

**Table G.5.1 Present Conditions of O/M Equipment of UDC
(As of December 1998)**

No.	Equipment	Capacity	Country of origin	Model	Year of starting operation	Present operation efficiency (%)
1	Sludge sucking car (Kamaz)	5m ³	Italy	1990	1994	60%
2	Sludge sucking car (Renault)	5m ³	France	1998	1998	100%
3	High compressor car (Renault)	5m ³	France	1998	1998	100%
4	Dump truck (Isuzu)	2 tons	Japan	1997	1998	90%
5	Dump truck (Long Ma)	2 tons	China	1991	1994	70%
6	Dump truck (Lavi 3)	1 ton	Vietnam	1984	1985	60%
7	Dump truck (Lavi 4)	1 ton	Vietnam	1984	1985	60%
8	Dump truck (Kamaz)	7 tons	Russia	1980	1983	70%
9	Dump truck (Ifa)	5 tons	Germany	1979	1980	70%
10	Crane truck (Fadano)	20 tons	Japan	1997	1998	100%
11	Bed flat truck (Mitsubishi)	14 tons	Japan	1998	1999	100%
12	High compressor truck (Smalley)	8 tons		1997	1999	100%
13	Crane truck (Nissan)	3.5 tons	Japan	1993	1994	70%
14	Crane truck (Toyota)	2 tons	Japan	1987	1994	60%
15	Excavator (Komatsu)	0.6 m ³	Japan	1986	1993	70%
16	Bucket excavator (JHC)	0.8 m ³	Japan	1986	1994	70%
17	Boat	85 HP	Japan	1997	1999	100%
18	High compressor		America	1994	1996	70%
19	Concrete cutting equipment (Mikasa)		Japan	1996	1997	70%
20	Concrete mixer	180l	France	1995	1997	80%
21	Concrete mixer	450l	France	1995	1997	70%
22	Concrete Crushing Equipment (Walkerman)		Germany	1993	1995	50%

Table G.5.2 O/M Works for Drainage carried out by Districts

Dist.	Name of Corp.	Est. year	Staff	O/M Personnel	Functions	Sewer length (m)	Installation data	Cleaning Time/year	O/M expenses/year (VN dong)	Operation conditions	Dredging of canals	Canal length (m)
1	Public service corp. of district 1	Nov-97	550	10	Public works in the district like cleaning of solid wastes, rehabilitation of public infrastr., and public house management etc.	39,406	na	2	300,000,000	na	N	-
3	Public service & urban dev. corp. of district 3	Nov-92	322	51		58,204	na	4	537,449,360	na	Y	90
4	Urban dev. & public service of district 4	Oct-97	203	15		74,534	na	12	954,552,788	na	N	na
5	Public service corp. of district 5	Oct-97	203	15	id.	74,534	na	12	954,552,788	na	N	-
6	Public Service corp. of district 6	1986	293	60	id.	60,000	na	8	4,500,000,000	na	Y	15,000
8	Public service corp. of district 8		53	16	id.	44,417	na	4	671,000,000	na	N	-
10	Public service & urban dev. Corp. of district 10	1997	255	24	id.	77,050	na	2	986,680,500	na	na	na
11	Public service & urban dev. Corp. of district 11	1988	156	36	id.	70,449	na	2	1,143,512,960	na	na	na
TB	Public service & urban dev. Corp. of district Tan Binh	1984	524	70	id.	132,915	na	1	600,000,000	na	Y	10,130
GV	Public service corp. of district GV	1997	141	22	id.	10,490	na	2	113,312,029	na	na	na
PN	Public service corp. of district Phu Nhuan	1986	131	12	id.	121,000	na	2	540,000,000	na	na	na
BT	Public service corp. of district Phu Nhuan	Mar-98	265	90	id.	85,000	na	1	250,000,000	na	na	2,100

Table G.5.3 (1/5) List of Outlets in F/S Area Controlled by UDC District 1

No	Outlet Name	Dimension	Mark	Location	Operation Condition
1	Nguyen Van Cu	Ø 800	01-01	Ben Nghe	Outlet, flap gate in good condition, behind outlet there is a small canal, the flow is not in good condition.
2	Nguyen Canh Chan	Ø 800	02-01	Ben Nghe	Outlet in good condition, the upper part is encroached by housing construction, flow is obstructed.
3	Tran Dinh Xu	Ø 1500	03-01	Ben Nghe	Outlet has just constructed, flow in good condition.
4	Ho Hao Hon	Box 2m x 2m x 2	04-01	Ben Nghe	Outlet and flow in good condition, the upper part of outlet is encroached by housing construction.
5	De Tham I	Ø 1000	05-01	Ben Nghe	Outlet has just constructed, flow in good condition
6	De Tham II	Ø 800	06-01	Ben Nghe	Flap gate under the Ong Lanh bridge, outlet is broken, the flow is obstructed
7	Nguyen Thai Hoc	Ø 1000	07-01	Ben Nghe	Outlet is encroached by housing construction, outlet is damaged, flow is not good condition
8	Yersin	Ø 1200	08-01	Ben Nghe	Outlet under the Camette bridge is damaged, the flow is obstructed
9	Ky Con	Ø 1500	09-01	Ben Nghe	Outlet is encroached by housing construction, the flow is obstructed
10	Canette	Ø 2000	10-01	Ben Nghe	Outlet under the Camette bridge is damaged, the flow is obstructed
11	Pho Duc Chinh	Ø 2000	11-01	Ben Nghe	Outlet, flap gate in good condition, the flow is in good condition
12	Nam Ky Khoi Nghia	Roof 0.8m x 1.8m	12-01	Ben Nghe	Outlet, flap gate in good condition, the flow is in good condition
13	pastour	Roof 0.8m x 1.8m	13-01	Ben Nghe	
14	Tom That Dain	Ø 1000	14-01	Ben Nghe	Outlet in good condition
15	Ho Tung Mau	Roof 0.8m x 1.3m	15-01	Ben Nghe	Outlet in good condition
16	Ham Nghi I	Roof 0.8m x 1.4m	16-01	S.Sai Gon	Outlet in good condition
17	Ham Nghi II	Roof 0.8m x 1.6m	17-01	S.Sai Gon	Outlet in good condition
18	Nguyen Hue I	Roof 0.8m x 1.2m	18-01	S.Sai Gon	Outlet, flap gate in good condition, the upper part has a wharf, the flow is in good condition
19	Nguyen Hue II	Ø 1000	19-01	S.Sai Gon	Outlet in good condition
20	Dong Khoi	Ø 1000	20-01	S.Sai Gon	Outlet, flap gate in good condition, the flow is in good condition
21	Hai Ba Trung	Roof 0.8m x 1.6m	21-01	S.Sai Gon	Outlet, flap gate in good condition, the upper part has kiosques, the flow is in good condition
22	Me Linh circle	Ø 1200	22-01	S.Sai Gon	Outlet, flap gate in good condition
23	Don Dat	Ø 1000	23-01	Don Dat	Outlet in good condition
24	Tom Duc Thang	Ø 1000	24-01	S.Sai Gon	Outlet, flap gate in good condition, the upper part has fence of harbour, the flow is in good condition
25	Tom Duc Thang II	Ø 1000	25-01	S.Sai Gon	
Total					25 outlets, of which 6 damaged/malfunctioning outlets

Table G.5.3 (2/5) List of Outlets in F/S Area Controlled by UDC District 4

No	Outlet Name	Dimension	Mark	Location	Operation Condition
1	Nguyen Tat Thanh I	Ø 800	01-04	Nguyen Tat Thanh I	Outlet is not investigated
2	Nguyen Tat Thanh II	Ø 800	02-04	Nguyen Tat Thanh II	Outlet is not investigated.
3	Ben Van Don	Roof 0.9m x 0.6m	03-04	Ben Van Don	Outlet in good condition.
4	Nguyen Truong To	Ø 600	04-04	Nguyen Truong To	Outlet is damaged, it is enroached by housing construction, the flow is not in good condition
5	Le Quoc Hung	Ø 1000	05-04	Le Quoc Hung	Flag gate is damaged, outlet is enroached by housing construction, the flow is in good condition
6	Doan Van Bo	Ø 800	06-04	Doan Van Bo	Outlet in good condition, under the Camette bridge, the flow is in good condition
7	Fertilizer company	Ø 1000	07-04	Fertilizer company	Outlet in good condition, the upper part has housing construction, the flow is in good condition.
8	Khanh Hoi I	Ø 800	08-04	Khanh Hoi I	
9	Khanh Hoi II	Ø 800	09-04	Khanh Hoi II	
10	Nguyen Khoai	Ø 800	10-04	Nguyen Khoai	Outlet is good, the upper part has storage location of cajuput, the flow is in good condition.
23	Khanh Hoi III	Ø 600	11-04	Khanh Hoi III	
24	Khanh Hoi IV	Ø 600	12-04		
25	Khanh Hoi V	Ø 600	13-04		
26	Khanh Hoi VI	Ø 600	14-04		
27	Khanh Hoi VII	Ø 600	15-04		
28	Khanh Hoi VIII	Ø 600	16-04		
29	Khanh Hoi IX	Ø 600	17-04		
Total					17 outlets, of which 2 damaged/malfunctioning outlets

Table G.5.3 (3/5) List of Outlets in F/S Area Controlled by UDC District 5

No	Outlet Name	Dimension	Mark	Location	Operation Condition
1	Nguyen Bieu	Ø 1000	01-05	Nguyen Bieu	
2	Tran Binh Trong	Roof 2.5m x 2.5m	02-05	Tran Binh Trong	Roof outlet, flag gate is good condition, the upper part has housing construction
3	Huyth Man Dat I	Ø 1000	03-05	Huyth Man Dat I	
4	Huyth Man Dat II	Ø 1000	04-05	Huyth Man Dat II	
5	182A Ham Tu	Ø 600	05-05	182A Ham Tu	
6	400E Ham Tu	Ø 600	06-05	400E Ham Tu	
7	706 Ham Tu	Ø 600	07-05	706 Ham Tu	
8	Bach Van	Roof 0.8m x 1.4m	08-05	Bach Van	
9	Bui Hau Nghia	Roof 0.8m x 1.4m	09-05	Bui Hau Nghia	
10	An Binh	Ø 1200	10-05	An Binh	
11	Nguyen Tri Phuong	Roof 2m x 2.2m	11-05	Nguyen Tri Phuong	Outlet in good condition, the upper part is enroached by housing construction
12	Phan Phu Tien	Roof 0.8m x 1.4m	12-05	Phan Phu Tien	Roof outlet is good condition, flow is in good condition
13	Tan Da I	Roof 0.8m x 1m	13-05	Tan Da I	
14	Tan Da II	Ø 600	14-05	Tan Da II	Outlet and flow is in good condition, the upper part is enroached by housing construction.
15	Phan Huy Chu	Roof 0.6m x 1.4m	15-05	Phan Huy Chu	
16	Hai Thuong Lan Ong	Ø 600	16-05	Hai Thuong Lan Ong	
17	Hai Thuong Lan Ong	Roof 2m x 2.5m	17-05	Hai Thuong Lan Ong	Roof outlet and flow in good condition, the upper part is enroached by housing construction
18	Trieu Quang Phuc	Roof 0.6m x 1m	18-05	Trieu Quang Phuc	Roof outlet is enroached by housing construction
19	Luong Nhu Hoc	Roof 0.6m x 1.4m	19-05	Luong Nhu Hoc	Roof outlet is enroached by housing construction
20	Trinh Hoi Duc	Ø 1000	20-05	Trinh Hoi Duc	
21	Van Kiep	Roof 0.8m x 1.4m	21-05	Van Kiep	
22	Mac Cui	Roof 0.8m x 1.6m	22-05	Mac Cui	
23	Nguyen Thi	Roof 0.8m x 1.4m	23-05	Nguyen Thi	
24	Phung Hung	Roof 0.8m x 1m	24-05	Phung Hung	
25	Van Tuong	Ø 800	25-05	Van Tuong	Outlet and flow in good condition, the upper part of outlet is enroached by housing construction
26	Go Cong	Ø 800	26-05	Go Cong	
Total					26 outlets, of which 6 damaged/malfunctioning outlets

Table G.5.3 (4/5) List of Outlets in F/S Area Controlled by UDC District 6

No	Outlet Name	Dimension	Mark	Location	Operation Condition
1	Go Cong	Roof 0.7m x 1.4m	01-06	Go Cong	Outlet and flag gate in good condition, flow behind outlet is good condition.
2	Ngô Nham Tinh	Ø 600	02-06	Ngô Nham Tinh	
3	Chu Van An	Ø 400	03-06	Chu Van An	Outlet in good condition, the upper part is encroached by housing construction, flow is not in good condition
4	Chu Van An	Ø 600	04-06	Chu Van An	
5	Huyh Thoa Yen	Roof 2m x 2.5m	05-06	Huyh Thoa Yen	Flag gate is encroached.
6	Nguyen An Khuong	Ø 600	06-06	Nguyen An Khuong	
7	Binh Tay	Ø 800	07-06	Binh Tay	Outlet and flow in good condition, the upper part of outlet is encroached by housing construction.
8	Cao Van Lau I	Roof 0.8m x 1.2m	08-06	Cao Van Lau I	
9	Cao Van Lau II	Ø 800	09-06	Cao Van Lau II	
10	Mai Xuan Thuong I	Ø 1500	10-06	Mai Xuan Thuong I	Outlet and flag gate is in good condition, flow is in good condition
11	Mai Xuan Thuong III	Ø 800	11-06	Mai Xuan Thuong III	Outlet, flag gate and flow is in good condition, the upper part of outlet is encroached by housing construction
12	Pham Phu Thu	Roof 0.7m x 1.5m	12-06	Pham Phu Thu	Flag gate is encroached.
13	Binh Tien	Ø 800	13-06	Binh Tien	
Total					13 outlets, of which 5 damaged/malfunctioning outlets

