3.4.2 Recommended Factories and Standard Size

a. Introduction

3.148   In the preceding Section, 27 sub-sectors are identified.
Next, it is necessary to transform these into individual factories
with the standard size per factory, in order to estimate the required
size of the Irbid Municipality Industrial Park. Each identified sub-
sector actually is producing many kinds of products which in most case
can not be produced by a single factory. Thus, it is necessary to
disaggregate the products by a single sub-sector into several groups
of products so that each group can be produced by a single factory.
Thus the analysis has to go back to the products level, which were
already identified in Section 3.4.1, d.

3.149   Criteria used in identifying individual factories are
similarity in (1) inputs materials for products and in (2) output
markets of products. Thus, in Section b which follows, all the
products of the selected 27 sub-sectors are reorganized based on (1)
input materials and (2) output markets.

3.150   In order to make sure of the soundness of selected products,
in Section c, below, (1) market existence in the Study Area and (2)
availability of input materials are reexamined. As a result, some of
the products are reexamined from the Section b list.

3.151   Based on Sections b and c, individual factories are identified,
and the final selection of the products is given in Section d.

b. Grouping of Products by Input Materials and Output Market

3.152   Here, an attempt was made to reorganize the selected products
into several categories according to the type of material and the
destined market. Input materials are classified into (1) agricultural
products, (2) non-metallic minerals, (3) wood, (4) metals (iron, steel
and aluminum), (5) plastics and chemical products, (6) paper and paper-
board and (7) twisted yard. Output markets are classified into (1)
construction works (both public and private), (2) private consumption,
(3) agricultural activities, (4) distribution industries, (5) souvenir
markets and (6) other manufacturing industries. The products are
reorganized by these two classifications. The result is in Table 3.31.

Table 3.31 Classification of Selected Projects by Materials and Market

Materials \ Market	Construction Works	Private Consumption	Agricultural Activities	Distribution Industries	Other Manufacturing Industries	Souvenir Market
Agricultural Products		Dairy Products, Processed Meat, Vegetable Oil, Fruit Oil, Animal Fats, Leather Products, Leather Footware, Mayonnaise, Canning and Preserving of Fruits and Vegetables, Bakery, Sugar.	Animal Feeds.			Leather Products.
Wood and Timber	Furniture and Fixtures. Other Wooden Products.		Wooden Cases, Boxes, Containers, Cabinets.		Saw Mills.	Figurines, Folkcrafts.
Metallic Materials (Aluminum, Iron and Steel)	Fabricated Metal Products (Locks, Padlocks, Tubes, Pipes, Cocks, Taps, Valves, Bolts, Nuts, Nail, Spring, Angle, Shapes, Fixtures). Cutlery, Hand tools and General Hardware of Metal. Metal Products (Curtain Rail, Fixtures, Window Frame).		Agricultural Machinery & Equipments.			
Non-metallic Materials (Lime and Clay)	Pottery, China, Earthenware (Ceramics, Sanitary Ware, Tiles, Tableware). Glass and Glass Products. Bricks, Cement, Mortar, Plaster, Tiles, Concrete.				Glass and Glass Products	Imitation Jewelry, Figurines, Folkcrafts.
Plastic and Chemical Products	Plastic Products.		Fertilizer and Pesticides.			
Paper Products		Containers and Boxes of Paper and Paperboard (Packing, Paper, Cartons, Containers).				
Twisted Yarn			Cordage, Rope and Twine Products			

Source: Study Team.

c. Reexamination of Market Reliability and Material
    Availability

3.153   Reexamination of market reliability and material availability
was made to make sure the soundness of the selected products. As a
result of the Study Team's examination, it was made clear that there
are a considerable number of promising products, in view of the
growing construction materials market, expanding distribution activities,
and processed agricultural products market and also in view of the
outlook for imports of agricultural resources, mineral resources and
materials (i.e., availability of materials). Consequently, all the
products listed in Table 3.31 seem to be justifiable for the Industrial
Park project, although a few products needs more careful examination
such as by interviews with officials of related departments and private
entrepreneurs.

d. Recommended Factories and Their Standard Size

3.154   Based on previous Sections b and c, individual factories and
their products are specified as shown in Table 3.32. In the Table,
also, input materials and locations are listed.

3.155   Size of factories are proposed in terms of number of employees
as shown in Table 3.32. These specifications including the number of
employees are derived from (1) a sample survey made by the Study Team
in 1979, (2) Department of Statistics, mimeo, "Industrial Survey, in
Establishments Engaging 5 Persons or More for the Year 1977", which
is summarized in Table 3.33, and (3) experiences of the Team members
who have dealt with a number of industrial estate projects in developing
countries. It was difficult to establish a profitable size of a
factory in this Study, and therefore standard sizes were used. Standard
size here means average size which can be seen in Jordan, which is
derived from the number of employees per establishment for each type
of economic activity.

3.156   Even though the best efforts were made in determining the size,
the sizes in Table 3.32 still are of tentative nature. Henceforth,
it should be reexamined before the implementation of this IEI project.

3.157   According to Table 3.32, 48 factories were identified. Out
of them, (1) 6 factories from factory number 38 through 43 were excluded
from the Irbid Municipality Industrial Park since they are dusty
and do not fit to locating in industrial estate, and a sugar factory
which has factory number 7 also is excluded from the Industrial Park
since its input material, i.e., Jerusalem Artichoke, is still at
experimental stage and is not proved to be successful yet.

3.158   In addition to above, additional 9 factories are excluded
from the Park.

Table 3.32   Recommended Factories in the Irbid Municipality Industrial Park

Factory No.	Kind of Factory	Products	Materials	Number of Employees (in persons)	Location	Note
1.	Food factory	Animal feed	Maize, Bone meal, Waste, Bagasse	30	Inside the Municipality Industrial Park	
[2]	Meat factory	Processed meat	Cattle, Goats, Sheep	50	"	
3.	Broiler factory	Processed chicken (Broilers)	Chicken	30	"	
[4]	Dairy factory	Milk, Cream, Butter, Cheese	Milk	100	"	
[5]	Canning factory	Canned meat, Fruits, Vegetables, Juice	Meat, Fruits, Vegetables, Fishes	50	"	
6.	Integrated bakery	Biscuits, Cake, Pastry, Confectionary	Sugar, Corn starch, Egg, Meat, Oil	50	"	
(7)	Sugar factory	Refined sugar	Jerusalem artichoke or Sugar cane	50	Outside the Park	
8.	Egg factory	Mayonnaise, Egg oil, Egg white, Egg yolks	Egg	40	Inside the Park	
9.	Oil factory	Vegetable oil, Olive oil, Animal fats	Olive, Vegetable, Soybean, Animal fats	30	"	

Factory No.	Kind of Factory	Products	Materials	Number of Employees (in persons)	Location	Note
10.	Fruits and Vegetable processing factory (exclude canning)	Pickled vegetables, Sauce, Ketchup, Jam, Marmalade, Ferment, Fruit Powder	Vegetables, Fruits	50	Inside the Park	
11.	Leather factory (1)	Leather products (Bags and Suits)	Leather (rather high quality)	30	"	
12.	Leather factory (2)	Leather products (Sandal, Belts, etc.)	Leather (rather low quality)	50	"	
13.	Rope manufacture (2)	Wire rope	Wire rod	20	Inside the Park	
[14]	Wire mill	Wire rod	Steel, Iron	20	"	Wire drawing machine
15.	Metal work (1)	Knives, Forks, Spoons, Hand tools	Steel, Iron	50	"	
[16]	Metal work (2)	Can	Aluminum, Iron	50	"	
17.	Metal work (3)	Agricultural implements	Steel, Iron	40	"	
18.	Metal work (4)	Curtain, Window frame, Fixture, Kitchen ware, Table ware	Aluminum	50	"	

(to continue)

Factory No.	Kind of Factory	Products	Materials	Number of Employees (in persons)	Location	Note
19.	Metal work (5)	Containers, Boxes, Cabinets	Iron, Steel	50	Inside the Park	
20.	Metal work (6)	Agricultural machine and equipment (Pumps, Pipes, Sprinklers, Portable sprayers, Valves, Nozzles)	Iron, Steel	40	"	
21.	Metal works (7)	Fabricated metal products (Locks, Tabs, Cocks, Taps, Bolts, Nuts, Nails, Springs, Angles)	Iron, Steel	40	"	
22.	Plastic factory (1)	Containers, Cases, Boxes, Cartons	Plastics	20	"	
23.	Plastic factory (2)	Table, Chair, Bench, Table-ware, Kitchenware	Plastics	20	"	
24.	Plastic factory (3)	Fixtures, Machine parts	Plastics	20	"	
[25]	Paperboard factory (1)	Paperboard, Packaging paper	Waste paper	30	"	
26.	Paperboard factory (2)	Boxes, Cases, Cartons, Containers made of paper-board	Paper board	50	"	
[27]	Fertilizer factory (1)	Compounded fertilizer, Organic fertilizer	Chemical fertilizers, Manure	30	"	

Factory No.	Kind of Factory	Products	Materials	Number of Employees (in persons)	Location	Note
28.	Fertilizer factory (2)	Fertilizers, Insecticides	Fine lime	20	Inside the Park	
29.	Glass factory (1)	Glassware, Tableware, Ashtray, Folkcraft, Immitation jewelry	Raw materials are soda ash, salt cake, silica sand,	50	"	
[30]	Glass factory (2)	Glass sheet, Glass blocks	dolomite, lime-stone and feld-spar. Glass	50	"	
[31]	Glass factory (3)	Glass bottle	factory is favorable at Dead Sea area. But not impos-sible at the Study Area.	30	"	
32.	Saw mill	Sawn timber	Pine logs, Cedar logs	30	"	
33.	Wood manufac-ture (1)	Cases, Boxes, Containers, Cabinets	Timber	50	"	
34.	Wood manufac-ture (2)	Building materials of wood	Timber, Plywood	50	"	
35.	Wood manufac-ture (3)	Tableware, Kitchenware, Figurines	Timber, Logs	30	"	
36.	Furniture factory	Furniture, Fixtures of wood	Timber, Plywood	50	"	

Factory No.	Kind of Factory	Products	Materials	Number of Employees (in persons)	Location	Note
37.	Rope manufacture (1)	Ropes for packaging	Twine yarn of cotton twine, Hide, Jute	30	Inside the Park	
(38)	Brick factory	Structural bricks	Clay	30	Outside the Park	
(39)	Ceramic factory	Sanitary ware, Tableware, Kitchenware, Tiles	Ceramics	30	"	
(40)	Mixed concrete factory	Ready-mixed concrete	Sand, Cement	20	"	
(41)	Sandlime factory	Sandlime, Bricks	Lime, Sand	20	"	
(42)	Lime factory	Fine lime	Limestone	50	"	
(43)	Cement factory	Cement, White cement	Limestone	100	"	
44.	Building material	Mortar, Plaster, Tiles, Blocks	Cement, Lime, Clay	50	Inside the Park	
45.	Room unit factory	Kitchen unit, Dining unit, Bath unit, Bedroom	Wooden furniture, Plastic products, Metal products	50	"	Expansion of existing factory
46.	Stationery factory	Ballpoint pen, Stationery goods of plastics	Plastics, Metal products	50	"	"

Factory No.	Kind of Factory	Products	Materials	Number of Employees (in persons)	Location	Note
47.	Bottling factory	Juice, Beverages	Bottles, Materials for bottling	50	Inside the Park	Expansion of existing factory
48.	Printing and Publishing factory	Printed matters, Books, Textbooks, Notebooks	Paper, Printing ink	100	"	Proposed by Chamber of Industry

Source: Study Team.

Notes: Factories with ( ) mean their locations are outside the Park.

Factories with [ ] will be deleted later.

Table 3.33   Number of Establishments and Employee, East Bank, 1977

Economic Activity	(A) (persons) No. of Establishment		(B) (persons) No. of Employees		(C) (JD 1,000) Value Added		(B)/(A) (%)		(C)/(B) (JD 1,000)	
	Total	5 Persons or More	Total	5 Persons or More	Total	5 Persons or More	Total	5 Persons or More	Total	5 Persons or More
Mining and Quarrying	88	75	3,409	3,367	15,400	15,337	38.7	44.9	4.52	4.56
Food	1,242	145	3,470	2,618	8,567	7,369	4.4	18.1	1.57	2.81
Beverages	5	5	225	225	1,014	1,014	45.0	45.0	4.51	4.51
Soft Drinks	7	7	344	344	623	623	49.1	49.1	1.81	1.81
Tobacco & Cigarettes	5	4	528	528	5,143	5,143	105.6	132.0	9.74	9.74
Weaving & Textiles	164	67	1,619	1,312	2,452	2,230	9.9	19.6	2.13	1.70
Clothing	654	65	2,411	721	3,870	2,941	3.7	11.1	1.61	4.08
Leather & Leather Products	34	9	261	215	973	948	7.7	23.9	3.73	4.41
Footwear	178	14	821	493	1,115	783	4.6	35.2	1.36	1.59
Wood Products	919	67	2,216	421	1,938	1,047	2.4	6.3	0.87	2.49
Paper Products	11	9	481	478	866	864	43.7	53.1	1.80	1.81
Printing and Publishing	56	33	500	465	1,375	1,315	8.9	35.2	2.75	2.83
Chemical Products	45	27	539	498	2,629	2,570	12.0	18.4	4.88	5.16
Petroleum Products	1	1	2,491	2,491	5,686	5,686	2,491.0	2,491.0	2.28	2.28
Rubber Products	16	5	237	210	151	140	14.8	42.0	0.64	0.67
Plastic Products	20	18	328	322	1,312	1,309	16.4	17.9	4.00	4.07
Non-metalic Products	345	79	2,894	2,149	8,915	8,615	8.4	27.2	3.08	4.01
Metalic Products	511	63	1,850	987	7,374	6,496	3.6	15.7	3.99	6.58
Electric Appliance	141	3	602	430	566	458	4.2	143.3	0.94	1.07
Transport Equipment	688	14	2,185	88	1,974	219	3.2	6.3	0.90	2.49
Miscellaneous	157	15	773	210	1,032	268	4.9	14.0	1.34	1.28
Electricity	3	3	1,513	1,513	3,117	3,117	504.3	504.3	2.06	2.06
Total	5,290	729	31,697	20,085	76,092	68,492	5.99	27.6	2.40	3.41

3.159   After selecting 48 factories, the Study Team made additional interviews to Government officials to confirm the factories. On these interviews, 9 more factories are pointed out not to be suitable for the Industrial Park based on the following reasons in Table 3.34. Thus, these 9 more factories are excluded from the Park.

Table 3.34   Reasons for Eliminating 9 Factories

Factory Code	Eliminated Industries	Products	Reason
2	Meat Factory	Processed Meat	Most of the materials has to be imported. It lacks comparative advantage.
4	Dairy Factory	Milk, Cream, Butter, Cheese	A big factory is already located in Zarqa, and has a branch-factory in Irbid.
5	Canning Factory	Canned Meat, Fruits and Vegetables, Juice	Jordan has insufficient materials for canning. Fresh type is favored and profitable.
25	Paperboard Factory	Paperboard, Packaging Paper	One factory in Amman has been sufferring from long-term deficits, so chances for success is little.
27	Fertilizer Factory	Compounded Fertilizer, Organic Fertilizer	There is a big factory in Aqaba. At present it is unnecessary to make such a factory since irrigation has not been promoted fully.
30	Glass Factory	Glass Sheets, Glass Blocks	There are many competitors such as a factory in Ma'an.
31	Glass Factory	Glass Bottle	This can be included in and merged to the recommended glass factory which will produce glassware, tableware, etc.
14	Wire Mill	Wire Rod	Two big factories are in operation within Amman district. This originally needs large scale of factory, so it is desirable that a single project or another type of the estate should be considered.
16	Metal Work	Can	Canning factory being cancelled, this is automatically eliminated in terms of vertical integration.

Source: Interviews.

3.160　　As a consequence of the exclusion of these 16 factories from the Industrial Park, the number of industrial sub-sectors to be located in the Industrial Park also is reduced from 27 to 23 as shown in Table 3.35.

Table 3.35　Final Seleted Industries for the Proposed
Industrial Park

Code	ISIC	Products
9	3122	Animal feeds
17	3311	Sawmill
18	3312	Wooden cases, Boxes, Containers and Cabinets
19	3319	Other wooden products
34	3691	Structural clay products
35	3692	Cement, Lime and Plaster
36	3699	Non-metallic mineral products
37	3822	Agricultural machinery and Equipment
20	3320	Furniture and Fixtures
5	3115	Vegetable oil, Fruit oil and Animal fats
16	3240	Leather footwear
31	3560	Plastic products (Egg trays, Boxes, Containers)
32	3610	Pottery, China and Earthenware
29	3819	Fabricated metal products (Locks, Springs, etc.)
6	3117	Bakery
8	3121	Mayonnaise, Ice making
13	3215	Cordage and Rope
15	3233	Leather products
22	3412	Paper boxes and Containers
25	3512	Fertilizer and Pesticides
33	3620	Glass products
37	3811	Cutlery, Hand tools and General handware of metal
38	3813	Metal products

Source:　Study Team and ISIC.

