTD



LEGEND

φ200	Pipe Size (mm)
L=200	Pipe Length (m)
AC	Administration Center
P	Park
WS	Water Supply Facility
C	Communication Facility
S	Sewage Treatmant Plant
———	Distribution Pipe

0 100 300 500m

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Figure 11-7-2 Water Supply Networks in K-3 Industrial Estate

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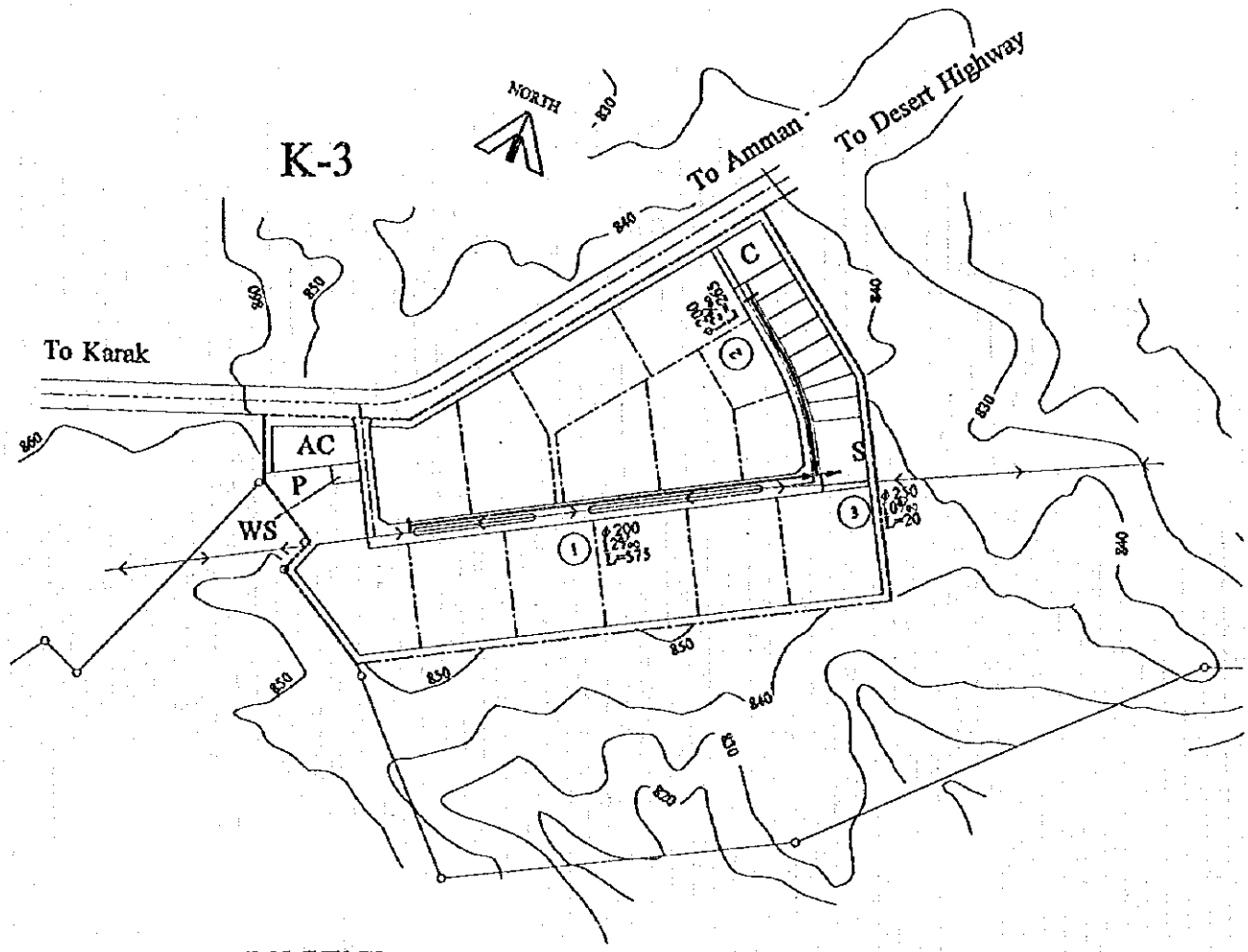
REGIONAL PLANNING INTERNATIONAL CO.,LTD



LEGEND

①	Line Number
φ200	Pipe Size (mm)
12‰	Slope(1/1000)
L=200	Pipe Length (m)
AC	Administration Center
P	Park
WS	Water Supply Facility
C	Communication Facility
S	Sewage Treatment Plant
———	Sewer Pipe

0 100 300 500m

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Figure 11-7-3 Sewerage System in K-3 Industrial Estate