Table G.5.3 (5/5) List of Outlets in F/S Area Controlled by UDC District 8

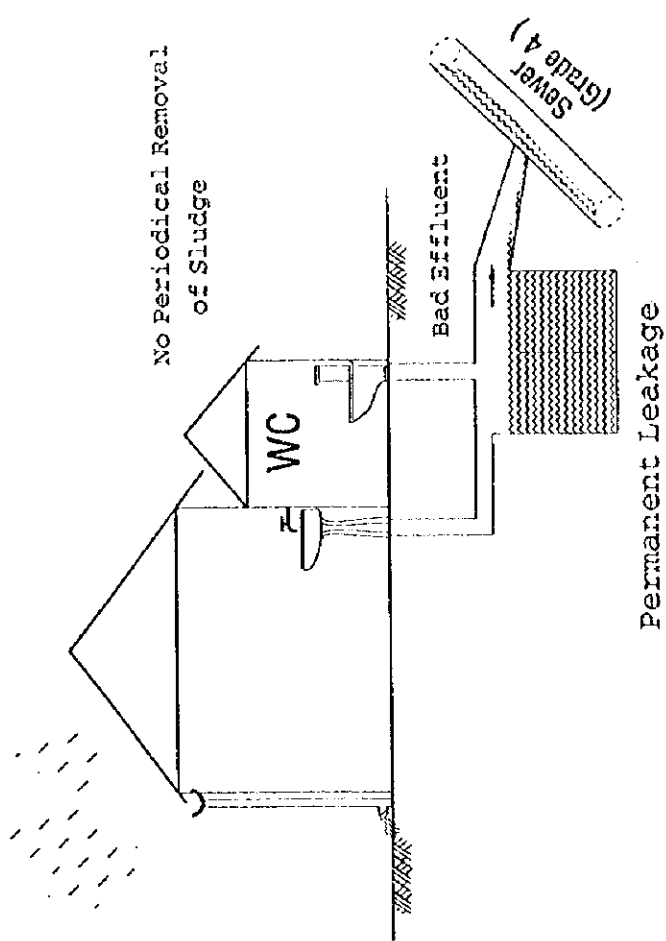
No	Outlet Name	Dimension	Mark	Location	Operation Condition
1	Pham The Hien	Ø 600	01-08	Pham The Hien	
2	Duong Ba Trac	Ø 800	02-08	Duong Ba Trac	
3	Au Duong Lan	Ø 1000	03-08	Au Duong Lan	
4	Chanh Hung I	Ø 800	04-08	Chanh Hung I	Outlet is closed by garbage, outlet has not flag gate, flow is jammed
5	Bong Sao	Ø 600	05-08	Bong Sao	
6	Pham The Hien	Ø 800	06-07	Pham The Hien	Outlet flow and flag gate is in good condition.
7	Chanh Hung II	Ø 800	07-08	Chanh Hung II	
8	Da Tuong	Ø 1000	08-08	Da Tuong	Outlet is in good condition, there is not flag gate, flow is not good condition
9	Ba Dinh	Ø 600	09-08	Ba Dinh	Outlet is in good condition.
10	U Cay		10-08	U Cay	
11	Can Giuoc	Ø 800	11-08	Can Giuoc	
12	Can Giuoc	Ø 600	12-08	Can Giuoc	
13	Dinh Hoa III	Ø 800	13-08	Dinh Hoa III	
14	Vinh Nam I	Ø 600	14-08	Vinh Nam I	
15	Nguyen Quyen	Ø 600	15-08	Nguyen Quyen	
16	Nguyen Quyen (Tung Thien Vuong)	Ø 600	16-08	Nguyen Quyen (Tung Thien Vuong)	Outlet is closed by housing construction, outlet has not flag gate, flow is not in good condition
17	Tung Thien Vuong	Ø 600	17-08	Tung Thien Vuong	
18	Vinh Nam II	Ø 600	17-08	Vinh Nam II	
19	Ben Can Giuoc	Ø 800	19-08	Ben Can Giuoc	
20	Tuy Ly Vuong	Ø 800	20-08	Tuy Ly Vuong	
21	Dinh Hoa I	Ø 800	21-08	Dinh Hoa I	
22	Dinh Hoa II	Ø 1600	22-08	Dinh Hoa II	
23	Phong Phu	Ø 800	23-08	Phong Phu	
24	Dinh Hoa	Ø 800	24-08	Dinh Hoa	
25	Tran Nguyen Han I	Ø 800	25-08	Tran Nguyen Han I	
26	Tran Nguyen Han II	Ø 800	26-08	Tran Nguyen Han II	
27	Ben Xom Cui	Ø 600	27-08	Ben Xom Cui	Outlet and flag gate is in good condition, the upper part of outlet there is a garbage-bin
28	Mac Van		28-08	Mac Van	
29	Nguyen Che Nghia	Ø 600	29-08	Nguyen Che Nghia	
30	Nguyen Quyen (Binh Dong)	Ø 600	30-08	Nguyen Quyen (Binh Dong)	Outlet is closed by housing construction, outlet has not flag gate, flow is jammed
31	Nguyen Che Nghia	Ø 800	31-08	Nguyen Che Nghia	
Total					31 outlets, of which 4 damaged/malfunctioning outlets

Table G.6.1 List of Proposed O/M Equipment

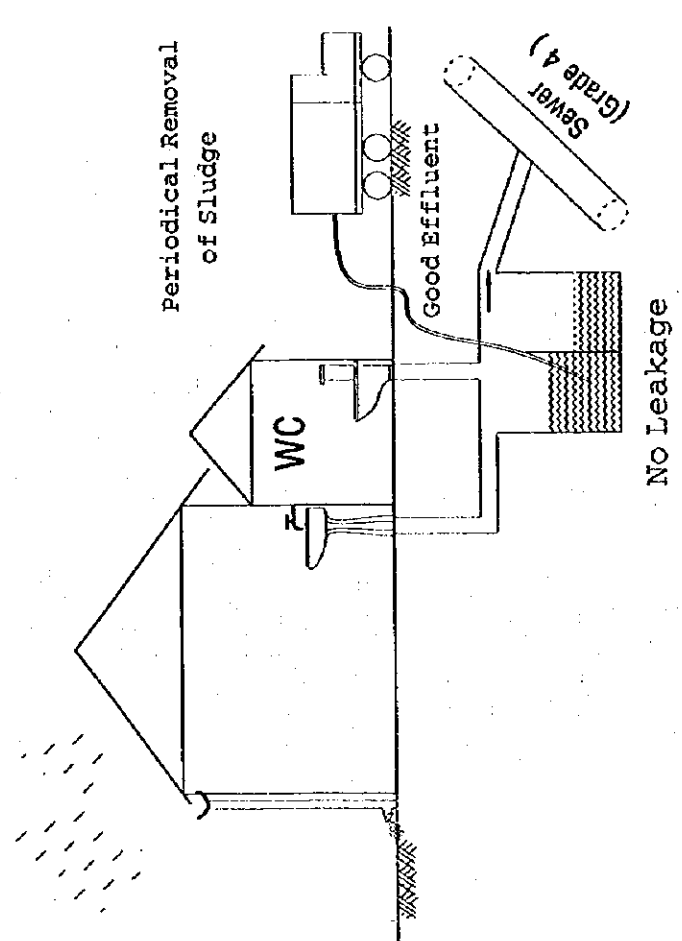
(Unit: mil. VND)

Item	Phase I			Phase II		
	Drainage	Sewage	Total	Drainage	Sewage	Total
Bucket Typed Cleaning Car	1,200* x 9		10,800	1,200* x 22		26,400
High Compresson Car	1,200* x 9		10,800	1,200* x 22	1,200* x 2	28,800
Vacuum Car	1,000* x 9		9,000	1,000* x 22	1,000* x 2	24,000
Transportation Van	400* x 10	400* x 2	4,800	400* x 22	400* x 2	9,600
Car	400* x 1	400* x 1	800	400* x 1	400* x 3	1,600
Checking Tool set	30* x 10	30* x 2	360	30* x 25	30* x 5	900
Repair Tool set	30* x 10	30* x 2	360	30* x 25	30* x 5	900
			36,920			92,200

* Estimated Unit Price (1999)



Septic Tank : Bad Operation
 (Present Situation : Move than Half)



Septic Tank : Good Operation
 (Present Situation : Less than Half)

Fig. G.3.1 Operation Situation of Septic Tank

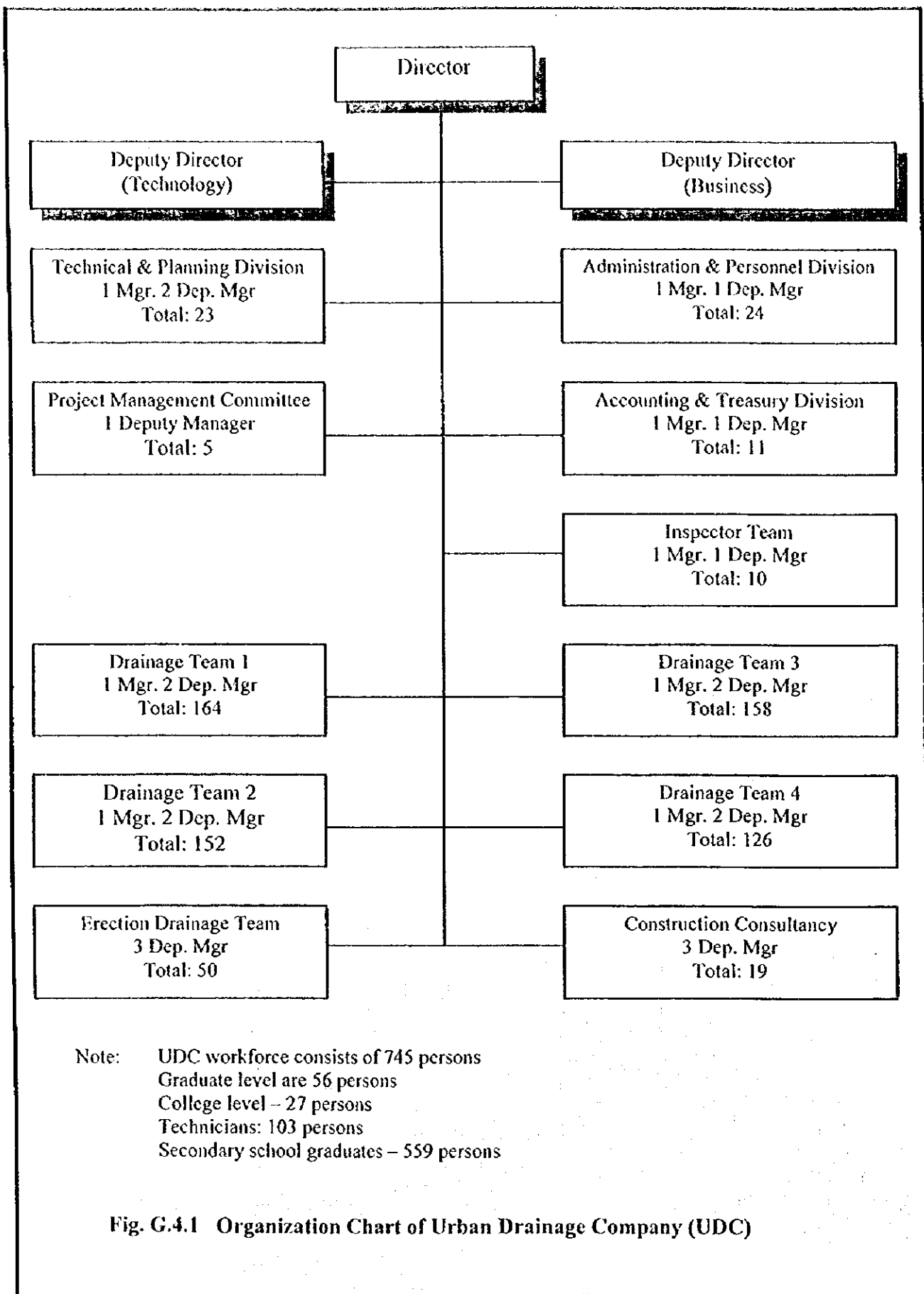


Fig. G.4.1 Organization Chart of Urban Drainage Company (UDC)