3.161   Thus, in total, 16 factories are excluded from the Industrial Park leaving 32 factories to be located in the Park. These 32 factories are estimated to employ 1,320 persons. According to employment projection in Section 3.3, the additional employment requirement in this Study Area by the manufacturing sector between 1977 and 1985 is estimated at approximately 2,400. Thus, these new factories expected to be located in the Industrial Park will use up 55 percent of the required employment by manufacturing sector.

3.4.3   Two Examples of Recommended Factories

a.   Factory Number 17

3.162   Just for the purpose of illustrating an example of recommended factories, the Factory Number 17 of Table 3.32 are explained at full detail in this Section. It is the factory for manufacturing and repair of agricultural implements and wheel barrows in ironworks.

3.163   The product range of the factory is extensive covering general ironwork, irrigation equipment, agricultural machinery, building fixtures, valves and machinery repair relating to casting and forging, and machining. Its main products are:

(1) Manufacture and repair of agricultural implements;
(2) Manufacture of bicycle trailers; and
(3) Manufacture of wheel barrows.

Its main equipments required are:

(1) Forging equipment;
(2) Welding equipment; and
(3) Machine processing equipment.

And, its construction costs and required personnels are shown in Table 3.36.

b.   Factory Number 11

3.164   Another example is taken up from the list. That is Factory Number 11, which will produce small leather products such as bags.

3.165   Raw materials required for this factory are:

(1) Tanned and dyed leather;
(2) Fixtures (guffer finished, plated) outside order;
(3) Internal materials (cloth, pigskin, core materials -- non-woven materials, foam); and
(4) Adhesive.

Table 3.36   Example: Cost of Construction and Required
Personnel for Factory Number 17

(Unit: US$1,000)

No.	Name of Facility	Equipment FOB Cost	Material Local Cost	Labor Local Cost	Total Cost	No. of Required Personnel (in persons)	Remarks
1.	Forging facility	33.2	0.5	1.6	35.3	10	
2.	Welding facility	16.3	0.9	0.2	17.4	10	
3.	Machining facility	32.4	5.2	2.3	39.9	4	
4.	Electricity, Water, Gas	4.7	4.9	1.5	11.1	1	
5.	Sub-Total	86.6	11.5	5.5	103.6	25	
6.	Ocean freight	21.0			21.0		FOBx0.25/ 1.03
7.	C & F cost	107.7					
8.	Marine insurance	2.1			2.1		C & F x 0.02 (2%)
9.	CIF unloading handling	109.8					
10.	Inland transportation	4.2			4.2		FOBx0.05/ 1.03
11.	Cost delivered to site	114.0					
12.	Cost at site	114.0	11.5	5.5	131.0	25	
13.	Indirect cost	13.0	1.7	0.8	15.6		No.5x0.15 (15%)
14.	Erected cost	127.0	13.2	6.5	146.6	25	

Source: Study Team.

Outline of its production process is:

(1) Using cutting equipment (oil-hydraulic press), the
design shape is stamped out of the leather. (Since
the leather shape, faults, etc., are not uniform, only
one sheet is stamped each time).

(2) The leather thickness is adjusted by slicing with a band
M/C.

(3) Only the parts for overlapping sewing margins are
partially sliced using a deckle edge cutting machine.

(4) The outer bag and inner lining are each sewn together
(using flat and arm sewing machines).

(5) The inner lining is attached to the other bag and
fixtures are added to complete the bag. (However, this
is assuming that tanned and dyed leather can be obtained
and completed fixtures can be purchased or ordered from
outside).

And, required personnels and assumed production are:

(1) In accordance with the factory size (15 x 30 m), it is
assumed that there will be 40 to 50 employees; and

(2) A monthly production of 2,000 to 3,000 bags and 4 to 5
types of products.

3.4.4 Relocation of Existing Factories

3.166 So far, we have examined the factories to be newly located
in the Industrial Park. There is another type of factories to be
located in the Park. That is relocation of existing industries inside
the municipality, particularly in the built-up area of the city. The
area for those relocated should be located adjacent to the area for
those newly established so that common facilities for both industries
can be established.

3.167 The City Council of the Irbid Municipality has a desire to
relocate workshops existing in the central part of the city, such as
workshops, auto-repair shops, furniture shops, block or brick making
and stone cutting works which tend to create environmental problems.

3.168 It is difficult to seize the exact land demands required
by these industries when relocated. We assume the number and type of
enterprises to be relocated as follows, based on information and
observations in the Irbid Municipality. However, this will be further
examined in Section 3.6.2.

(1)	Iron and steel workshops	30 to 40 workshops
(2)	Auto-repair shops	20 workshops
(3)	Furniture works	10 works
(4)	Blocks, bricks and stone cutting	20 works

3.169   The existing factories in the Irbid Municipality are small-scale cottage-type industries which as yet have not been capitalized or not been modernized. Then, an objective of relocating them and of moving them into industrial zone should be the promotion or modernization of these small-scale industries. In order to achieve this objective, high quality infrastructure and services should be provided at low costs. These conditions make a characteristic of the industrial area for small-scale industries.

3.170   Existing industrial area shows a typical pattern of an industrial area for small-scale industries. Standard sheds which have been built by the municipality are rented to private entrepreneurs at reasonable rents. But, the area seems to lack common facilities such as parking areas, convenient shops, canteens and a green park. A common workshop is also necessary to promote these industries. The present covered unit area available for workshop, which is about 50 m^2, seems to be too small.

3.171   We consider that the covered area for one workshop unit should be about 100 m^2 in the case of auto repairs, machine repairs and metal works and about 150 m^2 in the case of blocks, bricks and stone cutting. Then the total covered area needed for workshops is approximately 13,000 m^2.

3.172   These small-scale industries are possible to expand if linked with newly locating factories. An administrative organization, expected to be established to manage the Park continuously, should be responsible for the encouragement and promotion of these small-scale industries when they are relocated. Job training, finance, advisory service on management and technical advisory service will also be necessary.

3.4.5   Other Recommendations

3.173   Proposed factories should interrelate each other, for example, an animal feed factory can be connected with other foodstuff factories. Then activities or factories in the Municipality Industrial Park can be combined into an industrial complex, based on interlinkage between products and materials. Also, it should develop a close connection with factories outside.

3.174   Other development projects in the Study Area should also be related to the manufacturing industries. Besides housing construction and agricultural development, the establishment of a sewerage treatment plant in the Irbid Municipality can supply materials for organic fertilizer or soil improvement. The industrial development of the Study Area depends on taking every opportunity to make progress.

3.175 Among proposed factories, the metal work complex (five factories) should be paid special attention. This field is expected to expand in every developing country including Jordan. In order to encourage these metal fabrication works, a technical workshop or a technical service center with common facilities should be established inside the Municipality Industrial Park. In this shop or center, several kinds of basic metal processing machines such as lathes, milling machines, boring machines and drilling machines should be installed. These machines can produce a variety of metal parts for the occupants of the Park, and can be used in job training and also in making trial products. Technical advisors should be engaged in the works for this workshop or service center, which will in the future function as a technical service center, for the whole Study Area covering the satellite industrial center or rural industrial zone.

3.176 A common workshop is necessary in encouraging the relocation of existing industries, and this kind of services or facility served by this common workshop, combined with the technical service center, will help relocating auto-repair shops, metal workshops, and machine repair shops which exist at present in the built-up area of the city. However, in this Study, the cost for this common workshop is not included in cost estimate in Section 3.7 this time.

3.5 Site Selection

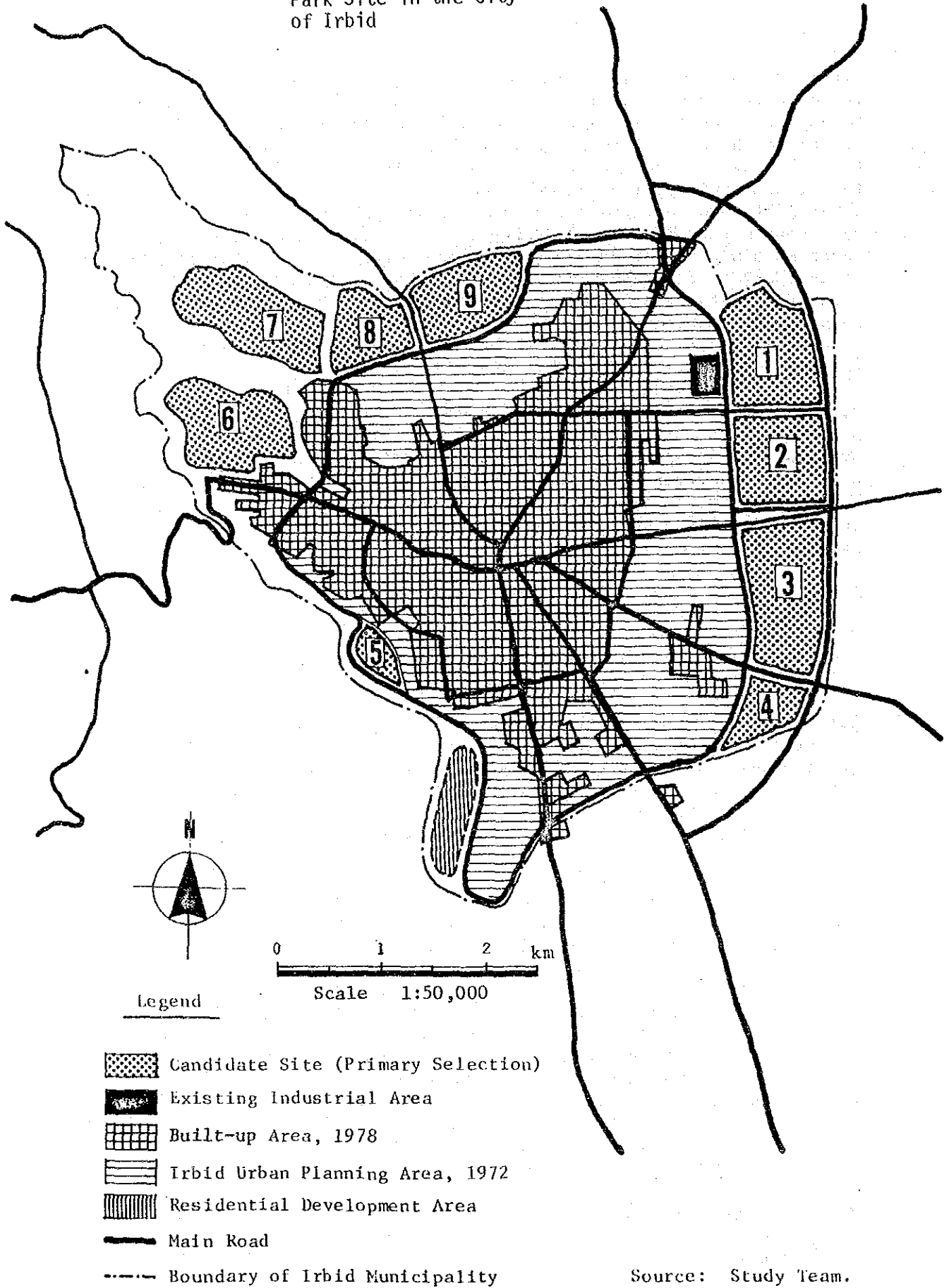### 3.5.1 Technical Approach Used in Selecting the Site

3.177 Selection of the most suitable site for the Municipality Industrial Park was done as follows, keeping in mind the interests of the municipality, people residing near the site, the industrial investors and the workers to be employed.

(1) The urbanized area of Irbid City and villages was eliminated from consideration;

(2) Alternative candidate sites (nine sites) within the Irbid City planning areas as shown on Figure 3.13 were identified; and

(3) The candidate sites were analyzed using the following four criteria: compatibility with desired land use, present and future conditions of the infrastructure, physical conditions (topography, configuration, wind direction, expandability) and degree of difficulty in land acquisition (price, ownership).

3.5.2 Result of Evaluation

3.178 Based on the above alternatives and their evaluation, the Study Team recommends that Site No. 1 is the most suitable one for the project. The several steps, given above, used by the Study Team to get this result are as shown in Table 3.37.

III-97

Figure 3.13   Primary Selection for Industrial
               Park Site in the City
               of Irbid

Legend

Scale   1:50,000

▨ Candidate Site (Primary Selection)

◼ Existing Industrial Area

▦ Built-up Area, 1978

▤ Irbid Urban Planning Area, 1972

▥ Residential Development Area

━ Main Road

·─··─ Boundary of Irbid Municipality

Source: Study Team.

Table 3.37　Site Analysis for the Irbid Municipality
Industrial Park

Site	Criteria	
	Location (Distance from the City Hall)	Traffic Condition
1	3.5 km Slope 1% towards northeast	BRR[1], ORR[2] and connecting road will be put in service from 1985
2	3 km Slope 1% towards north	BRR, ORR and connecting road will be put in service from 1985
3	3 km Slope 1% towards east	– ditto – Direct access to Route 16
4	3 km Slope 1% towards northeast	BRR, ORR will be put in service from 1985 Direct access to Route 16 and 11
5	2 km Slope 7-8% towards west	BRR will be put in service from 1985
6	2.5 km Slope 5% towards west	BRR will be put in service from 1985 Direct access to Route 16
7	3 km Slope 8% towards northwest	BRR will be put in service from 1985
8	2.5 km Slope 4% towards north	– ditto –
9	2.5 km Slope 4% towards west	– ditto –

(to continue)

Site	Criteria		
	Water Supply	Electric Power Supply	Wind Direction
1	Scarce but improved when Phase I of Maqaren Dam is completed in 1983	approx. 4.5 km to transmission line[3/]	Almost no harm
2	– ditto –	approx. 3.5 km	– ditto –
3	– ditto –	approx. 2.5 km	– ditto –
4	– ditto –	approx. 1 km	– ditto –
5	– ditto –	approx. 3 km	Harmful to the built-up area
6	– ditto –	approx. 7.5 km	– ditto –
7	– ditto –	approx. 7.5 km	Slightly harmful to the built-up area
8	– ditto –	approx. 7.5 km	– ditto –
9	– ditto –	approx. 7.5 km	– ditto –

| Site | Criteria | |
	Urban Conditions (1985)	Degree of Difficulty in Land Acquisition
1	Compatible	Land Price JD 4,000 - 5,000/donum Large parcel holders
2	- ditto -	Land Price JD 6,000 - 8,000/donum Small parcel holders
3	New Town Area as Subcenter of Irbid	Land Price JD 4,000 - 11,000/donum Small parcel holders
4	- ditto -	Land Price JD 7,000 - 11,000/donum Small parcel holders
5	Compatible	Land Price JD 8,000 - 10,000/donum Large parcel holders
6	- ditto - (out of present planning area)	Land Price JD 3,000 - 5,000/donum Large parcel holders
7	- ditto -	Land Price JD 1,500 - 2,000/donum Large parcel holders
8	- ditto -	Land Price JD 2,000 - 4,000/donum Large parcel holders
9	- ditto -	Land Price JD 2,000 - 4,000/donum Large parcel holders

Source: Based on the information from the Land and Survey Department, Irbid Municipality Office, and Irbid District Electricity Company.

Notes: 1/ BRR - Boundary Ring Road.
2/ ORR - Outer Ring Road.
3/ It is assumed that a transmission line is to be installed along BRR.

3.6 Physical Planning

3.6.1 General

3.179   This section deals with the layout and the facilities required
for the proposed Irbid Municipality Industrial Park. However, due to
the fact that nothing has been officially decided as to the site,
configuration and size of the Park, a detailed engineering study will
not be attempted. Therefore, the scope of work of this physical plann-
ing aspect is limited to building up a preliminary design of the
project to guide the following phase of the Feasibility Study and
Detailed Designs. The land use plan shown under also indicates a
typical pattern of an industrial estate and could be used as a proto-
type to be further studied and discussed by the authorities concerned.

3.6.2 Framework for the Irbid Municipality Industrial Park

3.180   The basic character, goals and framework have been set as
follows:

a. Objectives

3.181   The project is designed to broaden and enhance the economic
base of the Irbid Municipality as a growth pole of the Study Area in
line with the long-term strategy of promoting the economic development
of the Study Area. Also it is designed to create an urban type
industrial estate by introducing new small- and medium-scale industries,
such as food processing, metalworking, etc., which are identified as
the candidate industries for the project in Section 3.4, and in addition
by relocating those existing industries by 1985, such as auto-repair
shops and metalworking shops, which are at present located in the center
of the city.

b. Size of Land

3.182   Taking into consideration the various conditions discussed in
Sections 3.3 and 3.4, and also the land prices of the candidate sites,
it is proposed that an appropriate size of the project would be around
24 hectares, as this would allow development to proceed with little
difficulty. Here, changes in size will sometimes occur in the range
of plus/minus 10 percent, depending on the study of land use.

c. Employment

3.183   As shown in Table 3.38, the number of the factories to be
located in the Park are as follows:

The Relocated Industries Presently Existing in the City	100 - 120 workshops
New Industries	32 factories

Based on the field survey at the existing industrial area and the estimate in Section 3.4, it was assumed that the number of workers would be 600 persons (150 persons/gross hectare) for the relocated industries and 1,320 persons for new industries. Furthermore, the number of those indirect workers required for management and service for the Park was estimated at 80 persons. Accordingly, the total number of workers at the Park was estimated at 2,000 persons.