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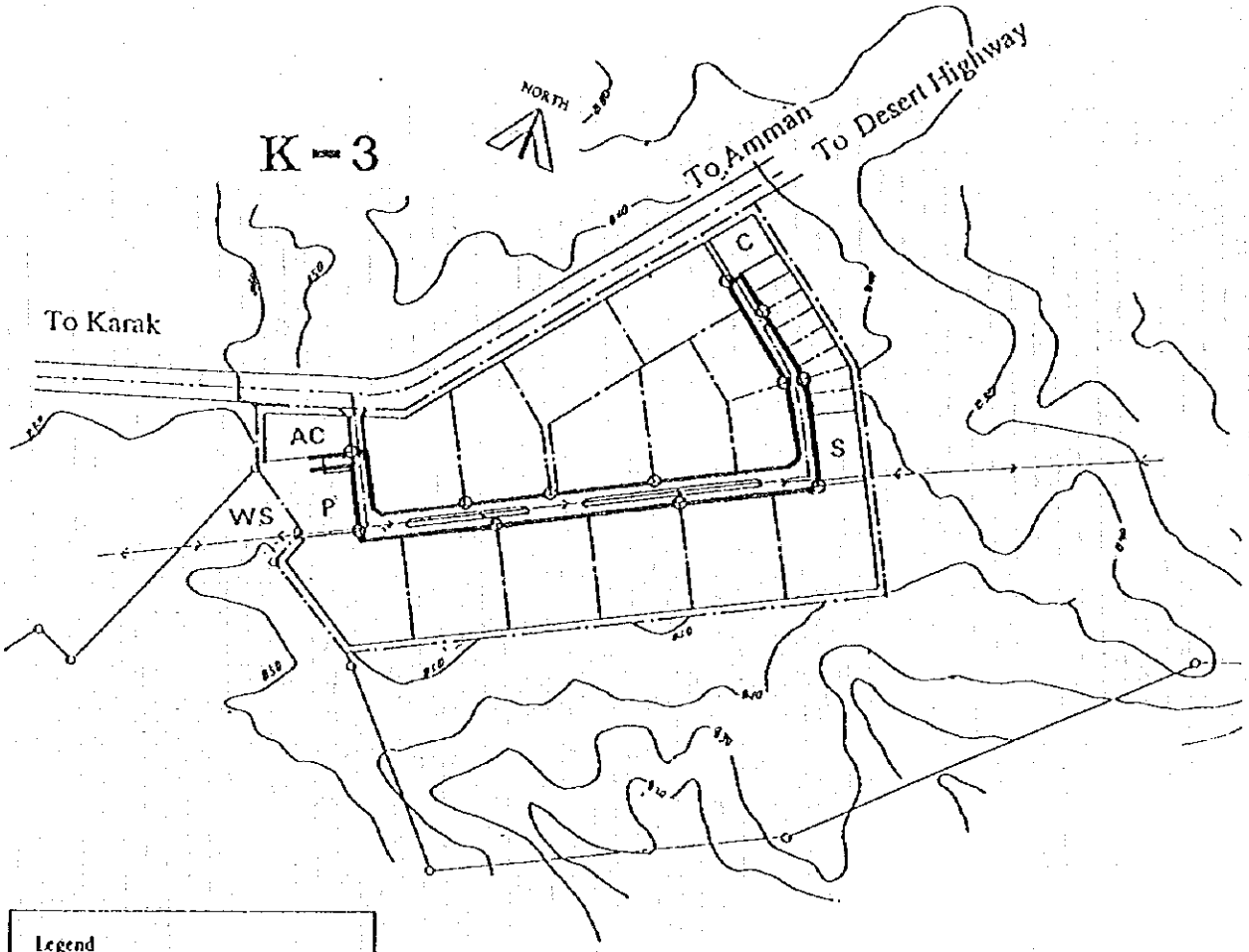
JAPAN INDUSTRIAL LOCATION CENTER
REGIONAL PLANNING INTERNATIONAL CO.,LTD



Legend

- Ring Main Unit
- 33kV Under ground Cable
- Ring Main Unit Internal Circuit
- Distribution Line
- Feeder
- Feeder
- Distribution Line

AC : Administration Center
P : Park
E : Electric Substation
Main Substation
S : Sewage Treatment Plant
WS : Water Supply Facility
C : Communication Facility

0 100 300 500M

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Figure 11-7-4 Preliminary Plan of 33 kV Distribution System in K-3 Industrial Estate
NIPPON KOEI CO.,LTD JAPAN INDUSTRIAL LOCATION CENTER REGIONAL PLANNING INTERNATIONAL CO., LTD

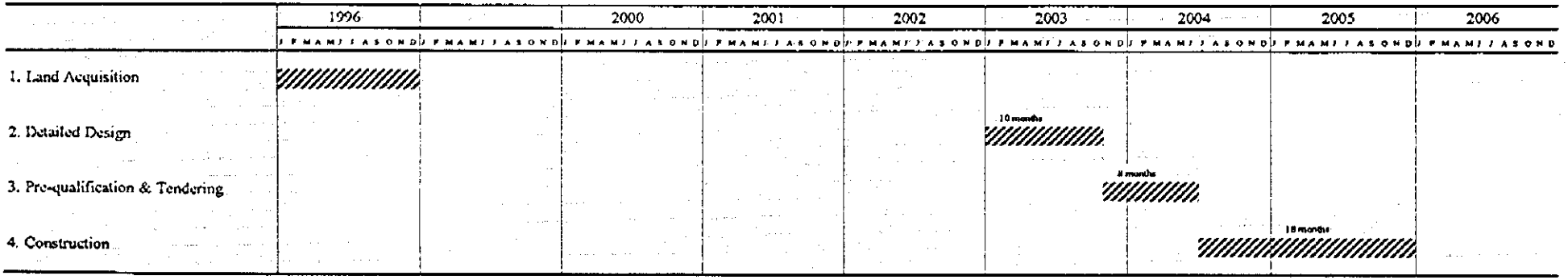

Figure 11-8-1 Overall Implementation Schedule for K-3 IE