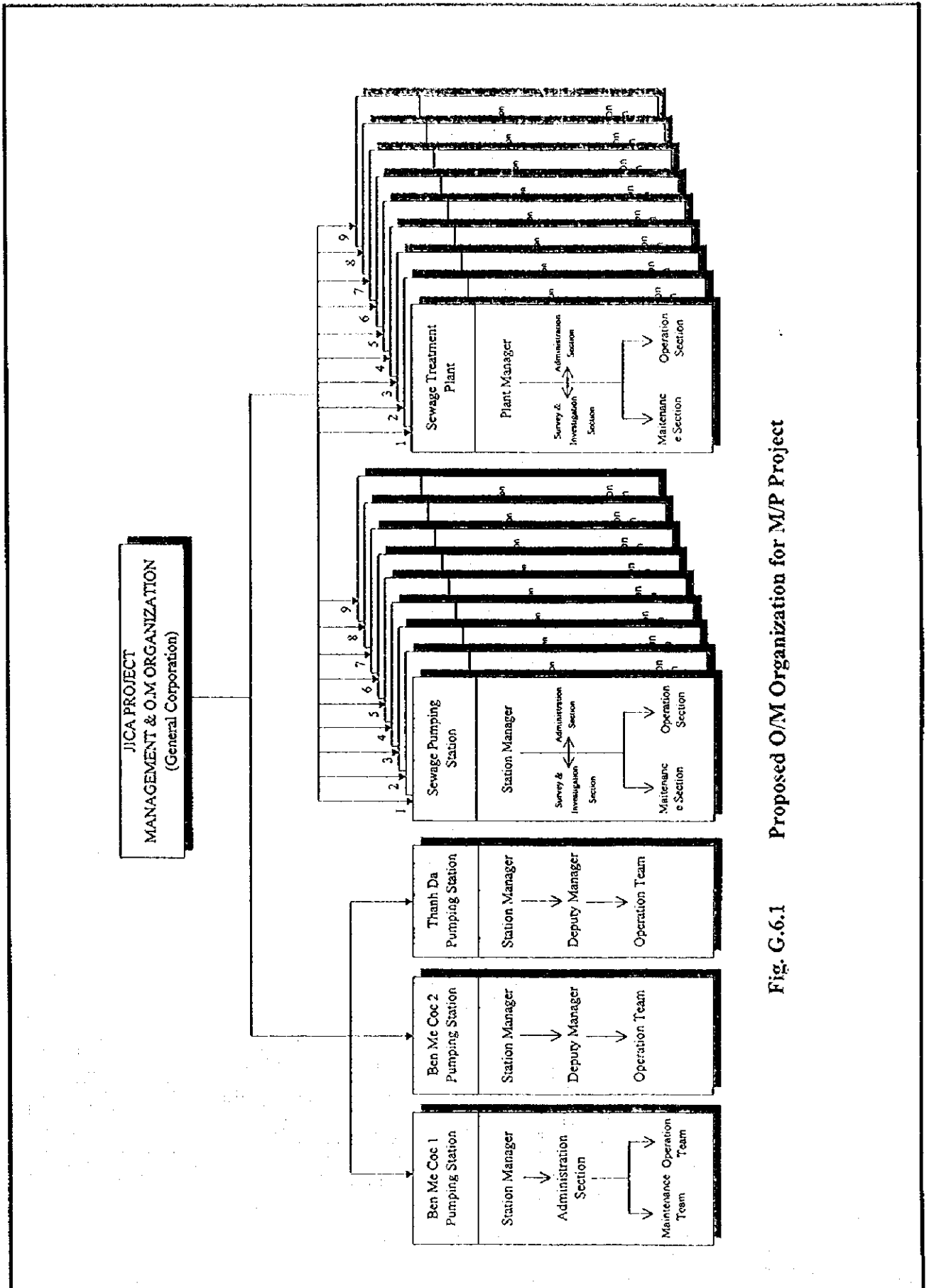


Fig. G.6.1 Proposed O/M Organization for M/P Project

ENVIRONMENTAL IMPROVEMENT PROJECT OF HO CHI MINH CITY
TAU HU - BEN NGHE - DOI, TE BASIN

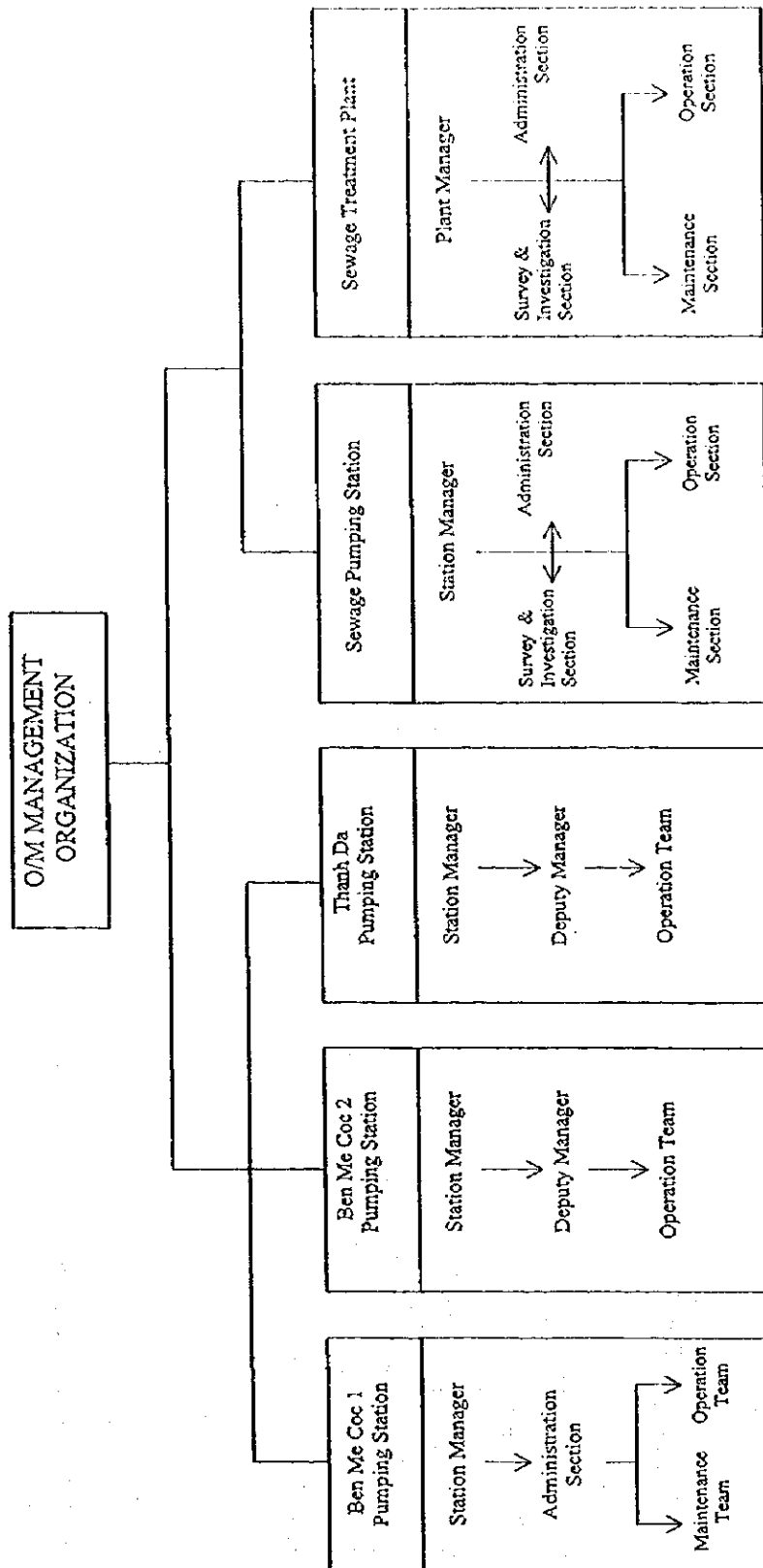


Fig. G.6.2 Proposed O/M Organization for Priority Project

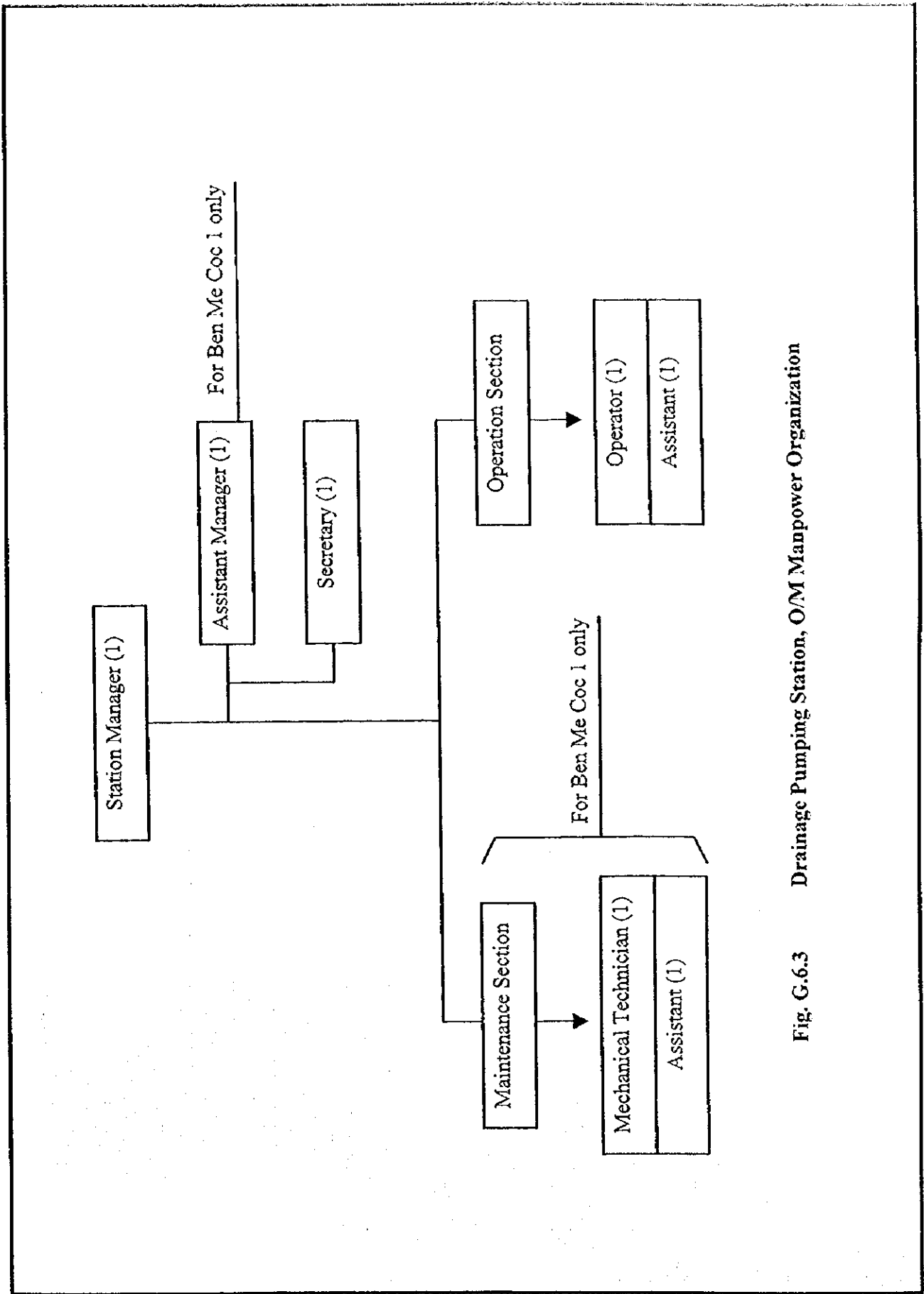


Fig. G.6.3 Drainage Pumping Station, O/M Manpower Organization

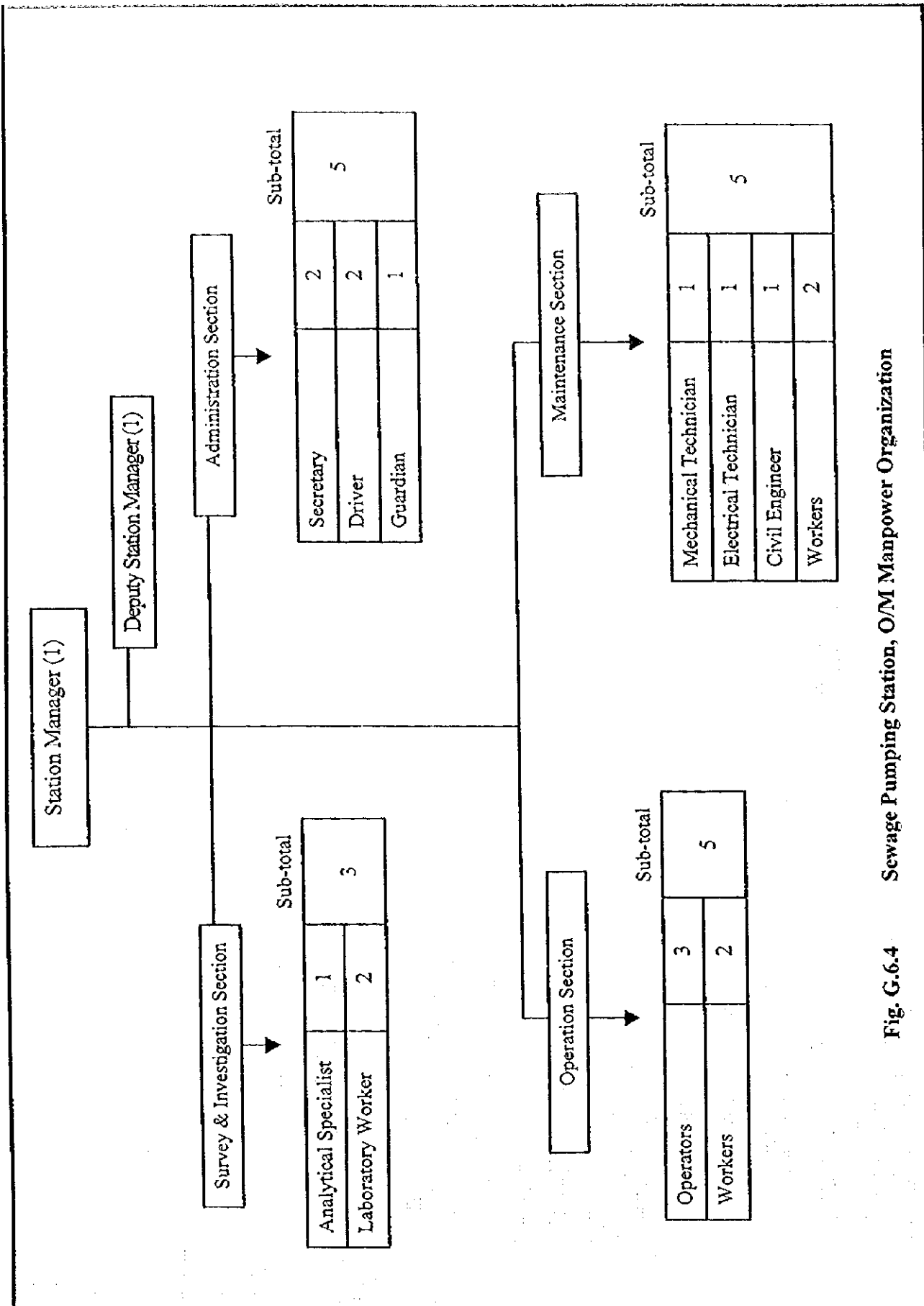


Fig. G.6.4 Sewage Pumping Station, O/M Manpower Organization

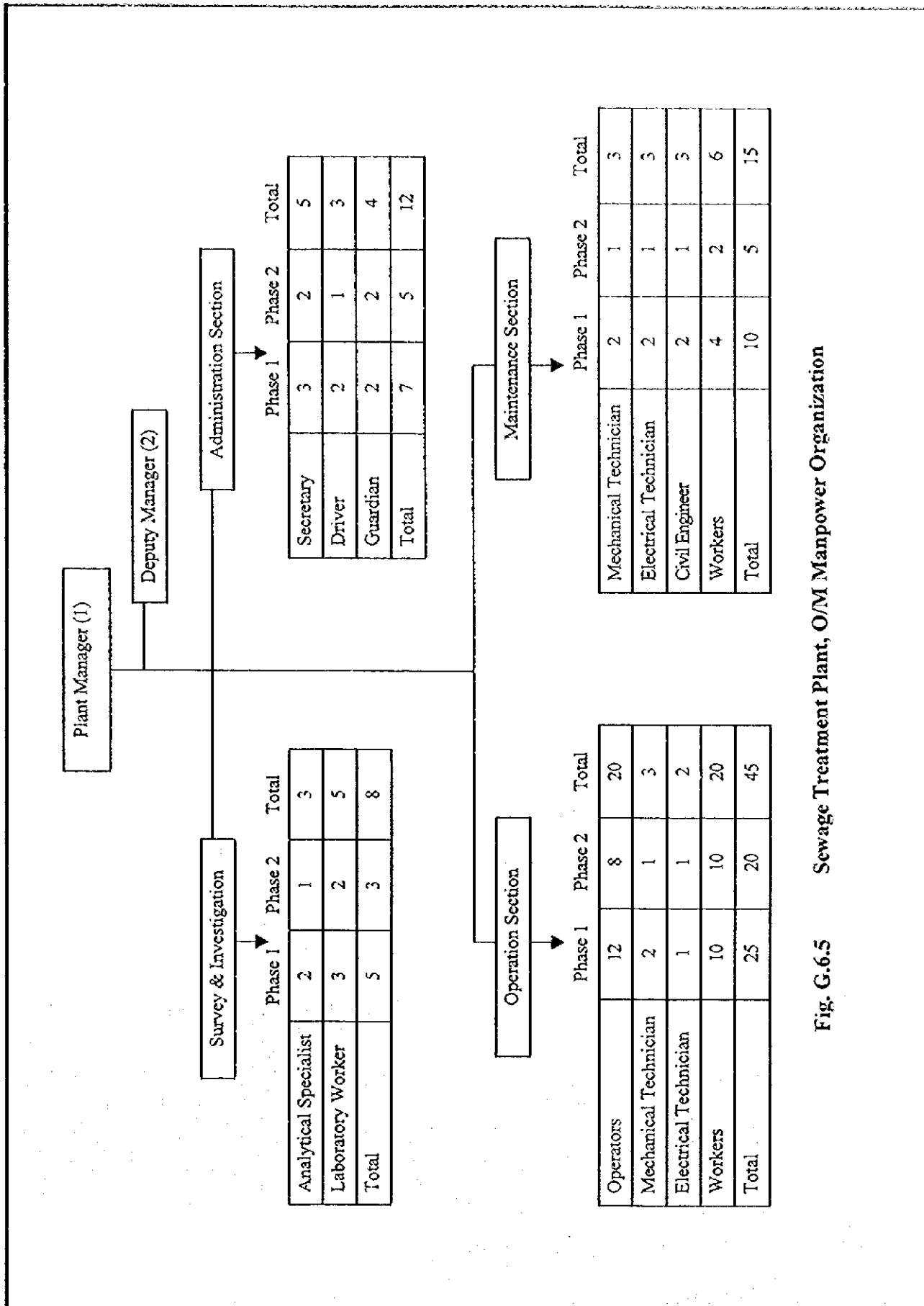


Fig. G.6.5 Sewage Treatment Plant, O/M Manpower Organization

SEWER/GATE MAINTENANCE RECORD

By organization:

Sewer/gate code no.:

Location: From:.....To:(.....m)

I. Technician Specification:

1. Established in:.....By:.....
2. Structure: Brick / RC / Other material (.....)
3. Section: Φ Round / Box / Roof
4. Rehabilitation work:In:.....By:.....
5. New expanded portion:In:.....By:.....

II. O/M Conditions

1. Cleaning times:...../year
2. Last cleaning date:by:.....
3. Cleaning remarks: Very good/ Good/ Medium/ Bad/ Very bad
4. Problem in operation: No /Yes (.....)
5. Problem in maintenance: No /Yes (.....)

III. Present Situation

1. Structure: Very good/ Good/ Medium/ Bad/ Very bad
2. Operation: Very good/ Good/ Medium/ Bad/ Very bad
3. Damages:

1

place:.....since:.....

2

place:.....since:.....

3

place:.....since:.....
4. Problems with related structures: City water/ Electricity/ Telephone cable/.....
5. Related plans:

Made by:.....

Checked by:.....

Date:

Date:

Fig. G.6.6

Sewer/Gate Maintenance Record .

MAINTENANCE WORK PACKAGE RECORD

Title: _____
 Work No./ Code: _____

1. SCOPE

Required Scope of Work: _____

 Services to Be Provided: _____

 Carried out by: _____

2. BUDGET

Personnel Assigned to Job	Work	\$ Cost	Code	Computer Services		
	Hours		Acct.	Type	Hours	\$ Cost
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

Payment Conditions: _____
 Total Work Hours = _____ Personnel Costs = \$ _____
 Computer Hours = _____ Computer Costs = \$ _____

Travel Expenses + Reproduction Expenses + Other Expenses = \$ _____

Total Budget = \$-Labor + \$-Computer + \$-Travel + \$-Other = \$ _____