Table 3.38   Estimated Number of Factories and Workers for the Proposed Industrial Park

	Number of Factories	Number of Workers
1) Relocated Industries		
• Iron and Steel workshops	30-40	
• Auto-repair shops	40-50	
• Furniture works	10	600
• Blocks, Bricks and Stone cutting works	20	
(Sub-Total)	100-120	600 persons
2) New Industries		
• Food processing	6	230
• Leather work	2	80
• Woodwork and Furniture	5	230
• Rope manufacture	2	50
• Metalworking	6	270
• Plastic factory	3	60
• Others	8	400
(Sub-Total)	32	1,320 persons
3) Others	–	80
4) Total	132-152	2,000 persons

Source: Study Team.

3.184   The number of workers for the relocated industries was estimated on the basis of the present situation at the existing industrial area. The density of worker in the existing industrial area was calculated using the present number of workshops shown in Table 3.39 as follows;

(1)   Assuming that four workers are required per shop, the total workers are approximately 1,200 persons (290 shops x 4 persons).

(2)   The density of workers is 150 persons/hectare (1,200 persons ÷ 8.0 hectares)

Table 3.39   Number of Workshops at the Existing Industrial Area, 1979

Auto-repair shops	170	shops
Metalworking shops	40	shops
Sheds Under Construction (4 sheds x 20 shops)	80	shops
Total	290	shops

Source: Study Team.

d.   Net Factory Land

3.185   Based on the number of factories and workers to be relocated, the required factory land is estimated as follows:

Relocated Industries	:	28,000 m^2	–	37,000 m^2
New Industries	:	140,000 m^2	–	163,000 m^2
Total	:	168,000 m^2	–	200,000 m^2

Source: Table 3.40

3.186   Taking into consideration the substantial impact of the project on the urban communities as well as to the Study Area as a whole, the project should not become a mere space devoted to massive factory buildings. It should contribute to creating a better image for the municipality and serve as a model of industrial development in the Study Area. In this sense, the factory land shall be limited to around 70 percent of the total Park area, the remainder to be used as open space that includes common facility area, road and green area.

Table 3.40   Net Size of Factory Land for the Proposed Industrial Park

	Number of Factory	Factory Land Required
1) Relocated Industries	100-120	28,000 - 37,000 m^2
2) New Industries		
• Food processing	6	25,000 - 30,000
• Leather work	2	4,000 - 5,000
• Woodworking and Furniture	5	25,000 - 30,000
• Rope manufacture	2	9,000 - 10,000
• Metalworking	6	25,000 - 30,000
• Plastic factory	3	7,000 - 8,000
• Others	8	45,000 - 50,000
(Sub-Total)	32	140,000 - 163,000
3) Total	132-152	168,000 - 200,000

Source: Study Team.

3.187   Estimation of the factory land for relocated industries was made in the following way:

(1)   By examination of the current situation of the existing industrial area, it was found that the work space of one workshop ranges from 40 m^2 to 50 m^2. Accordingly, it is estimated that the total work space would be 13,100 m^2 to 14,500 m^2 in the existing industrial area.

(2)   The ratio of the total work space against the total area of the existing industrial area is 16.4 to 18.1 percent. (The existing industrial area has 8 hectares.)

(3)   In the case of the Park, bigger modules of 100 m^2 and 150 m^2 are to be considered, based on anticipated needs. Then it was assumed that 80 to 100 shops of 100 m^2 module and 20 shops of 150 m^2 module would be required. Therefore, the total work space required becomes 11,000 m^2 to 13,000 m^2. If it is assumed that the efficiency of land utilization is raised from 35 percent to 40 per-cent (two times higher than the existing industrial area), the factory land required becomes 28,000 m^2 to 37,000 m^2.

3.188   On the other hand, the net factory land required for the new industries was estimated by the density of worker per hectare of factory land, which ranges from 50 employees per hectare in a feed factory to 250 employees per hectare in a printing and publishing factory being 91 employees per hectare on average.

e. Schedule

3.189   If, after the Feasibility Study and Detailed Design, the conclusion is reached that there would be no difficulty for implementation, it is estimated that the construction work will start in mid-1982 and be completed by the middle of 1984. Also it is assumed that occupancy by the invited factories will take place from mid-1983 and its rate will increase to 90 percent by the end of 1985 and 100 percent by the end of 1986.

f. Infrastructure

3.190   It is expected that the present infrastructure of the Irbid Municipality will be greatly improved by 1984 when the located industries are in operation. They are the trunk roads, water supply from the Yarmouk River, wider scale sewage system and expansion of telephone facilities. Therefore the physical planning of this project will be well coordinated and integrated with those infrastructural development program.

3.6.3 Location of the Irbid Municipality Industrial Park

3.191   It is proposed that the location of the Industrial Park is to be in Site No. 1, which was depicted in Section 3.5, as shown in Figure 3.14.

3.192   The selection of the location is based on the following considerations:

(1) Transportation:

It is necessary for the site to be in an excellent location regarding easy access to road networks.

The proposed location directly faces the Boundary Ring Road which runs along the existing administrative boundary of the Irbid Municipality. Also it will have easy access to Route 23 and to the proposed Outer Ring Road through the Connecting Road A. Accordingly, it will be surrounded by favorable access roads to meet the demands for the distribution of manufactured products and for commuters who will be employed at the Industrial Park.

(2) Relation to the existing industrial area:

The Park is suitably located to form a nucleus of
industrial activities in the Irbid Municipality
by unification of the functions of both the existing
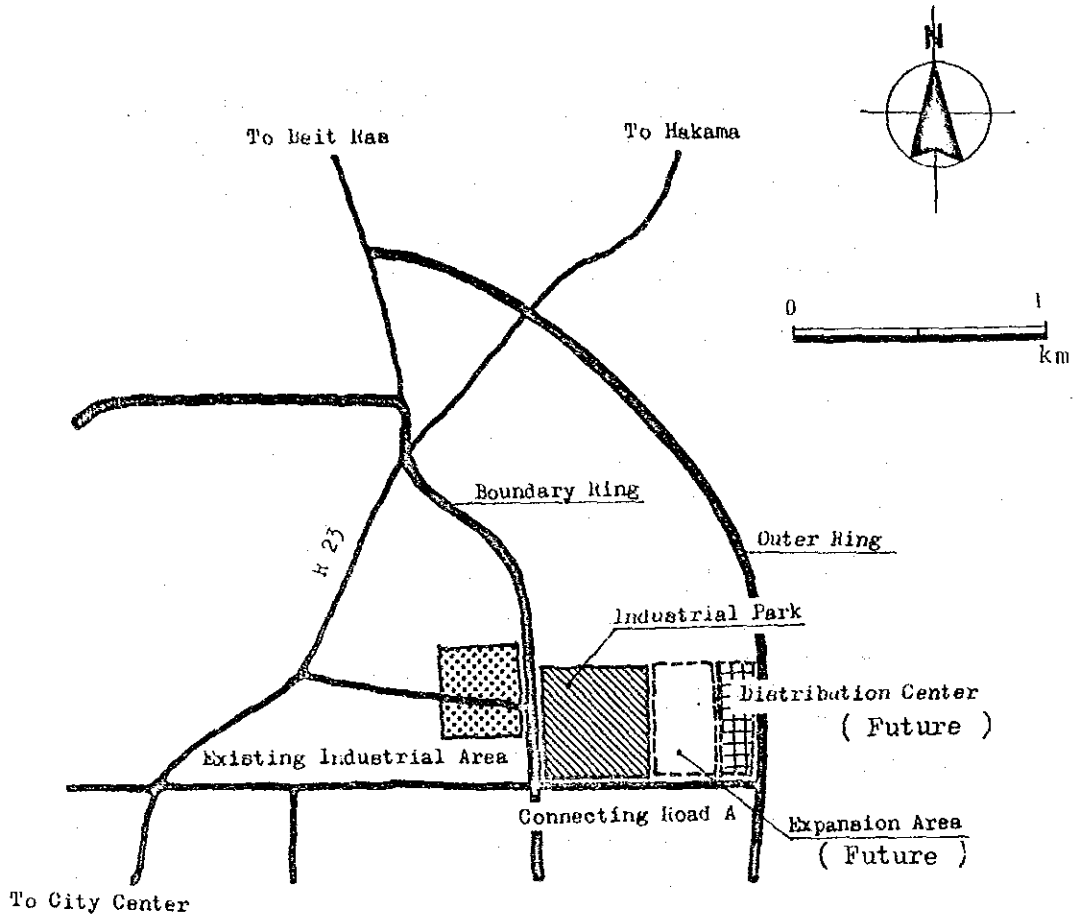industrial area with those of the Park.

By combining 12 hectares of the existing industrial
area (8 hectares already constructed plus 4 hectares
under construction) with 24 hectares of the proposed
Industrial Park, it is evident that a sizable
induatrial area will be formed. Also the proposed
location will allow future expansion towards the east,
up to the proposed Outer Ring Road. The available
space for future expansion is about 25 hectares.
It is generally thought that an industrial space of
50 to 70 hectares will effectively function as an
industrial nucleus.

Therefore, it is proposed to develop approximately 70
hectares of industrial space in total, which will
include the area for future expansion, so that a more
effective industrial nucleus may be established in the
Irbid Municipality. As to the future expansion area,
it is further proposed that a distribution center be
established there as it will become a necessity when
a substantial industrial concentration is formed in
the adjoining area.

(3) Topography:

As a large scale topographic map is not available, the
detailed analysis of topographical condition of the
site shall be made in the next phase of the study.
However, judging from the data of the available topo-
graphical map at a 1/25,000 scale, in addition to the
information obtained through our field survey, the area
around Site No. 1, is practically flat, which will
minimize the cost of required earthwork. The altitude
of the proposed location is about 540 m.

Figure 3.14   Location of the Irbid Municipality
                Industrial Park

To Beit Ras   To Hakama

N

To City Center   0 ———————— 1
                                km

Boundary Ring

K 23   Outer Ring

Industrial Park

Distribution Center
    (Future)

Existing Industrial Area

Connecting Road A   Expansion Area
                            (Future)

Source: Study Team.

3.6.4   Land Use Plan

        a.   General

3.193   Based on the candidate factories which were selected in
Section 3.4, the following items were studied to formulate a preliminary
land use plan.

        (1)   Standard unit of factory land and subdivision;
        (2)   Standard sheds (ready-made factory building); and
        (3)   Grouping of industries and its layout.

b. Standard Unit of Factory Land and Subdivision System

3.194 The standard unit of factory land for the candidate factories ranges from 2,000 m^2 to 10,000 m^2, as classified as under.

Standard Unit Size	No. of Factories
2,000 m^2	8 factories
5,000 m^2	20 "
8,000 - 10,000 m^2	4 "
Total	32 factories

Judging from the above classification, each of over 60 percent of the total number of the factories requires 5,000 m^2 of factory land.

3.195 Based on the above unit, a module of subdivision was established as shown in Figure 3.15.

Figure 3.15 Standard Unit of Factory Land and Subdivision in the Irbid Municipality Industrial Park

(Unit: m)

2,500 m^2 5,000 m^2 10,000 m^2
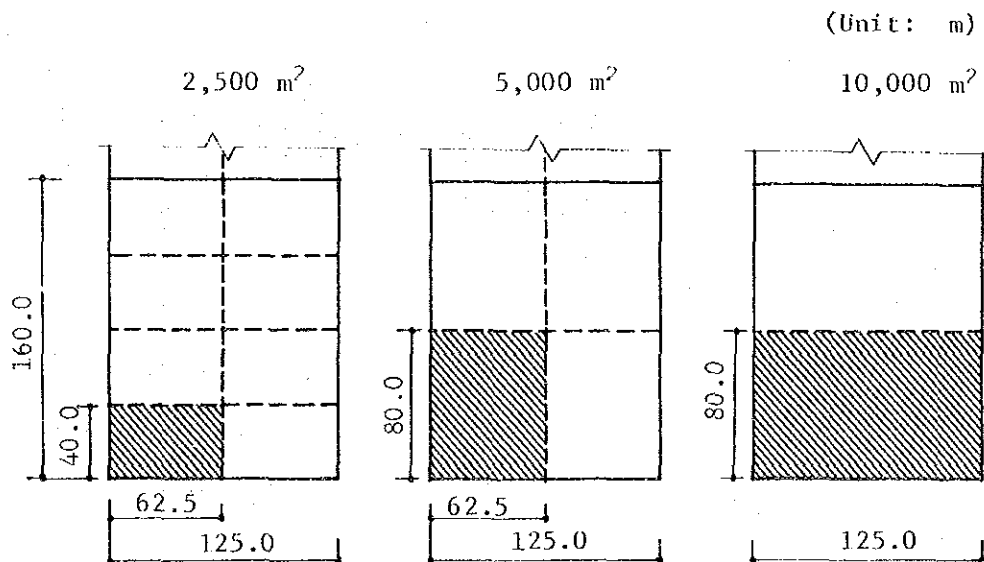
Source: Study Team.
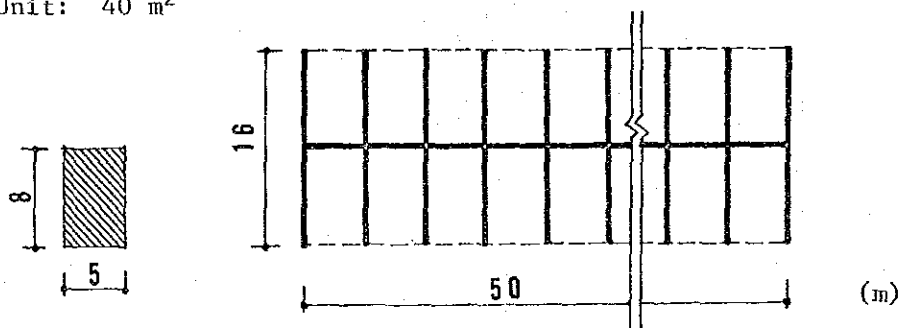
c. Standard Sheds for Relocated Industries

3.196   The older type of standard sheds, built in the existing
industrial area, have 50 m² module of work space. However, more recent
sheds have only a 40 m² module of work space. Due to there being fewer
units per shed, a water closet is not attached to each shed, and is
attached only to the restaurant building located in the industrial
area as shown in Figure 3.16.

Figure 3.16   Standard Shed in the Existing
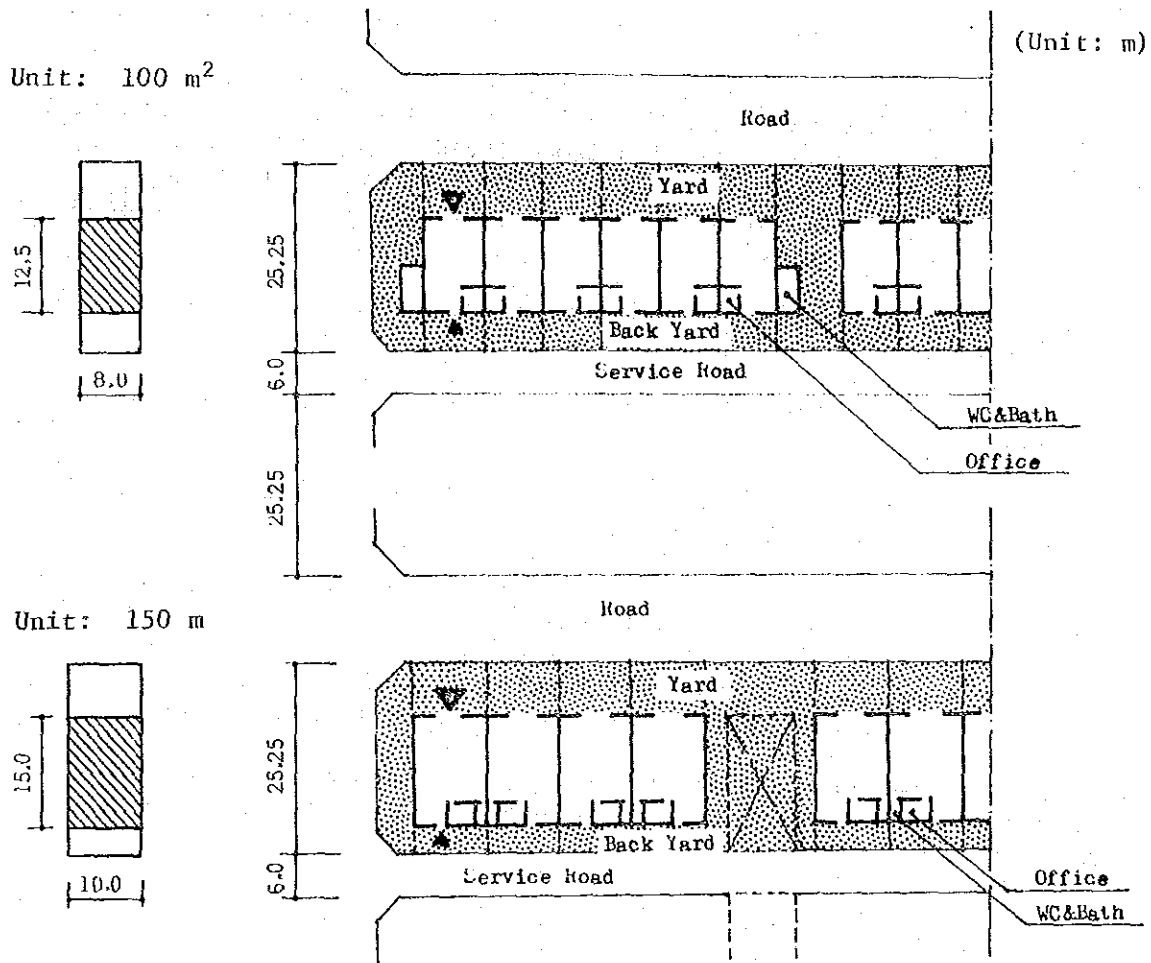Industrial Area

Unit: 50 m²
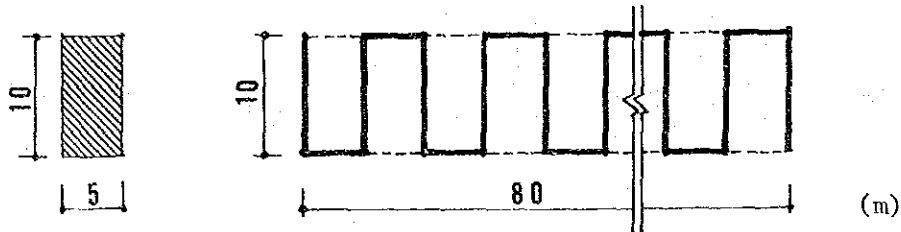
Unit: 40 m²

Source: Study Team.