3. IMPLEMENTATION SCHEDULE

Code	Work Task	Responsible Person	Start Date	End Date
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Work Package: Start date: _____ End date: _____

ADDITIONAL COMMENTS: _____

- 1) Work Performance: _____
- 2) Payment: _____
- 3) Guarantee: _____

Prepared by: _____ Date: _____

Approved by: _____ Date: _____

Fig. G.6.7 Maintenance Works Package Record

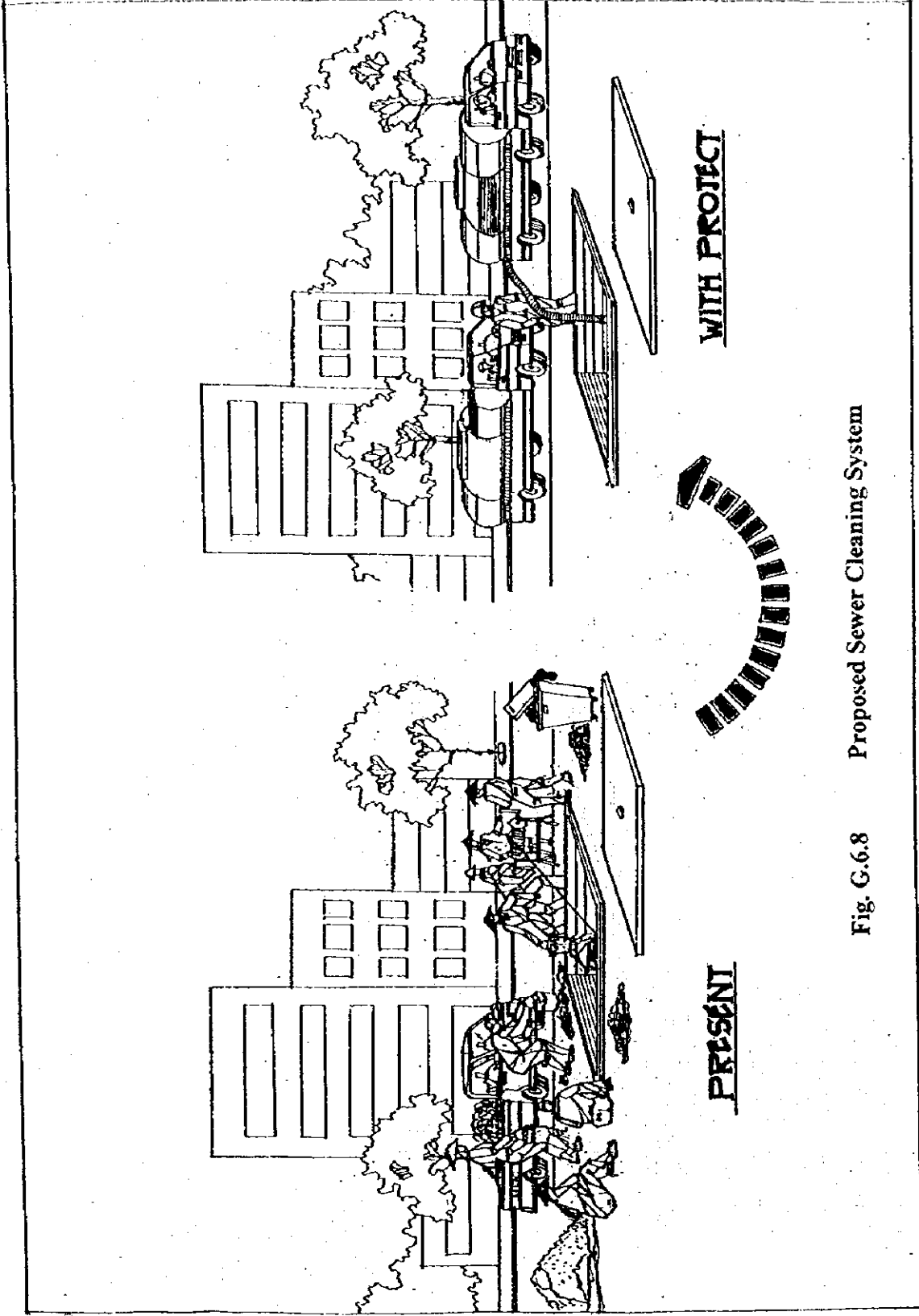


Fig. G.6.8 Proposed Sewer Cleaning System

WITH PROJECT

PRESENT SITUATION

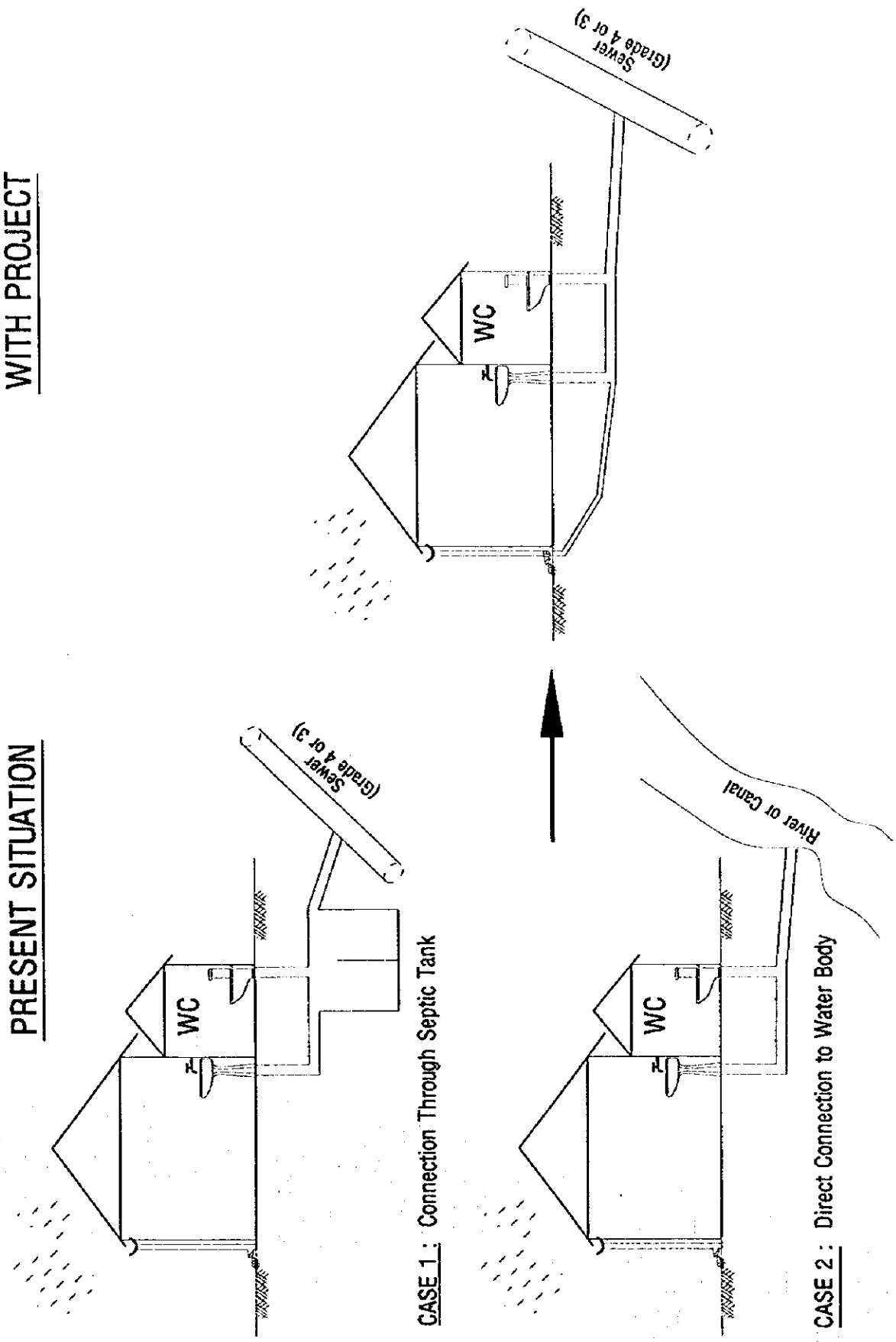


Fig. G.6.9 Proposed Sewer Connection from Individual Houses

Attached Material 1

QUESTIONNAIRE TO C/P OFFICIALS (Project of Drainage and Sewage Treatment in HCMC Region)

Aspect: Project

O/M

A. GENERALITIES:

1. Your opinions on the present situation of drainage and sewage treatment in the region of HCMC. And other cities in VN.
2. Your ideas to improve the conditions of drainage and sewage treatment in the region of HCMC. And other cities in VN.
3. Your comments on the present facilities of drainage and sewage treatment in the region of HCMC and other cities in VN.
4. Your comments on the present organization and functional effectiveness for drainage and sewage treatment in the region of HCMC.
5. For other cities in Vietnam, how about the situation and conditions for carrying out the drainage and sewage treatment works.
6. Is it proper to continue the present system of household septic tank or to change to the system of piping connection in urban areas? Reasons.
7. Whether is it proper to treat the sewage for a standard quality to make effluent or no need of treatment for ejecting to the surrounding water bodies? Reasons.
8. List of cities having companies for drainage and sewage treatment in VN. Kind of company, establishment year, organization, work scope, functioning results and problems in O/M works.
9. What kinds of cities should need drainage and sewage treatment works? And what systems are considered proper?
10. What kind of organization/company is presently considered proper for taking care of urban drainage and sewage treatment works.