3.197   For the relocated industries in the Industrial Park, the
standard sheds must be so designed that those small industries can be
provided with better facilities for them to grow smoothly. A
recommended plan for the standard sheds is shown in Figure 3.17.

Figure 3.17   Standard Shed Plan of the Proposed
                Industrial Park

Unit: 100 m²

(Unit: m)

Road

Yard

Back Yard

Service Road

WC&Bath

Office

12.5

8.0

25.25

6.0

25.25

Unit: 150 m

Road

Yard

Back Yard

Service Road

Office

WC&Bath

15.0

10.0

25.25

6.0

Source: Study Team.

d.   Selected Factories and Layout of Industrial Park

3.198   The candidate factories were grouped based on a common
element of each industry, to formulate the most rational layout.

(1)   Grouping based on common raw materials.
          Wood Group (Woodworking and Furniture);
          Metal Group (Metalworking);
          Plastic Group (Furniture, Container, etc.); and
          Food Group (Bakery, Oil, Meat, etc.).

     (2)   Grouping based on common needs for large water supply.
             Wet Group (Food processing, Bottling).

     (3)   Grouping based on common needs for social facilities.
             High Density Workers Group (Relocated factories).

     (4)   Grouping based on generating common pollutant.
             Noise and Vibration Group (Metalworking, Printing);
             Air Pollution Group (Feed, Building materials);
             Dusty Group (Feed, Building materials); and
             Water Pollution Group (Food processing, Bottling,
             Metals).

3.199   Then the principles of area assignment within the Park were
established as follows:

     – Each group belonging to category (1) to be placed in
       the same block.

     – Groups belonging to category (2) to be placed nearest
       to the main water supply.

     – Group belonging to category (3) to be placed nearest
       to the common facilities.

     – Groups belonging to category (4) to be placed at the
       east side where is the lowest level in the Park.

3.200   Based on the above principles of area assignment by the
industrial group, a layout plan was developed in schematic form as a
model (Figure 3.18).

3.6.5   Road Network Plan

3.201   The road network plan must be designed in such a manner that
the smooth movement of people and materials is secured.

     a.   Access Roads

3.202   Access to the Industrial Park is composed of (1) three urban
axes, namely the Boundary Ring Road (W=30 m), the proposed Outer Ring
Road (W=30 m) and the Connecting Road (W=20 m) and (2) one industrial
axis of the road (W=20 m) which connects the existing industrial area
with Route 23 (see Figure 3.19).

Figure 3.18   Schematic Layout of the Industrial Group Within
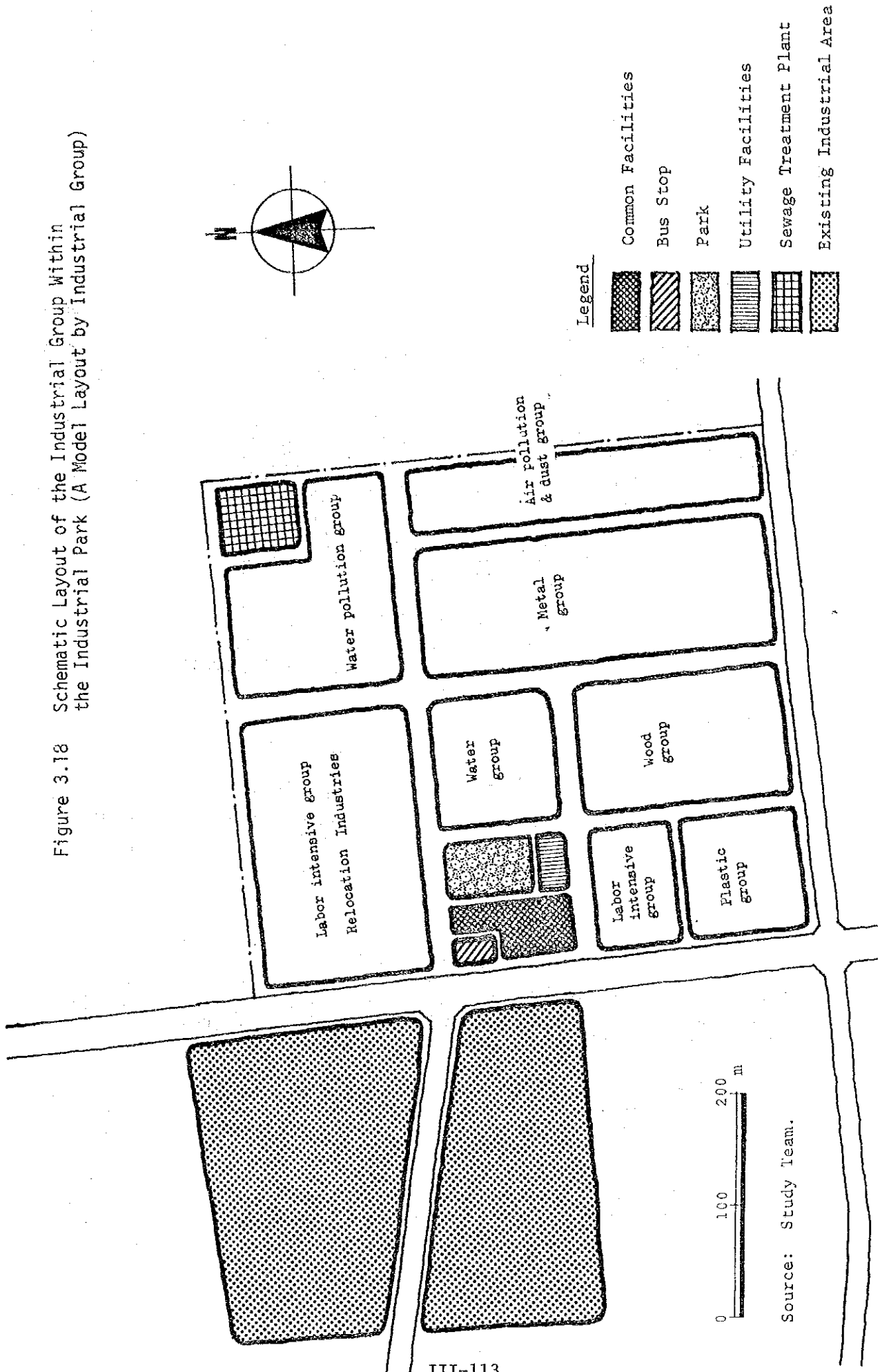the Industrial Park (A Model Layout by Industrial Group)

N

Water pollution group

Air pollution
& dust group

Metal
group

Labor intensive group
Relocation Industries

Water
group

Wood
group

Labor
intensive
group

Plastic
group

Legend

Common Facilities

Bus Stop

Park

Utility Facilities

Sewage Treatment Plant

Existing Industrial Area

0   100   200 m

Source: Study Team.

Figure 3.19　Access Roads for the Proposed
Industrial Park

Source:　Study Team.

Legend

Industrial Park Site

Existing Industrial Area
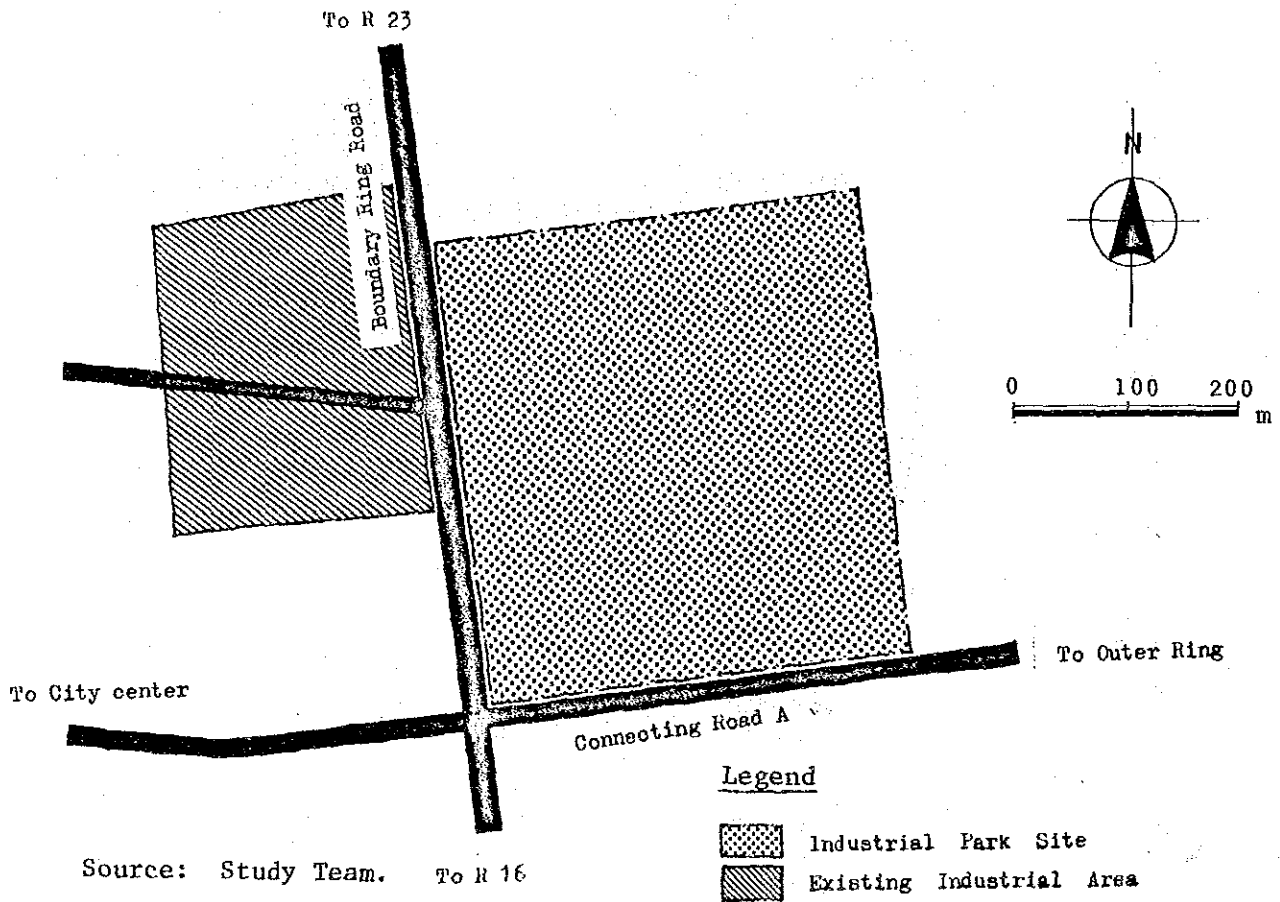
b.　Traffic Volume in the Industrial Park

2.203　The estimated peak load of traffic generated within the Park
is 850 cars/day including 470 cars/day of commuting traffic.
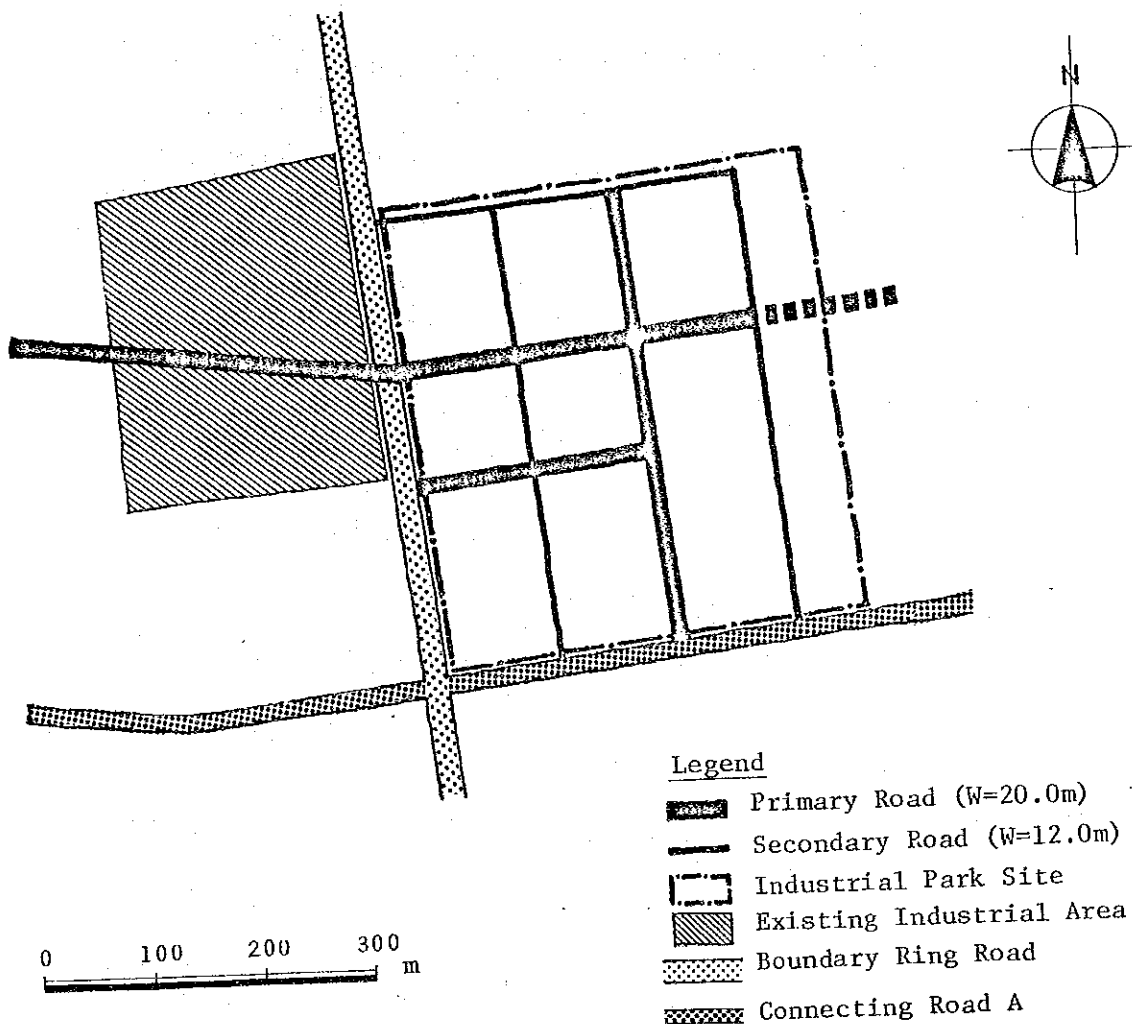Estimated Traffic Volume was calculated as below.