B. ADMINISTRATION, BUDGETING AND WORKING RESPONSIBILITY ON O/M WORKS

1. For city drainage works, before there are WASEENCO in Hanoi and WASENCO in HCMC. How about the situation of WASENCO in HCMC at present?
2. The present organization and administration for drainage works in the region of HCMC (Flowchart, establishment year, personnel, budget, operation etc.). Your comments on the organization, personnel, functions, budget allocation and operation effectiveness.
3. The main problems in O/M for drainage works in HCMC and in Vietnam.
4. The present situation and main problems of sewage treatment in HCMC and in

Vietnam. What should be done for the matter of sewage treatment in HCMC and in VN.

5. Measures to solve the problem of sewage for people living along canals/ rivers.

Is it possible to deplace them to another location? Methods for proceedings.

6. From the present situation and conditions in HCMC, whether is it proper to establish an organization for both works of drainage and sewage treatment, or to have 2 separate organizations (one for drainage and another for sewage treatment). Reasons.

7. The present situation of budget formation for O/M works for drainage and sewage treatment. Are there any financial problems? What are the solving methods.

8. Are local inhabitants presently paying for drainage and sewage treatment works ?

Is the situation considered proper at the moment or should need improvements?

Reasons.

C. LOCAL COMMITTEES AND INHABITANTS' INVOLVEMENT IN O/M WORKS

1. Are local committees (UBND Quan/ Phuong/ Khom) presently involved in the O/M works for drainage and sewage treatments. Reasons and Proceedings.

2. Are local inhabitants (Khom/ To) presently involved in the O/M works for drainage and sewage treatments? Reasons and proceedings.

3. Is it convenient to make local committees and inhabitants being involved in O/M works in a near future? Reasons and proceedings.

D. PROCEEDINGS FOR MANAGEMENT AND O/M WORKS

1. What are the basic principles for management in drainage and sewage treatment works?

2. Budgeting procedure, approval proceedings and implementation control

3. Is the financial share from local inhabitants considered as an important principle in the management of drainage and sewage treatment works?

4. The proceedings to obtain the governmental part of annual financial allocation. And the budget control from the government.

4. The procedure of staff selection. The control system of their work performance

5. The routine works in management and O/M. Persons in charges and Problems.

6. Is there an audit system in the organization for taking care of financial matters supervision?

7. Proceedings of Routine Operation Works in drainage and sewage treatment.

8. Proceedings of Routine Maintenance Works in drainage and sewage treatment.
9. Is it proper to include the management and O/M of drainage and sewage treatment works in the company of city water supply? Reasons. How to proceed?
10. What local matters should be carefully considered for successfully implement the management and O/M of drainage and sewage treatment works?

E. OTHERS

1. Between drainage and sewage treatment in HCMC region, which one is in higher priority from the Government?
2. Between drainage and sewage treatment, which one is in the higher priority for local inhabitants in HCMC?
3. For the local Government and inhabitants in HCMC region, are they really concerned about the hygienic environment? Measures from both sides to tackle the matter. Is the environmental education system applying at the moment?
4. For the local Government and inhabitants in HCMC region, what kind of sewage treatment system is considered proper for both sides?
5. In case of integrating the management and O/M of new drainage and sewage treatment works in the present HCM city water supply company, is it possible to carry out smoothly the management of the whole new company? Reasons.

Your proposed organization:
(Flowchart)

Your proposed management system:

Your proposed financial system and budget:

Your proposed personnel staff number and selection:

Your proposed working routines:

For drainage:

For water treatment:

Other proposed items:

CÂU HỎI ĐẾN NHỮNG VIÊN CHỨC CÁC CƠ QUAN ĐỐI TÁC

Lĩnh vực : Quản lý và Vận hành Bảo trì

A. TỔNG QUÁT:

1. Ý kiến của anh, chị về tình hình hiện nay của hệ thống thoát nước và xử lý nước thải trên địa bàn thành phố HCM và những thành phố khác của Việt nam.
2. Ý kiến của anh, chị về việc cải thiện điều kiện thoát nước và xử lý nước thải trên địa bàn thành phố HCM và các thành phố khác của Việt nam.
3. Ý kiến của anh, chị về các công tác thoát nước và xử lý nước thải hiện tại trên địa bàn thành phố HCM và các thành phố khác của Việt nam.
4. Ý kiến của anh, chị về tổ chức hiện nay và hiệu quả chức năng đối với hệ thống thoát nước và xử lý nước thải trên địa bàn thành phố HCM.
5. Đối với những thành phố khác ở Việt nam, tình hình và điều kiện để thực hiện các công tác thoát nước và xử lý nước thải như thế nào?
6. Có thể tiếp tục hệ thống hiện tại về bề tự hoại của các căn hộ dân cư hay đổi sang hệ thống cống nổi trong khu vực đô thị? Lý do.
7. Có cần xử lý nước thải theo chất lượng tiêu chuẩn để thải bỏ không, hay không cần thiết xử lý khi thải ra hệ thống kênh rạch xung quanh? Lý do.
8. Danh sách các thành phố có công ty thoát nước và xử lý nước thải ở Việt nam, cấp loại công ty, năm thành lập, tổ chức, lĩnh vực hoạt động, kết quả chức năng và các vấn đề trong việc vận hành bảo trì.
9. Những loại thành phố nào cần công tác thoát nước và xử lý nước thải? Và các loại hệ thống nào xem như thích hợp?
10. Loại tổ chức / công ty nào hiện nay được xem như thích hợp để bảo trì công trình thoát nước và xử lý nước thải?

B. HÀNH CHÁNH, NGÂN SÁCH VÀ TRÁCH NHIỆM TRONG CÔNG TÁC VẬN HÀNH BẢO TRÌ

1. Công tác thoát nước thành phố trước khi có WASEENCO tại Hà nội và WASENCO tại thành phố HCM. Tình hình WASENCO tại thành phố HCM hiện nay như thế nào?
2. Tổ chức và hành chính hiện tại cho hệ thống thoát nước trên địa bàn thành phố HCM (sơ đồ tổ chức, năm thành lập, nhân sự, ngân sách, vận hành, v.v...). Ý kiến của anh, chị về tổ chức, nhân sự, chức năng, sử dụng ngân sách và hiệu quả vận hành.
3. Các vấn đề chính trong vận hành, bảo trì các công tác thoát nước tại thành phố HCM và Việt nam.
4. Tình hình hiện tại và các vấn đề chính của xử lý nước thải tại thành phố HCM và Việt nam. Những việc nào cần làm đối với vấn đề xử lý nước thải tại thành phố HCM và Việt nam.
5. Các biện pháp giải quyết vấn đề nước thải đối với người dân sống dọc theo kênh rạch/sông ngòi. Có thể thế cho họ nơi định cư khác? Biện pháp tiến hành.
6. Từ tình hình và điều kiện hiện tại của thành phố HCM, có cần thiết lập một (01) tổ chức cho cả hai công việc thoát nước và xử lý nước thải, hay hai (02) tổ chức riêng biệt (một cho thoát nước và một cho xử lý nước thải). Lý do.

7. Tình hình hiện tại về thông tin ngân sách đối với việc vận hành, bảo trì hệ thống thoát nước và xử lý nước thải. Có tồn tại vấn đề tài chính nào không? Biện pháp giải quyết là gì?
8. Dân cư địa phương hiện có chi trả cho công tác thoát nước và xử lý nước thải không? Tình hình được xem là hợp lý vào lúc này hay cần phải cải thiện? Lý do.

C. THAM GIA CỦA ỦY BAN VÀ NHÂN DÂN ĐỊA PHƯƠNG VÀO CÔNG TÁC VẬN HÀNH VÀ BẢO TRÌ

1. Ủy ban địa phương (UBND Quận/Phường/Khóm) hiện quan tâm đến công tác thoát nước và xử lý nước thải hay không? Lý do và tiến trình.
2. Dân cư địa phương (Khóm/Tổ) hiện quan tâm đến việc vận hành và bảo trì hệ thống thoát nước và xử lý nước thải không? Lý do và tiến trình.
3. Có tiện lợi để làm cho ủy ban và dân cư địa phương quan tâm đến việc vận hành và bảo trì trong thời gian sắp tới không? Lý do và tiến trình.

D. TIẾN TRÌNH CÔNG TÁC QUẢN LÝ VÀ VẬN HÀNH BẢO TRÌ

1. Nguyên tắc căn bản trong công tác quản lý hệ thống thoát nước và xử lý nước thải?
2. Thủ tục ngân sách, tiến trình đã được phê chuẩn và kiểm soát việc thực hiện.
3. Phần tài chính do dân địa phương đóng góp có được xem như là nguyên tắc căn bản trong việc quản lý hệ thống thoát nước và xử lý nước thải không?
4. Tiến trình để được chính quyền phân phối tài chính hàng năm và việc kiểm soát ngân sách từ chính quyền.
5. Thủ tục chọn lựa nhân sự. Hệ thống kiểm soát việc thực hiện công việc của họ.
6. Công việc hàng ngày trong quản lý và vận hành, bảo trì. Các vấn đề và người chịu trách nhiệm.
7. Có hệ thống kiểm toán của tổ chức để trông coi giám sát vấn đề tài chính không?
8. Tiến trình công việc vận hành thoát nước và xử lý nước thải hàng ngày.
9. Tiến trình công việc bảo trì hệ thống thoát nước và xử lý nước thải hàng ngày.
10. Có hợp lý khi gom việc quản lý và vận hành bảo trì hệ thống thoát nước và xử lý nước thải vào công ty cấp nước thành phố? Lý do. Làm cách nào để tiến hành?
11. Những vấn đề nào thuộc về địa phương cần được xem xét cẩn thận để thực hiện thành công việc quản lý và vận hành bảo trì hệ thống thoát nước và xử lý nước thải?

E. CÁC VẤN ĐỀ LIÊN QUAN

1. Giữa hệ thống thoát nước và xử lý nước thải trong khu vực thành phố HCM, công việc nào được ưu tiên hơn?
2. Giữa hệ thống thoát nước và xử lý nước thải, việc nào được ưu tiên cho cư dân địa phương ở thành phố HCM hơn?
3. Chính quyền địa phương và người dân trong khu vực thành phố HCM có thật sự quan tâm đến vệ sinh môi trường không? Biện pháp mà cả hai sử dụng để giải quyết vấn đề. Hiện nay, hệ thống giáo dục về môi trường được áp dụng không?
4. Đối với chính quyền địa phương và người dân trong khu vực thành phố HCM, loại hệ thống xử lý nước thải nào được xem như hợp lý cho cả hai bên?

5. Trong trường hợp hợp nhất việc quản lý và vận hành bảo trì hệ thống thoát nước và xử lý nước thải mới vào công ty cấp nước thành phố HCM, có thể thực hiện trôi chảy việc quản lý toàn bộ công ty mới không? Lý do.

Tổ chức đề xuất của anh, chị:

(Sơ đồ tổ chức)

Hệ thống quản lý đề xuất của anh, chị:

Ngân sách và hệ thống tài chính đề xuất của anh, chị:

Sự chọn lựa và số nhân viên đề xuất của anh, chị:

Đường lối công việc đề xuất của anh, chị:

Đối với hệ thống thoát nước:

Đối với xử lý nước thải:

Những hạng mục đề xuất khác:

PHIẾU DỮ KIẾN

Số:

QUẬN: _____

1. Tên công ty: _____

2. Năm thành lập: _____

3. Tổng số nhân viên: _____ người. Sơ đồ tổ chức _____

4. Chức năng: ① _____

② _____

③ _____

④ _____

⑤ _____

5. Số nhân viên vận hành duy tu cống, rãnh, kênh: _____ người.

6. Số lần làm cống/năm: _____ lần/năm.

Số tiền chi phí: _____ /năm.

Chiều dài cống: _____ m.

Số hầm ga: _____ cái.

7. Chiều dài rãnh kênh: _____ m.

Số lần làm: _____ /năm.

Chi phí: _____

8. Vấn đề khi vận hành duy tu cống:

① _____

② _____

③ _____

9. Vấn đề khi vận hành duy tu rãnh, kênh:

① _____

② _____

③ _____

10. Các vấn đề khác:

① _____

② _____

③ _____

Ngày tháng năm

Attached Material 2

The answers from the HCMC Association of Urban Drainage and Sewerage *

Ref: Questionnaire from the Project Management Unit of the Study on Urban Drainage and Sewerage System for Ho Chi Minh City (JICA)

(Aspect : O/M)

(Subject Questionnaire on O/M Aspect enclosed with Official Letter No...../CV dated September 6, 1999)

I. General

1. In general, the existing conditions of drainage and sewerage systems in HCM City are out of mode, ununified, and could not meet social demands.

HCM City and other cities in Vietnam are found in the same situation. The management level in some cities, however, is rather better.
2. The task for improving the existing conditions of drainage and sewerage systems in HCM City and other cities in Vietnam is considered urgent. The first thing is to formulate the master plan for urban drainage improvement and to develop step-by-step the investment program in accordance with the master plan.
3. The present working system for urban drainage for HCM City is mainly based on the maintenance works of the existing drainage system following the initial drainage process without the application of any sophisticated drainage techniques. Therefore, the operation effectiveness is observed very low. In other cities the situation is almost similar to HCM City. Modern drainage technology, however, is applied much more in Hanoi and Hai Phong.
4. The drainage system of HCM City is not unified. Operation effectiveness is rather low. Wastewater treatment is partially conducted in some enterprises, hospitals or in households through septic tanks. In principle, the drainage of wastewater is controlled by the owners of the premises. The effluent source is only checked by the Environmental Committee when having environmental accidents or local people's complaints.
5. The situation and conditions of drainage and sewerage treatment in other cities are found similar to HCM City. Drainage fee is presently collected in Ha Noi and Hai Phong. This offers a stable condition for the investment program in drainage.
6. For the combined sewer system, it is recommended to continue the utilization of septic tanks at households as at now. For the drainage systems presently operating separately, it is recommended to connect their systems to the city sewer system in order to limit the environmental pollution in surrounding areas.