Automobile (Workers) 2,000 persons x 0.2 x 0.5 x 2 = 400 cars
Automobile (Visitors) 0.8 hectare x
　　100 cars/hectare　　　　　　　　　　　　　　　　 = 　80 cars
Bus (Workers) 2,000 persons x 0.7 ÷
　　40 persons/car x 2　　　　　　　　　　　　　　　 = 　70 cars
Trucks　19.0 hectares x 15 cars/hectare　　　　　　 = 290 cars
───
Total　　　　　　　　　　　　　　　　　　　　　　　　 840 cars

Note: It is assumed that 10 percent of the workers will
        come to the Park on foot, 70 percent (0.7) by
        buses and 20 percent (0.2) by private cars, each of
        which carries two workers (0.5). Buses and private
        cars generate two traffics each by coming and going.

c.   Road Network Plan

3.204   The standard of primary and secondary roads in the Park is
set at 20 m width and 12 m width respectively. Road network and a
standard cross-section of the roads are shown in Figures 3.20 and 3.21.

Figure 3.20   Road Network of the Proposed Industrial Park

Legend

▬▬ Primary Road (W=20.0m)

▬▬ Secondary Road (W=12.0m)

⌐¨⌐ Industrial Park Site

▨ Existing Industrial Area

⠿⠿ Boundary Ring Road

▨▨ Connecting Road A

Source: Study Team.

Scale: 0 100 200 300 m

Figure 3.21   Design Standard of the Roads
                Within the Proposed Industrial Park

Primary Road

         2.5   7.0   0.5
                   20.0   (Unit: m)

Secondary Road

        2.5   3.5
               12.0   (Unit: m)
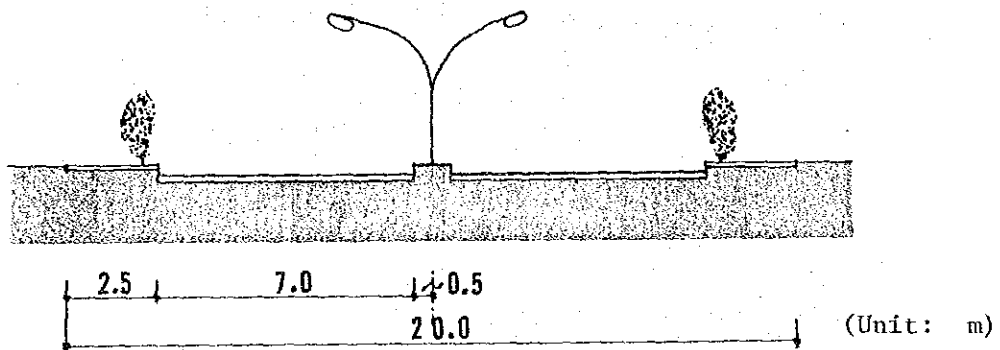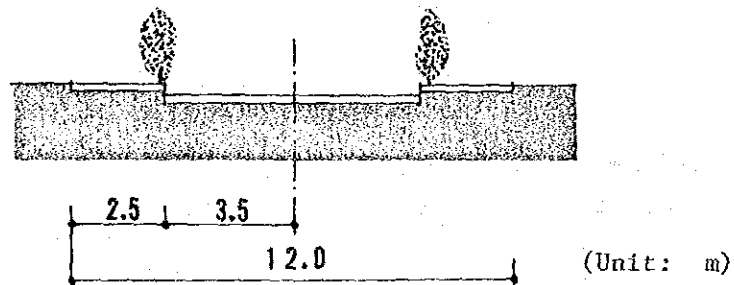
Source: Study Team.

3.6.6 Water Supply and Drainage System

a. Water Supply

3.205   The total demand for water was estimated at 500 m^3/day, assuming that the average per capita consumption of workers would be 250 liters/day for such selected industries. The main pipe for water from the Yarmouk River is planned to be installed along the Boundary Ring Road where the distribution pipe to the Park is connected (Figure 3.22).

b. Drainage and Sewer System

3.206   Ordinary waste water from factories shall be directly discharged into a dual function pipe for sewage and drainage installed under the main roads of the Park. Waste water not suitable for bio-treatment must be treated individually. The sewage pipe shall be connected to the municipal sewer system, when it becomes available. However, it is recommended that a treatment facility in the north-east corner of the Park should be provided (Figure 3.23).

3.6.7 Facility Location Plan

a. Electric Power Supply

3.207   It is estimated that the total demand for electricity in the Park will be 2.0 MW. According to the distribution plan, an improvement program of the Irbid District Electricity Company (IDECO) is expected to be completed by late 1981; this is a new substation to be installed at or near the Industrial Park. The proposed substation in the Park shall be connected to this new substation. The area required for the substation in the Park is 100 m^2.

b. Garbage and Solid Waste Disposal

3.208   The disposal facility shall not be made in the Park due to environmental considerations and the Park has to rely on the services of the Municipality.

c. Common Facilities

3.209   Special considerations must be given to the industrial amenities that the Park can offer to investors, workers and surrounding communities. The area required for common facilities is 8,000 m^2, the facilities being as in Table 3.41.

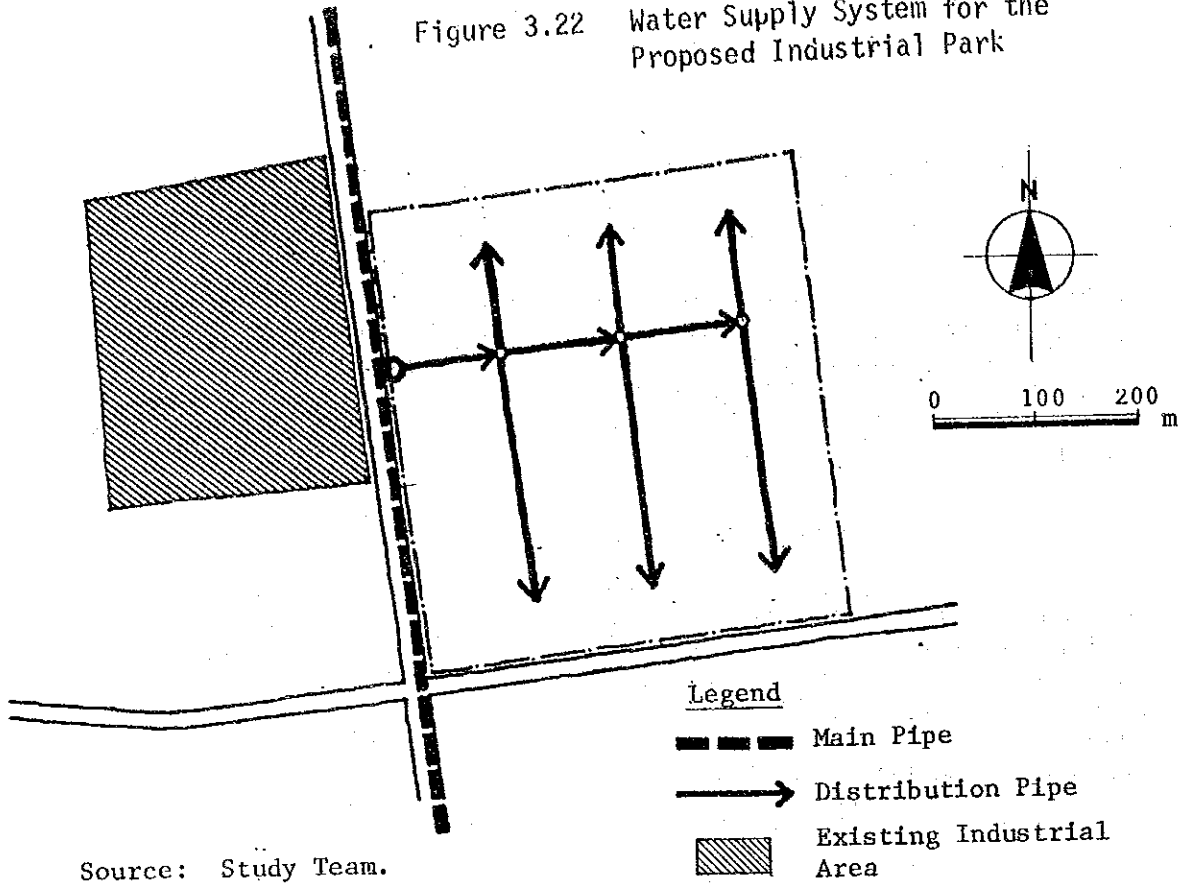Figure 3.22   Water Supply System for the Proposed Industrial Park

Legend

▬ ▬ ▬   Main Pipe

────▶   Distribution Pipe

▨ Existing Industrial Area

Source: Study Team.

Figure 3.23   Drainage System for the Proposed Industrial Park

Pump Station   Sewage Treatment Plant

Legend

────▶   Dual Function Pipe

••••••••▶   Sewage Pipe

▨ Existing Industrial Area

Source: Study Team.
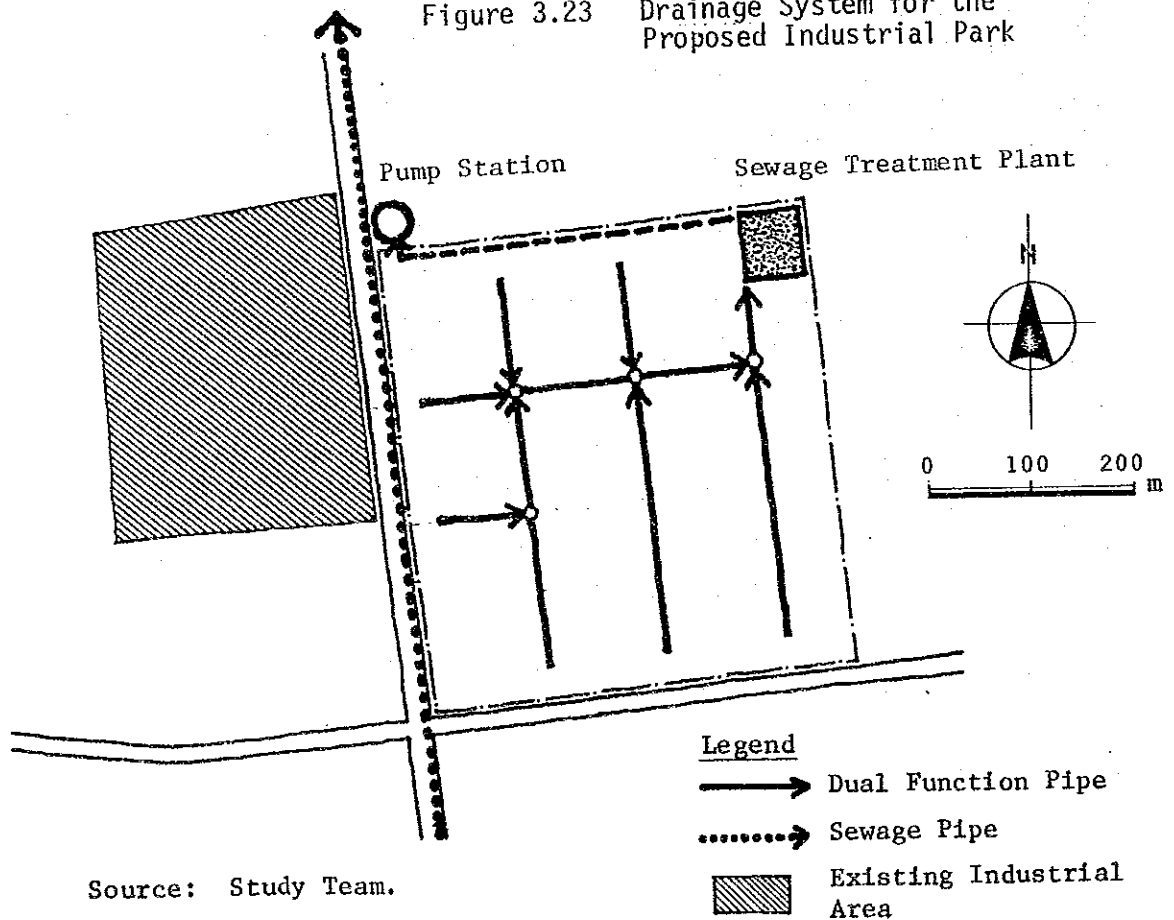
Table 3.41   Common Facilities Within the Proposed Industrial Park

Facilities		Building Space Required
(a) Administration		450 m²
• Administration Office(s)	200 m²	
• Fire Station	100 m²	
• Post Office	100 m²	
• Clinic	50 m²	
(b) Commercial		230 m²
• Shops	30 m²	
• Bank(s)	100 m²	
• Restaurant(s)	100 m²	
(c) Convention		850 m²
• Small Meeting Rooms (10-15 persons)	100 m²	
• Large Hall (300 persons)	750 m²	
(d) Religious (Mosque)		600 m²
Sub-Total		2,130 m²
(e) Others		1,800 m²
• Gas Station	500 m²	
• Warehouse(s)	1,300 m²	
Sub-Total		1,800 m²
Grand Total		3,930 m²

Source: Study Team.

3.6.8   Conclusion

3.210   As a result of the previous analyses, the land use plan at
the preliminary level is proposed as shown in Figure 3.24.   Required
land for this plan is shown in Table 3.42, which indicates that the
total amount of land for the Irbid Municipality Industrial Park is 26.6
hectares.

Figure 3.24 Land Use Plan, Irbid Municipality Industrial Park

Park
Main Road

Air Pollution
& Dust Group

Water
Pollution
Group

Water
Group

Metal
Group

Labor
Intensive
Group

Wood
Group

Plastic
Group

25 0 50   150   300m

Legend

Site for Factories
Site for Relocation Industries
Administration Center
Park & Green
Sewage Treatment Plant

Source: Study Team.
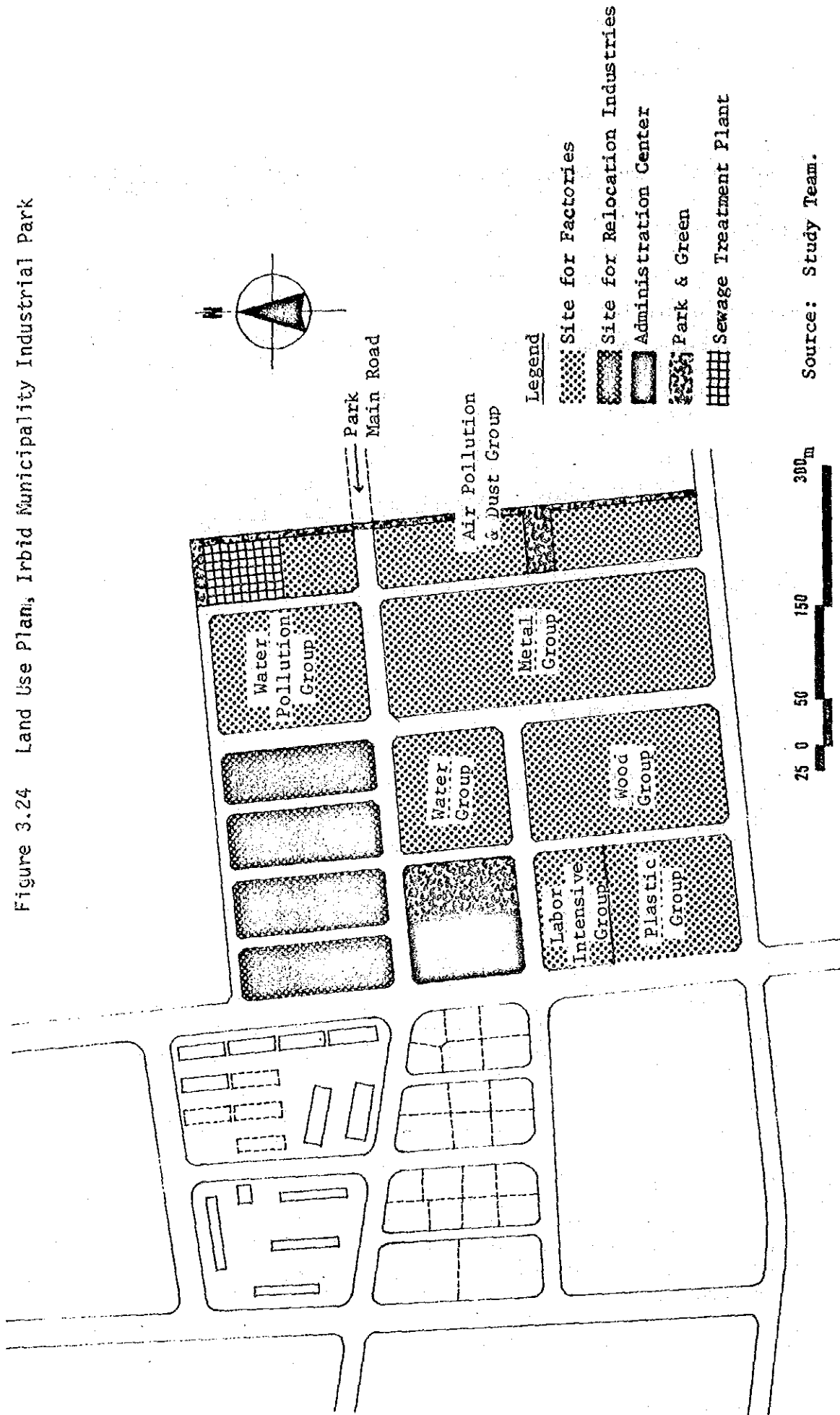
Table 3.42 Land Areas of the Industrial Park

(Unit: Hectare)

Land Use	Area[1]	
	Hectare	Percent
Factory Land for Newly Located Firms	15.7	72.4
Factory Land for Relocated Firms	3.6	
Administration Center	0.8	5.6
Central Green	0.7	
Border Green	0.7	2.7
Treatment Plant	0.5	1.9
Primary Road	2.5	17.4
Secondary Road	2.1	
Total	26.6	100.0

Source: Study Team.

Note: 1/ See the map.
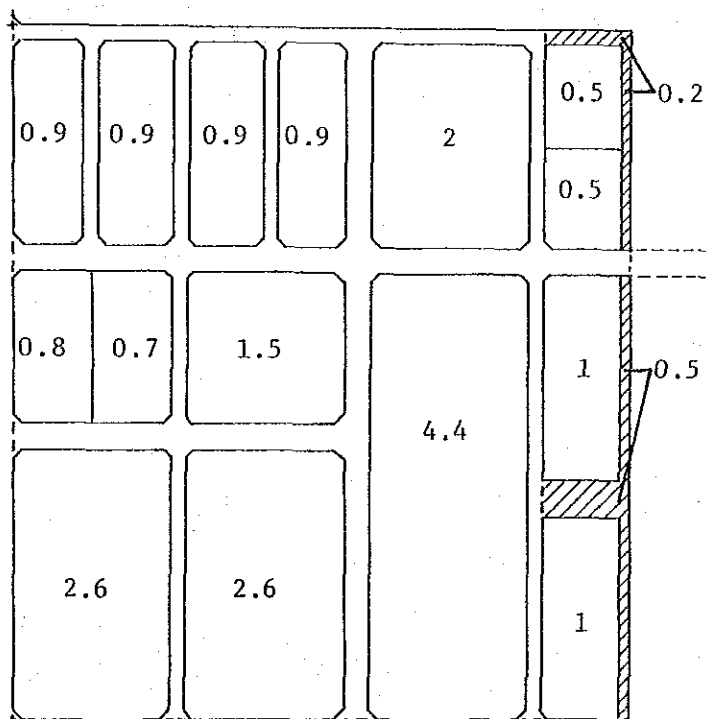
3.7 Cost Estimates

3.211 The total internal development cost of the project is approximately JD 2.87 million (see Table 3.43), of which 46 percent is for land purchase and the rest for improvement and buildings. Among the total project cost, the foreign portion is estimated at JD 921,000, accounting for 32 percent of total cost at 1978 prices. This fugure was inferred, assuming that the foreign portion is 60 percent of land improvement cost, building cost, engineering cost and contingencies, on the basis of data from a transportation expert.

Table 3.43 Breakdown of Costs of the Proposed Industrial Park

(Unit: JD 1,000 at 1978 prices)

(1)	Land Cost		1,330
(2)	Land Improvement Cost		565
	a. Earth work	160	
	b. Road and Drainage	90	
	c. Sewerage Treatment Plant	70	
	d. Electric Power Supply	45	
	e. Communication System	90	
	f. Water Supply	80	
	g. Landscaping	30	
(3)	Building Cost		590
	a. Common Facilities	180	
	b. Standard Sheds	410	
(4)	Engineering Cost		120
(5)	Contingencies		260
(6)	Total Cost		2,865

Sources: 1. Ministry of Public Works ,
2. Land and Survey Department.

3.8 Institutional Arrangements

3.8.1 Sponsoring Body of the Project

3.212 The success of the Irbid Municipality Industrial Park will depend on the effectiveness of organization and management of the sponsoring body. In the early stage of indsutrial development, there

is always the need for institutional support from all the authorities concerned, regardless of the size of the project. Unified and continuous management must be provided to promote the project.

3.213   There are several types of sponsorship for the industrial estate, such as government sponsored, government corporation sponsored, municipality sponsored and private sector sponsored. The suitability of each type depends on the country's level of industrialization, motivation and type and size of industrial estate. However, generally speaking, there are disadvantages in making government departments as an executing agency, due to the civil service staffing regulations and inability to recruit persons with suitable commercial or managerial experience. On the other hand, it sometimes is required that until the estate is able to meet its recurring costs, annual deficits have to be met by the Central Government.

3.214   In this regard, the Government has decided to establish JIEC under the current policy framework of the country's industrial development strategy as stated in Section 3.2.2, ii, c). JIEC will be empowered by the various authorities concerning the development and management of the industrial estate in the country. The first project of the JIEC is to be called Sahab Industrial Estate being composed of Amman Industrial Estate and Free Zone in Sahab, the first phase of which is scheduled to be in operation by 1982. Therefore, JIEC seems to be the most appropriate sponsoring body for the project. However, looking closer into the contents of the proposed law for JIEC, it is found that their activities are limited to the outside of the municipality boundary, and it would seem difficult for JIEC to handle the Industrial Park project unless certain necessary amendments are made.

3.215   The financial and technical background of the Irbid Municipality does not appear to be strong enough to carry out the project unless substantial support is given to it by the Central Government. Under these circumstances, it is difficult to identify any existing organization as the most appropriate and capable sponsor of the project.

3.216   In this connection, it is recommended that the Jordan Government study and decide on the sponsorship before proceeding to the next step. Our tentative thoughts on the subject which also reflect the result of evaluation on financial analysis are as follows;

      (1)   To form a joint corporation between the Central Government and the Irbid Municipality, having representatives from the authorities concerned on its Board and to enter into a Management Service Contract with the JIEC to run the project.

      (2)   To form a quasi public corporation from amongst agencies of the Central Government, municipality, IDB, Pension Fund and the private sector who may have interests in the project directly or indirectly.

3.8.2 Institutional Support Required for the Project

3.217   The value of an industrial estate, in promoting the industrial development, has been proved in many countries but it cannot be considered as a panacea for all the national and regional economic problems and cannot demonstrate its full effect without the concerted efforts of the supporting institutions.

3.218   The following are institutions whose support is very essential for the success of the project.

(1) Pre-development stage:

1) Feasibility study and engineering design supervision
(foreign government assistance is required here);

2) Equity participation for the sponsoring body
(Central Government, municipalities, and other local financial institutions);

3) Development finance
(foreign and local financing institutions on the basis of Central Government's guarantee).

(2) Construction stage:

1) Water supply
(MA, MIT, MMRA, MH, JVA, WSC, Governorate, Municipality);

2) Electricity
(MIT, JEA, IDECO);

3) Roads
(MPW, MMRA, Governorate, Municipality);

4) Telephone, telex
(MC, MMRA, TCC);

5) Sewage
(MMRA, Municipality).

(3) Project Promotion Stage:

1) Incentives to invite industry
(MIT, MF, IDB);

2) License for the invited industries
(MIT);

3) Industrial finance
(IDB, and other local financial institutions);

4) Manpower development
(ME, ML, YU, PTC, VTC);

5) Promotional work to invite foreign investors
(MIT, MF, ACI, ICI, IDB);

6) Industrial project promotion
(MIT, RSS, IDB, ACI);

7) License for building construction
(Municipality).

(4) Production stage:

1) Utility services
(IDECO, TCC, Municipality);

2) Manpower supply
(ME, ML, YU, PTC, VTC);

3) Material Supply
(MIT, MS);

4) Export promotion
(MIT, ACC, ICI);

5) Standardization of industrial products
(MIT, RSS);

6) Testing of industrial materials and products
(MIT, RSS, YU, PTC).

3.219   As shown above, many government agencies and authorities are involved in each stage of the development. Especially, the result of the financial evaluation in the next Section indicates that, in the project promotion stage, the establishment of tie-in loan with IDB or other local financial institutions contributes greatly to enhancing the financial feasibility of the Industrial Park.

3.220   It is recommended that a special task force team for the project be established within the IURPG to maintain a strong and efficient coordination among the authorities concerned until the official sponsoring body is created.

3.9 Financial and Economic Study

3.9.1 Financial Analysis

      a. Revenue Projection

      i. Source of Revenue and Pricing Policy

3.221   In the previous section, a plan for the Industrial Park of 26.6 hectares was formulated. Its development and building costs, including land acquisition cost, were calculated at approximately JD 2.865 million at 1978 prices in terms of financial cost.

3.222   In this section, at the outset, we intend to make a revenue projection. The major sources of revenue are as follows:

    (1) Installment sale of industrial lots:

        Two cases are assumed in accordance with the selling of industrial lots.

        1) Case 1: Market price approach

Selling price of industrial lots, calculated based on the market price of land, adjacent to the existing industrial area.	JD 15.0/m²
Period of Installment	20 years
Down Payment	10 percent at the time of contract
Interest Rate	6 percent per annum

Selling price of industrial lots, JD $15.0/m^2$
calculated based on the market
price of land, adjacent to the
existing industrial area.

Period of Installment   20 years

Down Payment   10 percent at the time of contract

Interest Rate   6 percent per annum

Necessary funds for this project have to be procured from the development and building costs of the Industrial Park. In consideration of the 9 to 10 percent interest rate of commercial bank loans, the back spread between this interest rate and the 6 percent rate of interest, which is assumed to be collected from prospective occupants, will cause a financial burden. However, in order to entice prospective occupants to move into the Industrial Park of the Municipality, and to achieve full occupancy at an early date, this low interest rate of 6 percent will be effective.

2) Case 2:   Cost basis approach

Selling price of industrial lots, calculated by adding 9 percent of profit margin to the unit construction cost.	JD 13.8/m²
Period of Installment	15 years
Down Payment	10 percent
Interest Rate	6 percent per annum

When the cost basis is adopted, the selling price is determined at a lower level than market price. So, we assumed that the period of installment is reduced taking note of the solvency of the occupants.

(2)   Rental fee of industrial lots:

Here also, two cases are assumed with reference to the study of the pricing policy of the Sahab Industrial Estate.

1)   JD 0.6/m²/year, with price increase of 40 percent every 5 years.
(rental fee of industrial lots to be adopted for the Sahab Industrial Estate)

2)   JD 1.2/m²/year, fixed rate.
(calculated by adding 9 percent of profit margin to the unit construction cost)

(3)   Rental fee of standard shed:

1)   JD 11.25/m²/year, fixed rate.
(this is a current rental fee of standard shed in the existing industrial area of the Irbid Municipality)

2)   JD 10/m²/year, with price increase by 40 percent every 5 years.
(rental fee to be adopted for the Sahab Industrial Estate)

(4)   Rental fee from land leased for commercial use:

This source of revenue will be derived from shops, banks, restaurants, fuel stations, and warehouses inside the proposed site. This rental fee is assumed to be 1.2 times that of industrial lots.

3.223   Besides this source of revenue, service charges such as water supply charges, waste water disposal charges and other maintenance fees should be considered in principle. However, in this study, we omitted them from the calculation because they are not so great as to make any significant impact on the result of the IRR calculation.

ii.   Schematic Sales-and-Lease Schedule of Land

3.224   The land for sale is supposed to be sold during the four-year period following the completion of construction. It is assumed that the demand for this Municipality Industrial Park will be spurred by the construction of the Ring Roads and other infrastructure. So, it is estimated that 15.6 hectares of industrial lots will be sold or leased to the extent of 20 percent in 1983, 30 percent in 1984, 40 percent in 1985, and 10 percent in 1986. On the other hand, standard sheds are supposed to be occupied fully within two years after the construction with a 50 percent occupancy rate in each year in 1983 and 1984. Based on these assumptions, land sale and lease schedule are projected as shown in Table 3.44.

Table 3.44   Land Sale and Lease Schedule

| | | | | | (Unit: donum of land) |
Type of Contract	1983	1984	1985	1986	Total
Industrial lots	31.2	46.9	62.5	15.6	156.2
Standard sheds	18.1	18.1	–	–	36.2
Commercial space	–	2.0	–	–	2.0

3.225   As aforementioned, in the case of term sales of land, the period to collect installments extends over 15 or 20 years. Furthermore, as an alternative in pursuit of the more advantageous financial arrangement for both the project and prospective occupants, a tie-in loan with IDB was assumed in order to reduce the financial burden, especially on the side of the project, caused by the negative spread of the interest rate and long-term collection of proceeds.

3.226   Concerning the rental fee of standard sheds and industrial lots, two policies of (1) a fixed rate and of (2) increasing rate by 40 percent at 5 years interval are compared to find the optimal pricing policy.

3.227   The whole results of revenue projection are shown in the Cash Flow Table in Appendix A, and each type of revenue until 1990 on the basis of the above-mentioned pricing policies is projected in Table 3.45.

Table 3.45   Revenue Projection by Type of Revenue, the Proposed Industrial Park

(Unit: JD 1,000 at 1978 prices)

Type of Revenue Policy	Unit Price	1983	1984	1985	1986	1987	1988	1989	1990	Remarks
a. Installment Sale of I.L.	JD 15/m²	48	120	214	233	227	221	214	208	tie-in loan with IDB is not assumed here.
	JD 13.8/m²	44	116	212	242	238	230	222	214	
b. Rental Fee of I.L.	JD 0.6/m²/year	19	47	85	94	94	132	132	132	increasing rate by 40 percent in every 5 years
	JD 1.2/m²/year	38	94	169	188	188	188	188	188	fixed rate
c. Rental Fee of S.S.	JD 11.25/m²/year	73	146	146	146	146	146	146	146	fixed rate
	JD 10/m²/year	65	130	130	130	130	182	182	182	increasing rate by 40 percent in every 5 years
d. Rental Fee of C.S.	JD 0.72/m²/year	1	1	1	1	1	2	2	2	- ditto -
	JD 1.44/m²/year	3	3	3	3	3	3	3	3	fixed rate
	(d = b x 1.2)									

Source: Study Team's estimation.

Note: Projection unitl 1990.
I.L.: Industrial Lots   S.S.: Standard Sheds   C.S.: Commercial Space

b.   Operation and Maintenance Cost Estimate

3.228   An industrial estate has to be continuously managed by one
authority, and therefore, operation and maintenance costs will obviously
become their responsibility. For this purpose, 16 people should be
engaged for maintaining and administering the Industrial Park and the
same salary and wage has been assumed for each of them, accounting for
30 to 40 percent of the total O/M cost. The administration cost, of
which the promotion cost is a slightly large element in the first part
of the project life, has been estimated at 80 percent of salary expenses
in principle. Repair and maintenance costs will naturally increase in
proportion to the tangible assets inside the Industrial Park, and they
are estimated to be (in annual terms) 2 percent of initial cost of road
construction and 0.8 percent of the cumulative investment on facilities
other than road. Aggregating these items, we can get the stream of O/M
cost as follows:

(Unit: JD 1,000 at 1978 prices)

	1983	1984	1985	1986 - 2007
O/M Cost	21	40	46	47

3.229   In an assessment of a project, one of the major factor which
influences the project feasibility is interest costs particularly on
the basis of business accounting. Naturally, how the interest rate
will decide the accounting soundness of the project is one of the major
concerns of decision makers. But, if we analyze the financial feasi-
bility of a project by using the internal rate of return (IRR), the
issues of interest payment will be internalized. Thus, in the calcula-
tion of IRR, all the interest payments can be excluded from the
financial cost. So, in our analysis all the interest are excluded
from the O/M cost.

c.   Financial Feasibility

i.   Introduction

3.230   The feasibility of the Industrial Park project has to be
examined in the light of the financial profitability. In other words,
the project needs to be self-sufficient. In this sense, the financial
rate of return of the project is a very important criterion for judge-
ment of project feasibility.

3.231   In this Section, so far, the detail of revenue and cost has
been projected for the project life. To add further, firstly, the
basic matters concerned with operational policy of the project have
to be given attention. They are summarized as follows:

(1)   Method of recovery of investment (sale and/or lease);
(2)   Pricing (cost plus profit margin or market price); and
(3)   Source of financing (government contribution and/or
      domestic bank loan).

ii. Cash Flow Analysis and Financial Rate of Return

3.232   In order to find out how the project can be managed on a sound financial basis, we made a discounted cash flow analysis. According to the hypothesis stated earlier, we have tried to find the alternative which provides maximum profitability. On this cash flow stream, the short-term shortage of funds is regarded as a negligible factor in the pre-feasibility study.

3.233   Alternatives were generated based on the following considerations:

    (1) Sales or leasing of land;

    (2) Sources of fund for acquiring factories: to buy or rent factory land; and

    (3) Land pricing policies of either of 1) market price base, 2) cost basis approach, or 3) prices used by the Sahab Industrial Estate project.

Based on the above considerations, the following 7 alternatives were developed for the purpose of financial analysis, using a 25-year project life.

    (1) Leasing system of industrial lots,
        Alternative 1 to Alternative 3;

    (2) Sales of sub-divided industrial lots,
        Alternative 4 to Alternative 6; and

    (3) Combination of sales of lots and a leasing system,
        Alternative 7.

Here, all standard sheds will be leased.

3.234   Cash flows and calculated FRRs are listed in Appendix A. The results of this financial analysis of these 7 alternatives are shown in Table 3.46. The table indicates that Alternative No. 6 is the best among them.