7. Wastewater must be treated before discharging into channels/canals in accordance with the regulations of Environmental Protection Law.
8. In all cities of categories 1 and 2, the organizations operating on drainage are existing. Ha Noi and HCM City, however, have their separate urban drainage companies. In other cities, the drainage organizations are found either joined with their local water supply organizations or with the local urban environmental organizations (for collecting and treating garbage).
9. In all cities of categories 1, 2 and 3, the implementation of drainage system and wastewater treatment system is considered necessary. Ha Noi, HCM City, Hai Phong, Da Nang, Ha Long, Hue, Bien Hoa, and Thu Dau Mot. need to be given priority to having separate drainage system and wastewater treatment system. Although Thu Dau Mot is a city of category 3, but it is located on the water source of water supply for HCM City. Therefore wastewater should be treated before discharging into this water body (Dong Nai River).
10. The existing urban drainage companies or companies for drainage and water supply are considered to be suitable for taking charge of the maintenance of drainage and wastewater treatment facilities.

II. Administration, budget and responsibilities for operation and maintenance

1. Formely there was a Hanoi Drainage Company established in Hanoi before the establishment of WASEENCO. And before the establishment of WASECO in HCM city, there was another Urban Drainage Company in this city. WASECO of HCM City is a drainage, water supply and construction company for the Southern region. The activities of WASECO are mostly depended on investment owners' contracts. So far these contracts are mainly to construct and supply materials and equipment for water supply systems. WASECO, therefore, does not manage drainage and water supply systems, so that WASECO is hardly to become an investment owner of drainage and water supply projects.
2. The present Urban Drainage Company is responsible for managing and operating the drainage system of HCM City. The operation duration of this Urban Drainage Company is almost 20 years (before 1980, the former Urban Drainage Company is called Urban Drainage and Lighting Company). Urban Drainage Company has five (5) divisions and units and six (6) enterprises under its management as follow:
 - Administration Division
 - Financial Statistical Division
 - Technical and Planning Division
 - Management Unit for works
 - Drainage Inspection Team
 - Consultant – Design – Survey Enterprise

- Drainage Enterprises No. 1, 2, 3, 4, 5 are responsible for operating drainage system to be divided by zone.

Urban Drainage Company is under the management of Department of Transportation and Public Works. This Department has a drainage and water supply division and management unit for projects and works (these officials earning salaries from State). The division and unit conduct speciality supervision and check and volume of maintaining drainage and water supply system by period.

Besides, Districts have transportation and public works enterprises. These enterprises have drainage teams responsible for the O/M of the sewer systems of Grade 3 and 4 (according to managing assignment for roads and alleys) located in their district areas. These enterprises are under the management of District People's Committees.

The administration and organization system mentioned above is found lack of coordination in works and, therefore, causing a low operation effectiveness.

3. Existing combined sewer system need to be improved and expanded in accordance with State standards, rearranging operation process and determining suitable organization.
4. Wastewater treatment situation of HCM City mentioned above (item 4 of part I). The urgent matters for wastewater treatment is to treat wastewater partially at works and factories that have high pollution and toxic levels, at residential areas located near water sources supplying for HCM City (such as Districts Thu Duc, 2, 9, Binh Thanh, 12...). In new areas for city water supply, it is essential to construct newly the sewerage system separated from the storm water drainage system.
5. For inhabitants living along channels/canals, they must be relocated/resettled to other sites or buildings outside of the clearance boundary. It is necessary to apply the policy for selling houses by installments.
6. In the actual situation and conditions of HCM City, in order to make a company for undertaking both drainage and wastewater treatment tasks, this company should have drainage and sewage units (treatment plants)..
7. At present the annual maintenance cost for existing combined sewer system is approximately VND 25 billion and the construction cost for new drainage sewers is about VND 20 billion. Cost allocations are from the State budget. Meanwhile, the cost for wastewater treatment is covered by the expenses from the premise owners. The allocation of annual budgets is not stable and often insufficient. Proposed countermeasure is to collect the drainage fee from inhabitants.
8. Drainage fee has not been collected so far. On the aspect of sewerage treatment, local people only pay for their own facilities such as the construction cost of their septic tanks. Therefore, the urgent matter to do now is to collect the drainage fee. The reason for

implementing this matter is that the Resolution from the Government and Ministries on the collection of drainage fee was issued.

III. Participation of Local People's Committees and local people in O/M Works

1. Local People's Committees (Districts, Wards and Communes) have especially paid strong attentions to the matter of drainage and wastewater treatment because it directly influences on their people's life. The process for conducting this matter is as follow:

People's Committees of Wards or Communes will send proposals to their District PCs. PCs of Districts will formulate the implementation plans if the proposals are in their responsibilities and, if not in their responsibilities, districts will transfer the proposals to Department of Transportation and Public Works for inquiring actions. The Department of Planning and Investment will synthesize all concerned plans and submit them to HCM City PCs annually for resolution's).

2. Local inhabitants (in each district block) have paid concerns on the O/M works of the drainage and sewage system when they faced with problems concerning the system. They will inquire the concerning organizations to solve the problems or submit their complaints to their local administration.
3. In the coming period, it is necessary to promote the Local PCs and inhabitants paying more attentions to the O/M of the drainage system. The local concern on this matter will enhance and facilitate the management and development of the drainage system. The process is to make the local inhabitants understanding the matter of drainage and sewage. Based on this development, the local PCs will formulate local plans, professional units will adjust the plans with the allocated budgets or collected fees to submit to PC of HCM City for approval.

V. Procedure of O/M management

1. The fundamental principle in management of urban drainage and wastewater treatment is to be based on the Master Plan of urban drainage and to follow the processes for operating the drainage and wastewater treatment systems
2. Budget formalities: Based on corresponding budgeting plans, implementation will be done for approved cases. In case of new works, the plan designs and cost estimates will be evaluated. In case of rehabilitation works, the unit prices will be evaluated, and works will be checked. through the supervision and reception processes.
3. At present, the financial contribution by local people for the management of drainage and wastewater treatment system is not considered as the fundamental principle.
4. The annual budget allocation process from the governmental side is to follow the annual plans (as presented in part III). After the reception formalities of the works, the Department

of Finance will make the disbursement to the contracted enterprise in accordance with the documents of work controls from the Committee of Work Control or, in case of investment project, the Project Management Unit.

5. Regarding the formality for positioning the management staff: Director of UDC is appointed by HCM City People's Committee in accordance with the recommendation from the Department of Transportation and Public Works (DTPW). Deputy Director of UDC and Directors of enterprises under UDC are appointed by DTPW in accordance with proposal of UDC. Deputy Directors of these enterprises are appointed by UDC.

Directors of Public Service Enterprises of Districts are appointed by the corresponding District People's Committees.

6. Daily maintenance and operation is conducted according to weekly plan and daily plan is assigned for teams and groups. Team leaders and group leaders are responsible for daily plan.
7. The Technical and Planning Division and the Financial Statistical Accounting Division of UDC perform the works of financial controls in UDC.
8. Operation process of O/M works is based on daily and weekly plans assigned to each work team. The person responsible for daily works is the leader of the work team.
9. Daily works for the maintenance of drainage system have been carried out in accordance with plans presented in item 6 of part IV.
10. The Integration of the services for urban drainage and sewage treatment into the Water Supply Company for unifying the management and O/M at the moment is considered improper. The reason lays in the loose inter-relation between these two parties in their present business activities. They both have responsibilities for the natural water source. In future, the units of water supply, urban drainage and wastewater treatment will be able to work together in a same company like a General Corporation for Water Supply and Drainage Sewage. The first reason is from the gradual increase in their relations such as economic relations (collecting drainage and wastewater treatment fees by water meters) and technical relations. Another reason is from the lack of water sources, the higher demands from users and the similarity in technologies for water supply and drainage. The proposal for setting up a General Company for Water Supply and Drainage Sewage is proposed by Asian Development Bank (ADB) through GKW Consultant Company (German) in the Master Plan Study for Water Supply and Drainage financed by ADB in 1997.
11. In order to perform successfully the management and operation of the drainage and wastewater treatment system, local authorities need to consider carefully the following matters:

- Master plan of drainage and wastewater treatment
- Master plan of water supply
- Collection of drainage and wastewater treatment fees
- Priority to improve and to construct the drainage system
- Step-by-step development of the sewerage system in accordance with the conditions of water supply and overall situation of technical infrastructure in HCM City

V. Related matters

1. At the moment, between the two (2) matters of urban drainage and sewerage treatment in HCM city, the matter of urban drainage is given a higher priority.
2. Concerning the priority between drainage system and wastewater treatment system in each area (District, Ward and Town), the priority is depending on its local characteristics.
3. Local Authorities and people of HCM City have paid concerns on the environmental matter. City people are taking part in local environmental activities organized by environmental organizations, expressing their opinions, submitting complaints on environmental pollution problems, investing in public environmental protection works, and organizing the local environmental groups. Concerning the Local Authorities, their investments in large-scale environmental protection works; check and control the environment; resolve environmental pollution complaints; mobilize public environmental works and environmental protection movements through their budget allocations. The environmental education is applied but not in scale.
4. At present, the septic tank system is the wastewater treatment system accepted by the Government and local inhabitants. People have no proper awareness about other wastewater treatment systems.
5. In case of integrating the management and O/M of the drainage and wastewater treatment system into the Water Supply Company, the integrated management can be obtained in the new company, but, at the same time, a proper organization should be proposed, preparation time and training will be needed, and a suitable financial mechanism should be established accordingly.

Proposed organization: Organization of the Association of Companies and Organizations for water supply and drainage companies (including wastewater treatment), which should have representatives of Authorities and consumers. The organization chart is arranged by an order: Board of Directors, Executive Board and Members from Companies/ Professional Organizations.

Proposed management system: There will be two management systems. State management system is operated in accordance with regulations of State. Association management system is operated in accordance with regulations of the Association.

Proposed financial system and budget: There are three financial sources: State budget, people's shares and private capital.

Selection of the Proposed staff: Staff of the enterprises and professional units will be decided by themselves with references of advices from the Executive Board. For the Executive Board, members will be decided by the Director Board. For the Director Board, the members will be elected by the General Assembly of the Association.

Proposed tasks:

- **For drainage system:** Based on the collected fees, the technology (including O/M techniques) to be applied will be determined. Costs for new constructions will be allocated from state budget or from soft loans from banks.
- **For wastewater treatment:** The proper technology will be determined, using a part of the collected drainage fees and proposing budget allocation for the deficit from total O/M cost. Costs for new constructions will be allocated from state budget or from soft loans from banks.

Other proposed items: The related master plan and investment plan for the target year of 2020 are needed at first and these items will be readjusted after every five years .

THE STUDY ON URBAN DRAINAGE AND SEWERAGE SYSTEM FOR HO CHI
MINH CITY IN THE SOCIALIST REPUBLIC OF VIETNAM

JICA Study Team

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Fax No. 001-84-8-930052

Date: 9 September 1999

Dr. Ngo Hoang Van

President

HoChiMinh City Water Supply and Sewerage Association

28 Le Quy Don Q 3 TpHCM

Dear Dr. Van:

Subject: Your reply letter of 6 September 1999 No. 14/CV

We acknowledged receipt of your letter dated 6 September 1999 with the reply to our inquiries about the present situation and activities in urban drainage and sewerage development in HCMC.

As per your reply, we recognized the necessity of urban drainage improvement in this city for basically stabilizing the socio-economic conditions of local inhabitants.

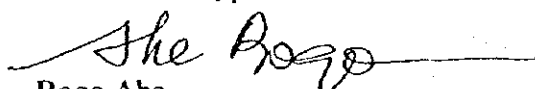
However, through our field studies, we have learned also that the septic tank system is not working well. About one half of the installed septic tanks were malconstructed, presently causing leakage of the tank liquid into the beneath soil and groundwater. Besides, regular desludging works have not been carried out for most installed septic tanks that would permit the equivalent black water presently flowing into the city sewer network for finally drained out into the surrounding water bodies.

This situation is considered harmful to the present living environment because many people are using these water sources, and some places in the city still having the defected piping works of city drinking water.

From this situation, we think that the implementation of sewage treatment is also important and urgent. Your observation on this matter, therefore, will be very appreciated.

With our thanks and best regards, we remain.

Yours sincerely,



Bogo Abe,

Member of JICA Study Team

Attached Material 3

Operation and Maintenance for Sewerage System

The main contents of operation and maintenance for sewerage system are shown below:

- (1) General affairs
- (2) Execution of budget
- (3) Control of property
- (4) Notification of service schedule, etc.
- (5) Collection of the sewerage charge, etc.
- (6) Guidance of drainage equipment, etc.
- (7) Observation and direction of industrial wastewater
- (8) Maintenance of sewer facilities
- (9) Maintenance of drainage channel
- (10) Maintenance of pumping station and sewage treatment plants
- (11) Water quality management
- (12) Adjustment of ledger for sewer management
- (13) Prevention of environment
- (14) Others

Details are described in the table below:

Classification	Main works
1. General affairs	Enactment of drainage ordinance, General affairs, Human affairs, Salary, Budget, Closing of amounts, Accounting, Welfare, Public relations; Additionally
2. Execution of budget	Purchase and control of materials (fuel, chemicals, articles of consumption) Conduct contract
3. Control of property	Control of capital assets (property control etc.)
4. Notification of service	Notification, reading, specification of drainage channel controlled by municipality
5. Collection of sewerage charge, etc.	Investigation of user, decision of sewerage charge (The recognition of the discharge wastewater volume), collection of the sewerage charge, the investigation of a deferred charge
6. Guidance of drain equipment, etc.	<ol style="list-style-type: none"> (1) Installation guidance and inspection of drain equipment and lavatory of washing. (2) Specification of construction shop. (3) Promotion of specification construction shop. (4) Subsidy for lavatory remodeling cost etc. (5) Commencement of usage of public sewer.
7. Observation and direction of industrial wastewater	<ol style="list-style-type: none"> (1) Installation of individual specific treatment facility, improvement guidance. (2) Examination of specific facilities installation report etc. (3) Financing relation to individual specific facility installation. (4) Maintenance, control guidance of individual specific facilities.