3.235   Alternative 6 assumes arrangement of a tie-in loan with a banking institution. In order to secure the high feasibility of the project, aside from financial support, a tie-in loan from the Industrial Development Bank should be negotiated with the objective of reducing the financial burden of the project. In this case, the project authority can get proceeds of sales during the first four years. At the same time, the prospective occupants can utilize this loan without much effort to procure the initial capital for land acquisition cost. From this angle, this alternative must be judged to have the highest priority and best profitability and could be self-sustaining unless unfavorable conditions are incurred in the course of implementing the project.

Table 3.46   Financial Rate of Return of Each Alternative

No.	Pricing Policy			Financial Support by Public Institutions		FRR	Comment and Remarks
	Rental Fee of S.S.	Rental Fee of I.L.	Selling Price of I.L.	Method	Amount (JD million)		
Alternative 1-A	JD 11.25/m²/year[1] (fixed rate)	JD 0.6/m²/year[2] (increasing rate by 40 percent in every 5 years)				8.2%	**Infeasible** Infeasible because we supposed a datum line of project feasibility should be 9 percent judging from that the interest rate of IDB loan is 9 percent. [1] Current rental fee for a standard shed in the existing industrial area of the Municipality (no increase in price during the project life). [2] Rental fee of industrial lots to be adopted in Sahab Industrial Estate.
Alternative 1-B	ditto	ditto		Capital subscription or grant at first year	0.202	9.0%	In order to get a satisfactory level in the case of Alternative 1-A, JD 0.202 million of the financial support from the external institutions will be needed. (9 percent of FRR: a datum line)
Alternative 2	JD 10/m²/year[3] (increasing rate)	JD 0.6/m²/year (increasing rate)				10.5%	**Feasible but uncompetitive** Both rental fees are the same as those at the Sahab Industrial Estate. The price of S.S. will become much higher than the rental fee of the existing industrial area after 5 years. So, it is difficult to attract prospective occupants into S.S. [3] Rental fee of S.S. to be adopted in Sahab Industrial Estate.
Alternative 3	JD 11.25/m²/year (fixed rate)	JD 1.2/m²/year[4] (increasing rate)				9.0%	**Fair but uncompetitive** It will be difficult to attract entrepreneurs here because of high rental fee of I.L. In this case, the rantal fee of I.L. in the proposed project is to exceed the one of Sahab Industrial Estate for 15 years. [4] This price was calculated by adding 9 percent of margin to the unit cost.
Alternative 4	JD 11.25/m²/year (fixed rate)		JD 13.8/m²[5]			9.4%	**Fair** [5] The price is based on the unit construction cost plus 9 percent margin. Installment sales under the condition of 6 percent interest rate, 15 years installment, with 10 percent down payment.

(to continue)

No.	Pricing Policy			Financial Support by Public Institutions		FRR	Comment and Remarks
	Rental Fee of S.S.	Rental Fee of I.L.	Selling Price of I.L.	Method	Amount (JD million)		
Alternative 5	JD 11.25/m²/year (fixed rate)		JD 15.0/m² [6]			9.1%	<u>Fair</u> [6] The market price of land in the existing industrial zone near the proposed site. Installment sales under the condition of 6 percent interest, 20 years installment, with 10 percent down payment. The result indicates that the increase in length of the installment period induces a rather high sensitivity of FRR.
Alternative 6	ditto		JD 15.0/m²	tie-in loan from banking institutions		11.1%	<u>Feasible</u> In this case, it is assumed that the tie-in loan is set for the occupants to afford necessary fund for lots. 75 percent of occupants are supposed to enjoy the tie-in loan. It is a key point whether a banking institution acknowledges an introduction of that type of loan for the proposed industrial park.
Alternative 7-A	ditto	JD 0.6/m²/year (increasing rate)	JD 15.0/m²			8.6%	<u>Infeasible</u> The space of industrial lots is equally divided for sale and for lease.
Alternative 7-B	ditto	ditto	JD 15.0/m²	Capital subscription or grant at a first year	0.086	9.0%	JD 0.086 million will be necessary to get 9 percent of FRR.

Source: Study Team.

III-133

3.236   Under the assumptions (1) that the project does not
benefit from the tie-in loan arrangement or any other financial support
and (2) that sales policy cannot be adopted, the rental fee from
industrial lots has to be set at the level of JD 1.2/m²/year, (at a
fixed rate at 1978 prices), which is incidentally the same as the fee
calculated by unit construction cost basis, in order to get a desirable
financial return, (assumed that 9 percent of FRR is a minimum critical
level for financial feasibility). However, if this rental fee is
adopted, there will be little chance of attracting prospective occupants,
when compared with the similar policy, i.e., rental fee of the Sahab
Industrial Estate which is lower than JD 1.2/m²/year.

3.237   Viewed from the competitiveness which has to be enough to
attract prospective occupants, Alternative 1 is the best, although it
cannot become feasible on the basis of FRR. In order to make this
Alternative 1 feasible, capital subscription of JD 0.202 million by
the Government at 1978 prices should be provided.

3.238   If we take the policy of securing the maximum choices for
the preferences of entrepreneurs, i.e., candidate occupants, it is
better to adopt the composite type of leasing and sales policies, which
is Alternative 7. However, Alternative 7 shows a 8.6 percent FRR,
which is not feasible, but is not much lower than the level desired.
To make this feasible, capital subscription of JD 0.086 million at 1978
prices should be provided. In any of the above cases, a certain degree
of financial support such as capital subscription by public institutions
will be required. However, in each case, it is almost certain that the
amount of required financial support will be small, accounting for JD
202,000 in Alternative 1 and JD 86,000 in Alternative 7 respectively.

3.239   If the sales policy can be adopted for this project, the best
alternative is Alternative 4, which (1) leases the standard sheds at
the same rate as that of the existing industrial area in Irbid Munici-
pality, and (2) sells the industrial land, i.e., factory land, at the
rate about 8 percent lower than the current market price of land in the
existing industrial zone near the project site. This sales policy
seems to be very competitive in regard to the existing industrial area
and zone, and therefore the land can be sold on schedule. And,
Alternative 4 shows 9.4 percent FRR, which means it is feasible. Thus,
provided that this sales policy can be adopted, Alternative 4 is
recommended as a desirable pricing policy. This is the only one policy
which can make the project financially feasible without any support
from the Government.

iii. Sensitivity Analysis

3.240   In the process of finding the best alternatives, some degree
of sensitivity analysis was made; for example, it was done by diversify-
ing the rental fee and selling price of industrial lots, although this
is not the usual way of performing sensitivity analysis. In this
Section, thus, the following three cases were subjected to sensitivity
analysis, using Alternative 1.

(1) Higher Construction Cost:

In consideration of the uncertainty of construction cost, the internal rates of return have been calculated on the basis of 20 percent increase of construction cost.

(2) Higher Land Acquisition Cost:

According to information about land prices in the periphery of the Irbid Municipality from the Land and Survey Department, it ranges from JD 1,500/donum to JD 11,000/donum. As we adopted JD 5,000/donum for the unit cost of the acquired land, it might happen that land price exceeds the adopted price, due to speculation or other environmental change. So, 20 percent increase (JD 6,000/donum) of land price is assumed to see the sensitivity.

(3) Lower Rental Fee:

In this Study, it is supposed that the rental fees are determined by 1) market price or 2) unit construction cost based on interest payment and land acquisition fee. However, it could happen that the rental fee has to be reduced downward due to slower progress in attaining full occupancy than had been called for by the proposed time schedule. So, we assumed 20 percent of decrease in each rental fee for the sensitivity analysis.

3.241   As is evident from Table 3.47, the deterioration of the rental fee is a major factor which has high propensity to change the financial rate of return.

Table 3.47   Sensitivity Analysis of FRR for the
Proposed Industrial Park

Case	Change in Condition (a) (%)	FRR (%)	Change in FRR (b) (%)	Sensitivity
(1)	+20 Const. Cost	7.4	9.8	0.49
(2)	+20 Land Cost	7.3	11.0	0.55
(3)	−20 Rent	5.9	28.0	1.40

Source: Study Team.

iv. Conclusion

3.242   As a conclusion, without any Governmental support, Alternative 4 is the best and it is feasible at 9.4 percent FRR. If the tie-in loan can be arranged, the FRR can rise to close to 11.1 percent. In the case of no sales policy, Alternative 1 is the best at 8.2 percent FRR, which is little less than the satisfactory level. If the capital subscription of JD 202,000 at 1978 prices is arranged Alternative 1 will become feasible.

3.243   In order to achieve high financial feasibility, as possibility, it might be recommended that the tie-in loan from Industrial Development Bank regarding the Municipality Industrial Park should be established with the objectives of reducing the financial burden and providing the occupants with easy procurement of funds for land purchase.

3.9.2 Economic Analysis

a. Introduction

3.244   Aside from the financial viability, an industrial park plays an important role in regional and national economy. In this context, the economic benefits and costs to be derived not only from direct effects but also indirect effects of the Industrial Park have to be investigated in accordance with the "with and without" principle.

b. Methodology

3.245   The main objective of the economic analysis in this Study is the appraisal of the economic feasibility of a project primarily on the basis of a comparison between products and services to be generated, and the project cost in national-economic terms. In addition to the computation of IRR, this Study also considers the effect of the project on foreign exchange savings or earnings. In these procedures, it is intended to clarify the magnitude of economic impact of the project by computing the economic rate of return (ERR), and also clarifying the factors influential to the project by sensitivity analysis.

c. Type of Economic Benefits

i. General

3.246   The type of economic benefits of this project can be divided into two concepts in the following way.

    (1) Direct benefits   – computable type
                                             – uncomputable type

    (2) Indirect benefits   – computable type
                                             – uncomputable type

Roughly speaking, the economic benefits of the project can be derived from relocated industries and newly implanted factories.

ii. Direct Benefits

(a) Incremental Products and Services

3.247   Based on "Industrial Survey, in Establishments Engaging 5 Persons or More" by the Department of Statistics, we estimated the expected value-added to be derived from each factory as shown in Table 3.48. By the supposition that the additional number of new factories are 32, occupying 156,250 m^2 of land, the incremental value-added per annum could amount to JD 3.2 million per annum, if full occupancy of the industrial lots is realized.

3.248   The incremental production, which is a major economic benefit for this project evaluation, can be conjectured based on the estimated value-added. The result shows that total aggregate production to be generated would amount to JD 13.7 million per annum at 1978 prices. (The incremental production of the services sector, i.e., rented commercial area in the Park, are excluded from the calculation, since its size is negligible.)

(b) Foreign Exchange Earnings and Savings

3.249   As mentioned above, in developing and newly industrialized economies, the ultimate impact of a project is not only the additional availability of goods and services, but also the increase (or decrease) in foreign exchange which is urgently needed in most developing countries including Jordan.

3.250   Taking account of this country's trade deficits, to obtain foreign currency or save foreign currency reserves through export promotion or import substitution will be an economic benefit to Jordan. However, as this benefit is considered to be a part of the incremental production, this has to be excluded from the IRR calculation to avoid double-counting.

(c) Other Direct Benefits

3.251   The project can expect other direct benefits which are difficult to estimate as follows:

(1)   Agglomeration benefit of relocated industries:

   Cost reduction of transportation and cost reduction owing to cooperative purchasing of raw materials and joint shipments;

(2)   Accumulation benefit of managerial and technological knowhow;

(3)   Health and safety effect;

(4)   An improvement in amenities; and

(5)   The development and up-grading of worker skills.

Table 3.48   Estimated Incremental Production of Each New Factory

Type of Factory	No. of Employee	Value-added per Worker	Estimated Total Value-added (A)	Estimated[1] Production	Estimated Value-added in Case of Japanese Small-Scale Industries (B)	A/B
Unit	in persons	JD	JD 1,000	JD 1,000	JD 1,000	percent
Feed	30	1,566	46.9	262.7	88	53.2
Broiler	30	1,566	46.9	281.4	69	67.9
Integrated Bakery	50	1,566	78.3	279.5	144	54.3
Egg	40	1,566	62.6	371.6	93	67.3
Oil	30	1,566	46.9	311.5	95	49.3
Fruits & Vegetable Processing	50	1,566	78.3	383.4	197	39.7
Leather	80	3,728	298.2	1,446.8	263	113.3
Paperboard	50	1,800	90.0	316.6	203	44.3
Fertilizer	20	4,878	97.6	416.6	97	100.0
Glass	50	3,080	154.6	404.6	115	133.9
Saw Mill	30	874	26.2	138.6	100	26.2
Wood Manufacture	130	874	113.6	639.7	399	28.4
Furniture	50	874	43.7	162.9	140	31.2
Rope Manufacture	50	1,514	75.7	361.3	163	46.4
Metalworking	270	3,986	1,076.2	4,490.0	918	117.2
Plastic	60	4,000	240.0	1,064.9	206	116.5
Building Material	50	3,080	154.0	447.2	136	113.2
Room Unit	50	1,335	66.7	344.1	138	48.3
Stationery	50	1,335	66.7	242.0	129	51.7
Bottling	50	1,811	90.5	488.7	115	78.7
Printing & Publishing	100	2,750	275.0	851.7	329	83.6
Total	1,320		3,228.6	13,705.8		

Sources: 1. Unpublished Mimeo. from Department of Statistics.
          2. Managerial Index of Small Scale Industry in Japan.

Note: 1/ This excludes indirect tax and includes corporate tax.

iii. Indirect Benefits

3.252   The indirect economic benefits and social effects of the
Industrial Park project can be summarized as follows:

    (1)   Augmented business in other sectors such as agri-
           culture, forestry, commerce, transportation and
           construction (multiplier effect); and

    (2)   Effects of regional development: Balanced urban
           development and minimization of pollution.

In the IRR calculation, the benefit of relocated factories is not
considered. Reasons are (1) that the amount of net benefit derived
from relocated factories is not so large within the total benefit of
this project, and (2) that the calculation of this type of benefit,
such as reduction of transportation cost, needs much time. So we did
not count this benefit, and regarded this benefit as an additional and
qualitative one to the calculated benefit.

    d.   Type of Economic Costs

3.253   The following items will comprise the economic costs in
response to the economic benefits.

    (1)   The land acquisition cost;
    (2)   The development and construction cost of the
           Industrial Park;
    (3)   The construction cost of factories, including
           standard sheds;
    (4)   Fixed capital investment in factories; and
    (5)   Production cost in each factory.

3.254   The construction cost of factories was not estimated yet.
Table 3.49 shows their estimation in terms of financial cost. As
shown in the Table, the total construction cost of factories was
estimated to be JD 1.668 million at 1978 prices.

3.255   These costs are modified by deducting transfer items in the
country such as duties and excise taxes. Power cost, originally,
should also be adjusted downwards since the power tariff is supposed
to be much higher than the economic cost of power generation in this
country. However, we did not adjust it, regarding it as a negligible
factor in IRR calculation.

Table 3.49   Factory Construction Cost

Factory	Number of Factories	Total Covered Area of Factory (m^2)	Total Cost[1] (JD 1,000)
Food Processing	6	8,450	278.9
Leather Work	2	1,600	52.8
Wood Work and Furniture	5	9,400	310.2
Rope Manufacture	2	3,000	99.0
Metalworking	6	9,500	313.6
Plastic Factory	3	2,400	79.2
Others	8	16,200	534.6
Total	32	50,550	1,668.3

Note: 1/ Building is assumed to be of steel frame and of asbestos
        panels, and its unit cost is estimated to be JD $30/m^2$.
        In addition to this, engineering cost (10 percent) is
        added.

3.256   With regard to the land cost, it was estimated on the basis
of opportunity cost of land, i.e., (1) value-added of agricultural
production for the land not urbanized and (2) rent of land after the
urbanization. According to the projection in Chapter II, urbanization
was assumed as follows:

        Urbanization Process   1983   20 percent of proposed site
                                1984   40 percent   "
                                1985   60 percent   "
                                1986   80 percent   "
                                1987 100 percent   "

Agricultural value-added per hectare is estimated as follows according
to Ministry of Agriculture and Appendix C.

                            (Unit: JD at 1978 prices)

        Agricultural Value Added   33.2/hectare

        Agricultural Value Added in the
        Industrial Park Area   884.4/26.6 hectares

Urbanized land value was measured in terms of annual rent when it
is urbanized. The annual rent of urbanized land is calculated by the
following formula:

$$a\frac{(1+r)^{n+1}-1}{(1+r)^n r} = A$$

where, a: rent of land;
r: interest rate (=9 percent);
n: period (=50 years);
A: Land price at the edge of urbanized area
in 1978 at 1978 prices (=JD 8,000/donum).

By this method, we can get JD 670/donum for the annual rent of
urbanized land.

3.257   By discounting both the annual rent and the annual agricul-
tural value added to the 1978 present value, the economic land price
of the project area is estimated to be JD 5,450 per donum. This is
9 percent higher than the market price around the proposed site, which
was about JD 5,000 per donum in 1978.

3.258   Since the financial cost was estimated based on this market
price of JD 5,000 per donum, the total economic land cost of the Park
is estimated to be JD 1.45 million at 1978 prices. Likewise, we made
some conversions in terms of wage, fixed capital investment and
construction cost.

3.259   The application of a shadow wage rate has to be made care-
fully, taking into account the considerable labor shortage, especially
in the field of skilled labor. According to interviews with government
officials and the results of an agricultural income survey, conducted
in the Phase I Study, the wage for unskilled labor in factories is
around JD 3 to 5 per day which is almost equal to the marginal produc-
tion of farmers (conjectured from the above mentioned agricultural
survey). So we used the market wage rate as an opportunity cost of
unskilled labor, only by deducting 5 percent of income tax portion.

3.260   As to (1) development cost of the Park, being comprised of
1) land improvement cost, 2) common facilities building cost, and 3)
a part of engineering cost of the financial costs, (2) building cost
of standard sheds which also includes the rest of the engineering cost
and (3) factories construction cost for newly located industries,
their economic costs are estimated by using following procedures:

(1)   The wage of labor is adjusted by deducting the tax
portion (5 percent) from the financial cost;

(2)   The foreign portion of above (1) to (3) development
costs, is assumed to be 60 percent and customs tariff
is estimated to be 15 percent of CIF, and the portion
of customs duty is deducted from the financial cost;

(3) The domestic portion of the above costs is adjusted also by deducting 5 percent tax portion from it.

3.261   The Study Team made a factory survey, of which a part is listed from this survey. We obtained the information in Appendix B about the expense of fixed capital equipment and its service life. The result showed that fixed capital equipment per worker is supposed to be approximately JD 2,000 at 1978 prices. This cost does not include custom duties because of the application of the Encouragement of Investment Law. Thus, this is the economic cost. Therefore, JD 2.65 million of fixed capital equipment will be installed every 10 years in accordance with the increase in the occupancy rate.

3.262   As a result of the above adjustments, each cost is converted into economic cost as follows:

(Unit: JD 1,000)

		Financial Cost	Economic Cost
(1)	Development Cost of the Park (including common facilities)	840	723
(2)	Building Cost of S.S.	420	396
(3)	Construction Cost of New Factories	1,668	1,460
(4)	Fixed Capital Equipment		2,653
(5)	Land Cost	1,330	1,449

3.263   Next, as shown in Table 3.50, production cost in each factory is the largest part among the economic cost, accounting for JD 12.3 million per annum. This is calculated by deducting (1) operating profit (2) custom duties and (3) depreciation from the total production in each factory.

3.264   It should be noted here that, due to the lack of supporting data, as a rule, rough estimates of cost in terms of shadow-price were made, fundamentally using market prices after adjusting major items such as duties and taxes.

e.   Economic Feasibility

3.265   As calculated on the basis of the economic costs and benefits as shown in Table 3.51, economic rate of return was estimated at 18.5 percent, which is likely to be more than the opportunity cost of capital when compared with the money market rate of 9 to 12 percent and general consensus on the opportunity cost of capital in developing countries (8 to 15 percent).

Table 3.50   Production Cost of Each Factory

(Unit: JD 1,000 at 1978 prices)

Type of Factory	Estimated Operation Profit (A)	Depreciation (B)	Duties[1] (C)	Tax Portion of Labor Cost(0.05) (D)	Total (E=A+B+C+D)	Estimated Production Cost (Production - E)
Feed	5.3	4.5	15.2	1.4	26.4	236.3
Broiler	5.6	4.9	16.2	1.6	28.3	253.1
Integrated Bakery	13.4	8.2	11.6	3.2	36.7	243.1
Egg	7.4	6.4	21.4	2.1	37.3	334.3
Oil	5.9	3.5	24.6	1.6	35.6	275.9
Fruits & Vegetable Processing	15.3	7.3	18.0	4.0	44.6	338.8
Leather	44.8	16.5	54.1	15.2	130.6	1,316.2
Paperboard	21.2	8.2	16.2	3.1	48.7	267.9
Fertilizer	27.0	6.8	24.6	2.9	61.3	355.3
Glass	13.3	11.6	14.3	4.4	43.6	361.0
Saw Mill	3.3	0.9	3.4	0.6	8.2	130.4
Wood Manufacture	15.3	7.4	24.2	6.0	52.9	586.8
Furniture	4.1	2.6	6.3	1.8	14.8	148.1
Rope Manufacture	6.5	5.5	17.7	2.6	32.3	329.0
Metalworking	107.8	108.5	93.1	38.2	347.6	4,142.4
Plastic	44.7	28.7	43.8	9.0	126.1	938.7
Building Material	30.0	23.8	8.9	6.9	69.6	377.6
Room Unit	11.3	3.3	21.2	2.0	37.8	306.3
Stationery	4.4	7.3	8.2	3.3	23.2	218.8
Bottling	4.9	15.4	35.2	3.0	58.5	430.2
Printing & Publishing	36.6	28.1	22.0	14.3	101.0	750.7
Total					1,364.7	12,340.9

Source: Managerial Index of Small Scale Industry in Japan.

Note: 1/   Cost of materials x Import ratio x Tariff.

Table 3.51 Economic Rate of Return

(Unit: JD million)

Year	Cost							Benefit			
	Land Cost	Building Cost of S.S.	Construction Cost of Factory	Development Cost of the Park	Fixed Capital Equipment	Production Cost	Total	Incremental Production	Residual Value of Land	Scrap Value of Machine	Total
1982- 0	1.449	0.198	0.292	0.723			2.662				
1		0.198	0.438		0.531	2.468	3.635	2.741			2.741
2			0.584		0.796	6.171	7.551	6.853			6.853
3			0.146		1.061	11.107	12.314	12.335			12.335
4					0.265	12.341	12.606	13.706			13.706
5						12.341	12.341	13.706			13.706
6						12.341	12.341	13.706			13.706
7						12.341	12.341	13.706			13.706
8						12.341	12.341	13.706			13.706
9						12.341	12.341	13.706			13.706
10						12.341	12.341	13.706			13.706
11					0.531	12.341	12.872	13.706			13.706
12					0.796	12.341	13.137	13.706			13.706
13					1.061	12.341	13.402	13.706			13.706
14					0.265	12.341	12.606	13.706			13.706
15						12.341	12.341	13.706			13.706
16						12.341	12.341	13.706			13.706
17						12.341	12.341	13.706			13.706
18						12.341	12.341	13.706			13.706
19						12.341	12.341	13.706			13.706
20						12.341	12.341	13.706			13.706
21					0.531	12.341	12.872	13.706			13.706
22					0.796	12.341	13.137	13.706			13.706
23					1.061	12.341	13.402	13.706			13.706
24					0.265	12.341	12.606	13.706			13.706
25						12.341	12.341	13.706	2.128	1.699	17.533
Total							303.235				327.288

IRR: 18.5%

Source: Study Team.   Notes: S.S.: Standard Shed

III-144

3.266   Furthermore, as stated earlier, it should be noted that there are other benefits, difficult to be measured for the purpose of ERR calculation.

f.   Sensitivity Analysis

3.267   Sensitivity analysis in the economic study has been attempted on supposition of the following three cases:

(1)   Case A: 30 percent lower production concurrently with 30 percent down of production cost

(2)   Case B: 30 percent higher construction cost (including land cost)

(3)   Case C: 50 percent slowing down of attainment of full occupancy, i.e., from 4 years to 6 years for the new industrial lots and from 2 years to 3 years for the standard shed.

As a consequence, factory land will be occupied as follows:

	1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.	6th yr.
Percent	10	15	20	30	15	10

And, standard shed will be occupied at 33.3 percent annually.

3.268   Results are shown in Table 3.52. It was shown that the shift-down of the incremental production is a most influential factor to ERR. Slowing down of occupancy has little effect on ERR. Moreover, it can be noticed that, in every case, the project can be justified economically.

Table 3.52   Sensitivity Analysis of ERR

Case	Change in Condition (%) (A)	ERR (%)	Change in ERR (%) (B)	Sensitivity (B/A)
A	-30	13.6	26.6	0.89
B	+30	17.2	7.0	0.23
C	-50	17.8	3.7	0.07

Source: Study Team.

g. Conclusion

3.269   Based on our economic analysis, this project is economically
feasible at 18.5 percent ERR, which is sufficiently high enough as
compared to the economic cost of capital. Also, sensitivity analysis
showed that, even at an unfavorable condition of the 30 percent reduc-
tion in production, this project is still viable.

3.270   This means that there are high possibilities to create the
estimated production and export promotion, based on an appropriate
management of the project and an appropriate and well-timed policy for
the Industrial Park development.

3.10   Additional Consideration

3.271   An intricate issue on this Industrial Park project derives
from the organizational competence to manage and administer the project.
Under the terms of reference of the Phase II Study, IEI was proposed
to be located within the municipality boundary in consideration of the
overall development strategies of the Study Area discussed in the
Phase I Study and there was no premise on an executing body of the
project. However in the course of Study, it was announced that JIEC
would be formed, which brought up this issue of whether the Park should
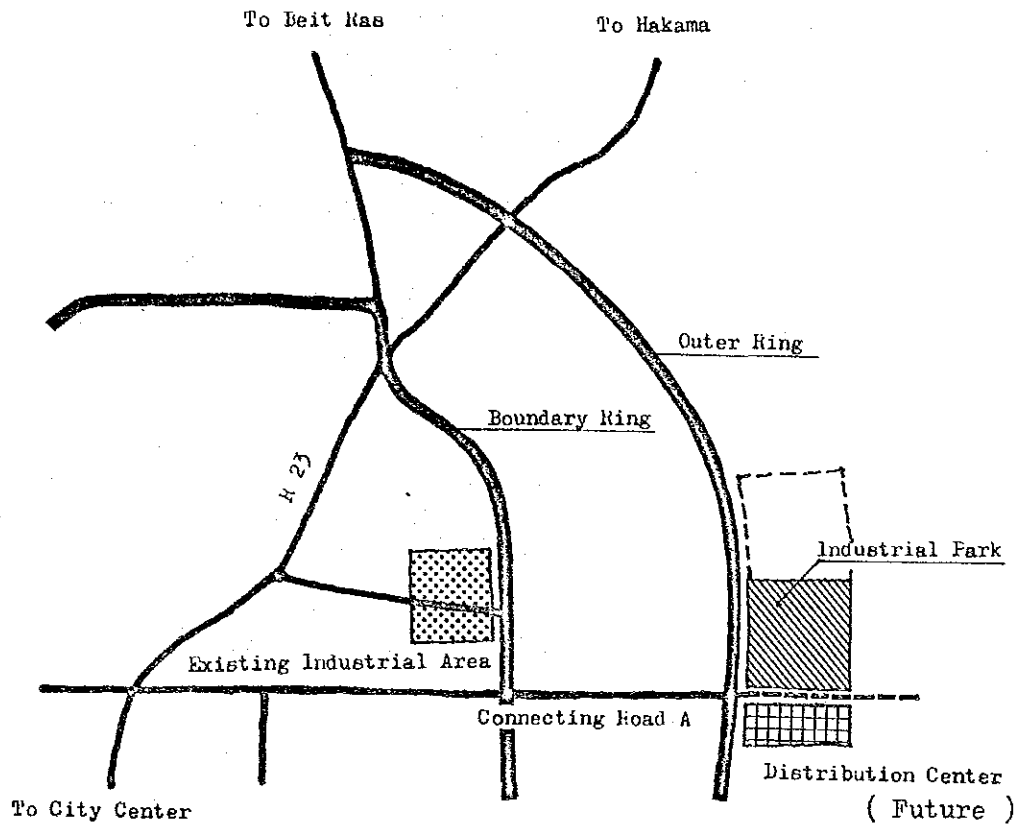be inside the municipality or outside it.

3.272   As our recommended site is within the Municipality as
indicated in Sections 3.5 and 3.6, the executing authority of the
project has to be the Municipality Office or our recommended organiza-
tions in accordance with a stipulation of the Jordan Industrial Estate
Corporation Law. But, it is suggested by some Government officials
that the Municipality might not be able to develop and to give
managerial services to the occupants as a going concern. In this case,
JIEC is the best authority to develop and manage this project. How-
ever, JIEC cannot touch a project inside the municipality, and
therefore it is better to move the project site outside the municipality
boundary for this purpose. Thus, in order to enable JIEC to undertake
this project, another site which is just outside the Outer Ring Road
and is on the Connecting Road A is proposed here. This alternative
site for the Park is illustrated in Figure 3.25.

3.273   In this case, the physical planning of the Park will be
almost same as the first alternative due to the similar topography with
little gradient. Also, the internal development cost and land acquisi-
tion cost will be unchanged according to the result of the land price
survey. In this second alternative, the major factor which has
influence on the financial and economic feasibility is off-site
infrastructure cost, that is to say, the cost for a connecting water
supply and power supply, etc.

3.274   In this context, the feasibility of this new alternative
will be the same in terms of financial analysis and will be a little
lower but still feasible in terms of economic analysis.

3.275   The choice between the two alternative sites should be made
by the Jordan Government before proceeding to the next step of this
project.

Figure 3.25   Location of Second Alternative Site

To Beit Ras   To Hakama

Outer Ring

Boundary Ring

R 23

Industrial Park

Existing Industrial Area

Connecting Road A

Distribution Center

To City Center   (Future)

Source: Study Team.

3.11   Conclusion and Investment Schedule

3.11.1   Conclusion

3.276   As already known, an industrial estate was conceived and has
been planned and implemented as an instrument to have multiple effects
on the industrial and regional development.   In the so-called Newly
Industrialized Countries (NICs) such as Brazil, Korea, Hongkong, Taiwan
and Singapore, etc. their successful experiences have proved the value
of the industrial estate in promoting their industrialization.   However,
it cannot be considered as a panacea for all the community's economic
problems and cannot demonstrate its full effect without the concerted
efforts of the supporting institutions.

3.277   As pointed out in this study, at present the relative share of the mining and manufacturing sector of the Study Area is considered to be extremely low in terms of the value of production and further attention must be paid to increase its share, at least to the level of the national average. However the Study revealed that the Study Area has enough potential for industrial development in terms of availability of natural resources, such as human, land, water and mineral (limestone and clay) and man-made resources of the various infrastructures. The recent introduction of several new industries, such as ballpoint pen, foundry, industrialized room component, dairy and sanitary wares in Irbid indicates the beginning of a new era for the Study Area.

3.278   Irbid is the second largest municipality in the country and its role in the Study Area is extremely important. The project under this Study was selected in line with the long term development strategy of the Study Area and is designed to generate the following direct benefits.

(1)   About 2,000 job opportunities;
(2)   About JD 13.7 million of yearly output at 1978 prices;
(3)   About JD 3.3 million in terms of value-added.

3.279   Though the level of the Study is preliminary, the results of the Study show that the project is technically feasible and will become financially feasible under certain condition as discussed in the previous section.

3.280   The success of the Irbid Municipality Industrial Park will depend on the effectiveness of the organization and management of the sponsoring body. In the early stage of industrial development, there is always the need for institutional support from all the authorities concerned regardless of the size of the project. Unified and continuous management must be provided to promote the project. In order to encourage and promote industrial investment, by those who are neither familiar with industry nor with the region and the country, simplification of the complex procedure is essential.

3.281   Due to the fact that JIEC activities are limited to the outside of the Municipality and that the financial and technical background of the Irbid Municipality does not appear to be strong enough to carry out the project, it is difficult to identify any existing organization as the most qualified sponsor of the project.

3.282   In this connection we would like to recommend the Jordan Government to study and decide on the sponsorship before proceeding to the next phase. Our tentative thoughts are as follows in relation to the conditions stated in the financial analysis.

(1)   To form a joint corporation between the Central Government and the Irbid Municipality, having representatives from the authorities concerned on its Board and to enter into a management Service Contract with the JIEC.

(2) To form a quasi public corporation from amongst
     member of the Central Government, municipality, IDB,
     Pension Fund and the private sector who may have
     interests in the project directly or indirectly.

3.283   There is another solution to settle the organizational
bottleneck, i.e., to place the Industrial Park outside the Municipality.
Although the financial and economic feasibility will slightly deterio-
rate in this case, it is worthwhile to examine this alternative.

3.11.2 Investment Schedule

3.284   Before the start of construction, it requires preparatory
work such as review of the study particularly as to the candidate
industries (feasibility of some selected industries and sounding out
the interests of potential investors, etc.) and detailed design, land
acquisition and necessary financial arrangement.

3.285   The period required for such preparatory works is estimated to
be about 36 months. The feasibility study and subsequent engineering
work will take about 14 months.

3.286   During the period when land acquisition is to be completed,
the contract for construction can be approved and awarded. Mobiliza-
tion for construction can begin right after the contract is awarded.
The construction period is estimated to be twenty months (see Table
3.53).

Table 3.53   Investment Schedule for the Irbid Municipality
              Industrial Park, 1980 to 1986

	1980	1981	1982	1983	1984	1985	1986
Feasibility Study Engineering Design		—————	————				
Land Acquisition			—-—				
Contractor's Prequalification			——				
Construction				——————	————		
Occupancy					— ———	——————	—————

Source: Study Team.

JICA