	<ul style="list-style-type: none"> (5) Inspection of factory regarding water quality. (6) Inspection of individual specific facilities (including water quality analysis). (7) Report on utilization of public sewer service
8. Maintenance of sewer facilities	<ul style="list-style-type: none"> (1) Investigation, design, construction and supervision. (2) Plan, design, executes and supervision of cleaning and dredging of sewer. (3) Plan, design, construction, and supervision of repair and improvement. (4) Protection of sewer facilities
9. Maintenance of drainage channels	<ul style="list-style-type: none"> (1) Investigation, designs, construction and supervision. (2) Plan, designs, executes and supervision of cleaning and dredging of channels. (3) Plan, design, construction, and supervision of repair and improvement. (4) Protection and defense of city drainage channels.
10. Maintenance of pumping stations and sewage treatment facilities.	<ul style="list-style-type: none"> (1) Establish water and sludge treatment plan. (2) Operating plan of pump station and sewage treatment facilities. (3) Plan of pump station and sewage treatment facilities operation control, design, supervision, and execution. (4) Disposal plan, plan, design, supervision, executions of grit, screen's dregs, sludge cake (5) Design, supervisor, and execution of cleaning work and control of building and plant a tree etc. (6) Record and arrangement (various diaries, monthly reports, and annual reports) of pump station and sewage treatment facilities operation' control.
10-1 Operation	<p>Execution of instruction and operation in emergency in abnormal circumstances.</p>
10-2 Maintenance and check	<ul style="list-style-type: none"> (1) Maintenance and check plans, and plan of points of machine and electric equipment of pumps and sewage treatment facilities. (2) Maintenance and check, design, and supervisor of machine and electric equipment of pumps and sewage treatment facilities. (3) Making and execution of plan of maintenance and check business of machine and electric equipment of pump station and sewage treatment facilities.
10-3 Replacement and improvement	<ul style="list-style-type: none"> (1) Making plan of mending construction, design, supervisor, and execution

11. Water quality management	<ul style="list-style-type: none"> (1) Making of plans of water quality examination, investigation, and research, etc. (2) Execution of water quality examination and activated sludge examination. (3) Execution of revitalization dirt examination. (4) Execution of factory drain examination. (5) Execution of investigation and research. (6) Execution of temporary examination. (7) Arrangement of data, and analysis, making of report. (8) Making of operation control indicator. (9) Correspondence in abnormal circumstances. (10) Adjustment of water quality measurement machine (11) Execution of entry inspection (environmental department) cross-checking.
12. Adjustment of ledger for sewer management	<ul style="list-style-type: none"> (1) Making and keeping of ledger. (2) Correction and inspection of ledger. (3) Management of drawing and books (general plan, running through level chart, drain district chart, electrical system chart, and piping system chart, etc.
13. Prevention of environment	<ul style="list-style-type: none"> (1) Plan of plan concerning water quality measurement of discharge river. (2) Execution of water quality measurement of discharge river.
14. Others	<ul style="list-style-type: none"> (1) Report to supervisor government office etc. (2) Situation grasp and improvement of safety and hygiene control. (3) Permission such as private use. (4) Limitation of act and approval of construction other than manager, etc. (5) Attendance of another enterprise construction. (6) Investigation and research on drainage. (7) Guide of visitors. (8) Spread and enlightenment activity. (9) Others.

Attached Material 4

Actual O/M Expenses for Urban Drainage and Sewerage

1. Actual O/M Expenses for Urban Drainage and Sewage Treatment in HCMC

At present, the annual O/M expenses and budgeting systems for urban drainage and sewerage treatment for the whole area of HCMC are summarized as follows:

Section	Work Item	Organization in-charge	Annual O/M Expenses	Budget Source	Annual Maintenance Volume/Distance
Drainage	Waterways (Grade 1)	OWM	10 billion VND	PC-HCMC	100km of 736km
	Sewers 2	UDC	30 billion VND	----	0 of 234km UDC
	Sewers 3			----	50% of 100km
	Sewers 4 Inner canals	District	30 billion VND	----	90% of 415km 0 of all canals
Sub-total			70 billion VND		
Sewerage	Govern. Office	Citenco	1 billion VND	Governn't	1 mil. m ³
	Individ'l House	Private Co	30 billion VND	Individuals	for 150,000 units
Sub-total			31 billion VND		
TOTAL			101 billion VND		

Sources: OWM, UDC, District Public Service Enterprises and Septic Tank Treatment Co.

At present, the annual O/M expenses for the whole area of HCMC in urban drainage and sewerage treatment are estimated at 101 billion VND, where 31 billion VND (or 30%) have been used for sewerage (septic tanks) treatment and 70 billion VND (or 70%) for urban drainage

2. Estimation of Actual O/M Expenses in the Study Area:

As for the Study Area, the annual O/M expenses and budgeting systems for urban drainage and sewerage treatment are calculated as follows:

- (1) For the waterways controlled by OWM, some are excluded from the Study Area, but all canals of OWM presently subjected to dredging are found in the Study Area. This means the figure on aforementioned expenses for this part will be similar for the Study Area.
- (2) In the Study Area, the sewer demarkation shows that the sewers controlled by UDC (Grade 2 and 3) are at about 516 km or 97 % of all HCMC areas (530 km) and the sewers controlled by Districts (Grade 4) are at about 415.5 km or 92 % of all HCMC areas (450 km). This means that the present O.M. costs for these items in the Study Area will be calculated proportionally with these

percentages.

- (3) For the aspect of sewerage treatment, as 10% of the population and households of HCMC are excluded from the Study area, the quantities subjected to the sewage treatment are roughly considered as 90 % of the corresponding figures mentioned in the above.

The present O.M. expenses for urban drainage and sewage treatment in the Study Area, therefore, are estimated as follows:

Section	Work Item	Organization in-charge	Annual OM Expenses	Budget Source	Remark
Drainage	Waterways (Grade 1)	OWM	10 billion VND	PC-HCMC	As 100%
	Sewers 2&3	UDC	0 billion VND	----	As 97%
	Sewers 4	Districts	29 billion VND	----	As 92%
	Inner canal		28 billion VND	----	
Sub-total			0 billion VND		
Sewage	Gover Offices	Citeneo	67 billion VND		
	Indivi.Houses	Priv.Co.	0.9 billion VND	Individuals	As 90%
Sub-total			27 billion VND		As 90%
TOTAL			28 billion VND		
			95 billion VND		

At present, the annual O/M expenses in the Study Area for urban drainage and sewage treatment are estimated at 95 billion VND where 28 billion VND (or 29.5 %) have been used for sewage treatment and 67 billion VND (or 70.5%) for urban drainage.

3. Estimation of Actual O/M Expenses in the Priority Project

Firstly, from the demarkation of sewers in the district areas covered in the Priority Project area, the corresponding lengths of sewers are calculated as follows:

District	Area (ha)	Sewer 2&3(m)	Sewer 4 (m)	In F/S area (ha)	% in Distr.	Est. Sewer 2&3 (m)	Est. sewer 4 (m)	Remarks
D.1	760	79,246	23,450	565	75	95,130m	22,702	Estimates based on percents of covered areas
D.3	480	58,208	40,780	51.8	11	for Ben	14,679	
D.5	410	30,514	23,330	410	100	Nghe -	33,342	
D.6	700	34,561	47,880	157	22	Saigon	29,064	
D.4	400	19,540	39,430	354.1	90	164,393m	42,974	
D.8	1,880	21,190	39,730	744.1	40	for DoiTe.	56,753	
D.10	570	67,470	38,140	288.9	51		26,049	
D.11	500	34,549	3,430	181.1	36		33,289	
D.Tan Bin	3,850	59,895	59,090	117.7	3			
	9,550	405,173	315,260	2869.7	30	236,820 m	258,853	

The total length of sewers of Grade 2 and 3 controlled by UDC in the Priority Project Area is 236.82 km or 44.7 % of 530 km for the whole HCMC. And the total length of Grade 4 sewers controlled by Districts in the Priority Project is 258.85 km or 57.5 % of 450 km for the whole HCMC.. The O/M expenses for these sewers, therefore, are calculated on this basis.

As for the aspect of sewage treatment in the Priority Project area, the subjected population of 1.5 million inhabitants is 1/3 of the population of the Study Area (4.5 million inhabitants). The present expenses for this aspect, therefore, are roughly calculated as 1/3 for the expenses in the Study Area.

The actual expenses for O/M in the F/S Area, therefore, are estimated as follows:

Section	Work Item	Carried out by	Annual OM Expenses	Budget Source	Remarks
Drainage	Waterways	OWM	5 billion VND	PC-HCMC	As 50 % *
	Canals (1)			----	No works
	Sewers 2&3	UDC	13.4 billion VND	----	As 44.7 %*
	Sewers 4	Districts	17.3 billion VND	----	As 55.5 %*
Sub-total			35.7 billion VND	PC-HCMC	
Sewage	Govern't Office	Citenco	0.3 billion VND	Government	As 1/3 **
	Individ'l House	Priv.Co.	27 billion VND	Individuals	As 1/3 **
Sub-total			27.3 billion VND	Both sides	
TOTAL			63 billion VND	Both sides	

Notes : * of the total actual expenses for all HCMC

** of the actual expenses for the Study Area

At present, the annual O/M expenses for urban drainage and sewage treatment in the F/S Area are estimated at 63 billion VND where 27.3 billion VND (or 43%) have been used for sewage treatment and 35.7 billion VND (or 57%) for urban drainage.

Attached Material 5

Required Chemicals and Power for Sewerage Treatment

1. List of Required Chemicals for Sewerage Treatment

Chemicals	Phase 1	Phase 2
1. Polymer	29,143 kg of sludge solid x 1%: 241.4 kg/day	110,114kg of sludge solid x 1% 1,101 kg/day
2. Chlorine	3 mg/l x 141,000 m ³ /d = 423 kg/d	3 mg/l x 512,000 m ³ /d = 1,536 kg/d
3. Detergent	1g/l x 50 m ³ = 50 kg/day	1g/l x 125 m ³ = 125kg/day

2. List of Power Requirement for Sewerage Treatment

Phase 1

Item	PHASE 1				
	Equipment	Quant'y	Power/Unit	Re'd Power	Remark
Pumping Station	1. Bucket Crane	1	33.2 kw	33.2	
	2. Lifting Pump	2	400	800	
	3. Pit disch. Pump	2	22	44	
	4. Lighting	set		50	
	5. Office equipment	set		22.8	
	Sub Total 1:			950 kwh	
Treatment Plant	1. Lifting Pump	2 (1)	400	800	
	2. Pit disc. Pump	1 (1)	22	22	
	3. Sludge Pump	3 (1)	3.7	11	
	4. Blower	1 (1)	800	800	
	5. Sld. Return Pump	8 (1)	45	360	
	6. Excess Sld. Pump	3 (1)	3.7	11	
	7. Mixer	2 (0)	5.5	11	
	8. Sld. Thickn. Pump	1 (1)	30	30	
	9. Sld. Withdr. Pump	1 (1)	11	11	
	10. Drainage Pump	2 (1)	1.5	3	
	11. Sld. Feedg. Pump	5 (1)	3.7	18.5	
	12. PE Feedg. Pump	5 (1)	3.7	18.5	
	13. Mixer	1 (0)	5.5	5.5	
	14. Belt press Pump	1 (1)	15	15	
	15. Antifoam. Pump	1 (1)	45	45	
	16. Sandfilter Pump	1 (1)	37	37	
	17. Water sup. Pump	1 (1)	55	55	
	18. Backwash. Pump	1 (1)	30	30	
	19. Backwaste Pump	1 (1)	11	11	
	20. Dewater. Fan 1	1 (1)	0.4	0.4	
	21. Dewater. Fan 2	1 (1)	1.5	1.5	
	22. Bldg. Load	1 set		120	
	23. Central Control	1 set		40	
	24. Outdoor Lightg	1 set		60	

	25.Standby _____	1 set		50	
	Sub-total 2			2,566.4 kw	
	Total			3,516.4 kw	

Phase 2

Item	PHASE 2				
	Equipment	Quant'y	Power/Unit	Re'd Power	Remark
Pumping Station	1.Bucket Crane	1	33.2 kw	33.2	
	2.Lifting Pump	4	400	1600	
	3.Pit disch.Pump	2	22	44	
	4.Lighting	set		50	
	5.Office equipment	set		22.8	
	Sub Total 1 :			1,750kwh	
Treatment Plant	1.Lifting Pump	4 (1)	400	1,600 kw	
	2.Pit disc.Pump	1 (1)	22	22	
	3.Sludge Pump	12 (12)	3.7	44.5	
	4.Blower	4 (1)	800	3,200	
	5.Sld.Return Pump	24 (12)	45	1,080	
	6.Excess Sld.Pump	12 (12)	3.7	44.5	
	7.Mixer	1 (0)	5.5	5.5	
	8.Sld.Thickn.Pump	1 (1)	7.5	7.5	
	9.Sld.Withdr.Pump	2 (2)	11	22	
	10.Drainage Pump	2 (1)	1.5	3	
	11.Mixer	1 (0)	7.5	7.5	
	12.Sld.Feedg.Pump	3 (1)	30	90	
	13.PE Feedg.Pump	3 (1)	3.7	11	
	14.Mixer (sludge)	2 (0)	5.5	11	
	15.Mixer (decanter)	1 (0)	5.5	5.5	
	16.Liq'd ret'rn pum	1 (1)	15	15	
	17.Belt press Pump	18 (1)	3.7	67	
	18.PE Feedg.Pump	18 (1)	3.7	67	
	19.Mixer(stor.tank)	1 (0)	5.5	5.5	
	20.Beltpr.Ret'rn P.	1 (1)	15	15	
	21.Antifoam.Pump	2 (1)	110	220	
	22.Sandfilter Pump	3 (1)	37	111	
	23.Water sup.Pump	3 (1)	55	165	
	24.Backwash.Pump	1 (1)	30	30	
	25.BackwastePump	1 (1)	11	11	
	26.Dewater.Fan 1	1 (1)	0.4	0.4	
	27.Dewater.Fan 2	1 (1)	3.7	3.7	
	28.Bldg.Load			320	
	29.Central Control			90	
	30.Outdoor Lightg			270	
	31.Standby			420	
	Sub Total 2			7,964.6kw	
	Total			9,714.6kw	

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***APPENDIX H ENVIRONMENTAL
IMPACT ASSESMENT***

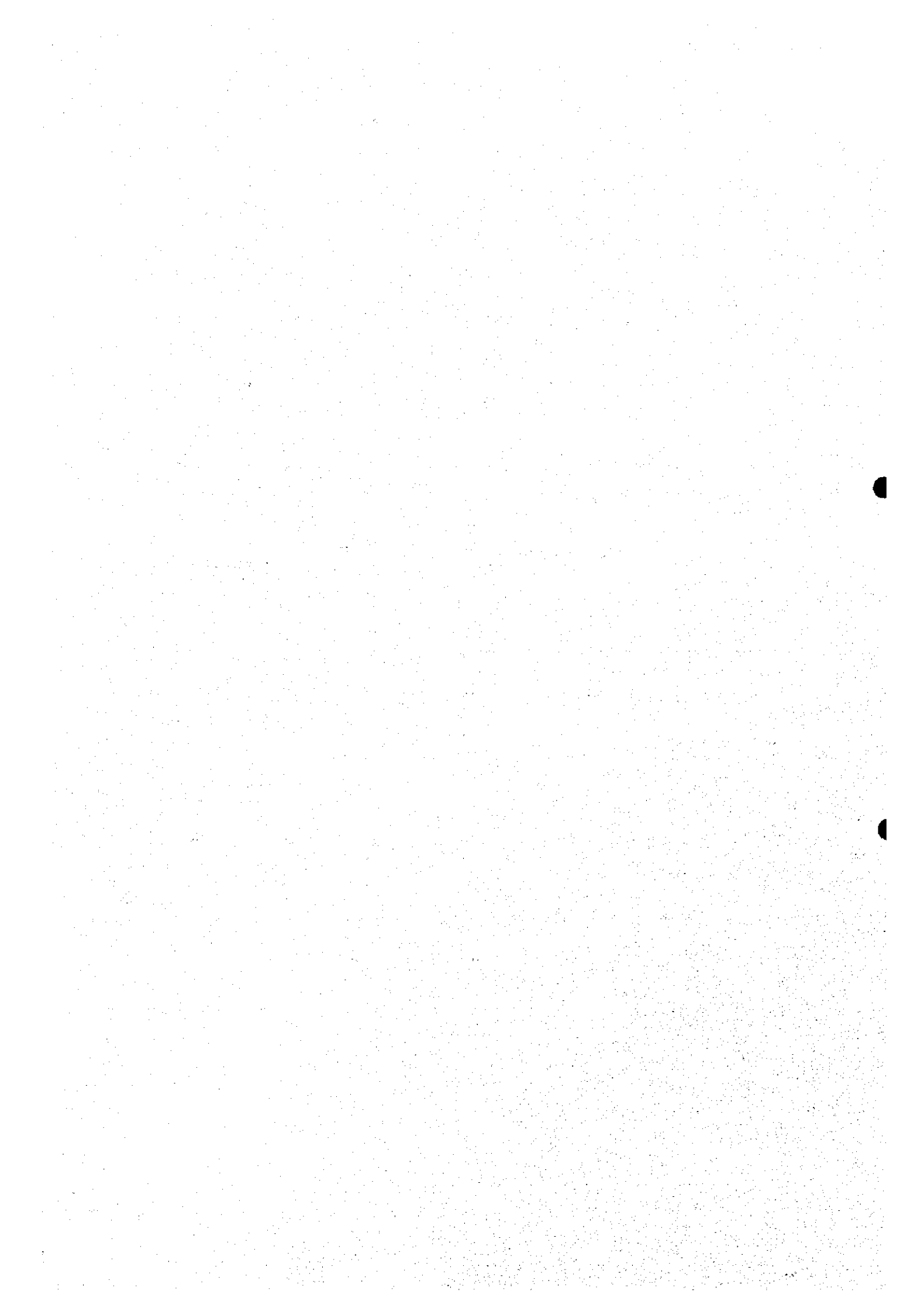


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APPENDIX II ENVIRONMENTAL IMPACT ASSESSMENT

1. Introduction

Fig. II.1 shows the steps in environmental impact assessment for this study. Since, this study consists of formulation of Master plan for Urban Drainage and Sewerage System for Ho Chi Minh City and the Feasibility Study on Tau Hu Ben Nghe Doi Te project, the environmental assessment is carried out in three steps as mentioned below:

- Step 1 Initial Environmental Examination (IEE) and Preparation of Terms of Reference (TOR) for Environmental Impact Assessment Survey for the Priority Project, Tau Hu Ben Nghe Doi Te Project.
- Step 2 Execution of Environmental Surveys on Tau Hu Ben Nghe Doi Te Project, and
- Step 3 Environmental Impact Assessment (EIA) on the Tau Hu Ben Nghe Doi Te Project.

At Master Plan Stage, Initial Environmental Examination (IEE) was conducted for the priority project to identify major environmental issues, which could be of concern. Table H.1 briefly explains IEE. TOR for EIA was prepared to examine those issues in detail as per requirements of Vietnamese Laws. EIA was carried out from August – September 1999 and details are reported in Report “Environmental Impact Assessment” prepared by CENTEMA and approved by MOSTE. Brief summary of the report is presented in this chapter.

2. Environmental Legislation and Policies

2.1 Requirements for Environmental Impact Assessment

Environmental concerns and developments of environmental legislation and policies in Vietnam began in the early 1990s. The National Assembly of the Socialist Republic of Vietnam, at its 4th session of the IX Legislature, passed the Environmental Protection Law (EPL) on 27 December 1993. Subsequently the decree No. 175-CP was issued on the 18th October 1994 to provide guidance for the implementation of the Law on Environmental Protection. This specifies the requirements of an EIA at different stages of the project development. For the feasibility study, EIA report have to conduct with an outline to include specific chapters on project description, background information, impacts (on water, air, soil, biological, transportation, health, others), mitigation and conclusion.

The EIA report for the Feasibility project “Study on the Urban Drainage and Sewerage System for Tau Hu - Ben Nghe, Doi - Te Catchment” is made based the following legal foundations:

- Government Decree 175/CP issued on October 18, 1994 by the Government, in guidance on implementation of Environmental Protection Law;
- Introduction for guidelines on setting up and appraising the report of EIA to direct foreign investment projects (No. 1420/QD-Mtg);
- Decision of MOSTE minister on Promulgation of the regulation and organization of Appraisal Council on EIA and issuing environmental license (No. 1806/QD-Mtg);
- Regulation and organization of Appraisal Council on EIA report and issuing environmental license (No. 1807/QD-Mtg);
- Institution on guidance for preparation and appraisal of environmental impact assessment report for investment projects (No. 1100/TT-Mtg) and, other related regulations and laws.
- Regulation of Foreign Investment Law in Vietnam stipulated on November 12, 1996 (modified from 1987, 1990, 1992 version);
- Decree No 12/CP issued on February 18, 1997 by the Government, promulgating detailed regulations on implementation of Foreign Investment Law in Vietnam;
- Environmental Protection Law dated December 27, 1993 by the Parliament of the Socialist Republic of Vietnam;
- Decision No 490/1998/TT-BKHCHNMT issued on April 29, 1998 by Ministry of Science, Technology and Environment in guidance on making and appraisal of Environmental Impact Assessment report for investment projects;
- Regulation on carrying out the environmental impact assessment for the project;
- Regulation on the infrastructure execution for Ho Chi Minh city.

2.2 Approval Procedure for EIA

Approval of an EIA report is a requirement for obtaining the necessary permit to proceed with the proposed development or renovation activities. Violators of EIA requirements as stipulated in Article 50 of the Law shall be subjected to administrative or criminal prosecution depending on the nature and extent of the environmental consequence.

The approval of an EIA report shall constitute one of the bases for overseeing authorities to approve a project or authorize its implementation. In December 1994, the MOSTE issued a decision to establish evaluation councils for EIA and environmental licensing. At the national level, the evaluation council is an advisory body to MOSTE, while at the local level the evaluation council advises the chair of the People Committee of provinces or cities, which assists in considering scientific and technical issues related to environmental protection identified in the EPL.

According to the MOSTE's Circular No. 490/1988/TT-BKHCHNMT dated 29 April 1988, submission of an EIA report for approval to the state management agency for environmental protection is required. The circular specifies varying details of EIA report at three different stages namely during the request for investment permit, during the detailed design and construction, and prior to the project start up.

During the feasibility study of this project, it is required to submit the project documents, which contain a section or chapter, which presents brief potential environmental impacts from the project. The document must be submitted to the state management agency in charge of environmental protection for consideration, with onward submission to MOSTE for review and formal approval.

Upon receiving the project EIA, MOSTE shall seek the opinion from Ho Chi Minh City's DOSTE for consideration and grant decision on approval or shall seek further environmental mitigation measures within 60 days.

2.3 Environmental Standards and Regulations

MOSTE has issued various environmental standards. MOSTE also allows a project proponent to propose equivalent standards from other countries for MOSTE's approval and for use where local and national standards are not available, inadequate, not regulated, not applicable, and finally not enforceable.

For carrying out this project, the existing provincial and national policy and requirement on wastewater collection, treatment and safe disposal of effluent have been considered. The appropriateness of the following set of Vietnamese standards has been evaluated and an affordable level of treatment is being proposed for approval by Ho Chi Minh City DOSTE and MOSTE to maximize the health benefit to the people.

3. Organization, Participants and Implementation Method

The EIA report for "Study on the Urban Drainage and Sewerage System for Tau Hu - Ben Nghe, Doi - Te Catchment" has been made by Center for Environmental Technology and Management - CENTEMA, Van Lang University, Ho Chi Minh city with the participation of an expert group of high experience in establishing EIA report with specialization in: air pollution monitoring, wastewater pollution, noise, vibration, hazardous waste, environmental ecosystem, environmental economy.

The process of EIA report composition includes the following steps:

- Collecting necessary data and documents: environmental natural conditions, socio-economy, pre-feasibility report and several other documents related to the Project as well as to the construction area.
- Making survey on the status of environmental elements by standard methods, that include: socio-economic survey in considered area - 1st, 4th, 5th, 6th, 8th districts in Ho Chi Minh city; water and sludge quality survey at Tau Hu - Ben Nghe and Doi - Te canals, Ong Lon - Cay Kho canal; under ground quality survey at the project area; wastewater quality survey at sewerage outlets along both sides of canals; air and soil quality survey at the project area.

- Based on the result of the former steps, impact assessment of the Project on environmental, socio-economic factors has been carried out.
- Recommend general measures based on scientific and practical foundations to minimize and limit the negative impacts in order to protect the environment.
- Compose the EIA report and defend it in front of EIA report appraisal committee of Government grade or local grade according to recent regulation of Ministry of Science, Technology and Environment.

Participants

Ph.D.	NGUYEN TRUNG VIET	CENTEMA - Leader
Dr. Eng.	SANJAY ARORA	Pacific Consultants International - PCI
MSc.	HUYNH NGOC PHUONG MAI	CENTEMA - Environmental Technology
MSc.	PHAM THI ANH	CENTEMA - Air pollution and noise
ME.	TRAN THI MY DIEU	CENTEMA - Environmental Technology
BE.	HOANG QUOC HUNG	CENTEMA - Environmental Technology
BE.	NGUYEN KIM THANH	CENTEMA - Geography and Hydrology
BE.	HUYNH THU VAN	CENTEMA - Ecological science
BE.	TRAN PHUONG KHANH	CENTEMA - Social science

4. Description of Project

Major components of the project are urban drainage improvement and Sewerage Development. Urban Drainage improvement involves Tau Hu Ben Nghe canal improvement, Pump drainage improvement at Thanh Da, Ben Me Coc (1) and Ben Me Coc (2) and rehabilitation of 10 km of existing combined Sewer. Sewerage development involves construction of interceptor sewer, construction of conveyance sewer and lift pumping station and construction of wastewater treatment plant. Detailed description of project components is already described in previous chapters.

5. Significant Environmental Impact and Mitigation Measures

The proposed project will result in improvement of living environment, public health benefits and abatement of pollution to rivers and groundwater. Improper planning and engineering design and the use of inappropriate construction techniques/methods and equipments can be counterproductive and lead to serious negative short term and long term impacts. Potential and significant environmental impacts, both positive and negative are identified and assessed for

- a) the pre-construction stage,
- b) the construction stage, and
- c) operation stage.

Table H.2 shows the impact matrix for significant impacts and Table H.3 elaborates Mitigation Measures.

5.1 Pre Construction Stage

5.1.1 Impact

Project activity causing significant impact in this stage is Land Procurement for canal improvement works, WWTP, Pumping Stations, etc. Significant impact of this activity is in terms of relocating the people. More than 20,000 persons (about 3,125 households) are located along the banks of Tau Hu - Ben Nghe canal and at the site of treatment plant , pumping station.

Environmental problems will appear in relocation/resettlement process as follow:

- Policy and compensation cost for 3,125 households;
- Relocation and resettlement to new residential areas;
- Clearing and transferring construction area;
- Culture, social safety and order of new residential areas;
- Relocation/resettlement of inhabitants from slum houses locating in and along Tau Hu - Ben Nghe canal and Doi - Te canal to other sites might create new slum houses;
- Changing career and creating new job for relocates;

If problem of relocation is not properly mitigated it may jeopardize the project. In addition, Procurement of land will be essential for WWTP construction. Failure to procure land will have serious impact, because alternative locations for WWTP site are limited.

5.1.2 Mitigation Measure

For relocating people, new residential areas have to be planned with adequate job opportunity, so that resident can earn money by new jobs. It is also important to apply proper enforcement measures in order to avoid illegal relocating which can cause pollution in new areas. The compensation should be done only when people settle in new residential areas and sign agreement that they will not move to the other slums.

Other management measures are listed below:

- Minimization of relocation
- Consideration of socio-economic condition
- Consideration of inhabitants' needs and community involvement.
- Planning and management of relocation/resettlement

5.2 Construction Stage

Project activities causing significant impacts in this stage are as follows:

- Construction of sewers, pumping station, wastewater treatment plant
- Improvement of Tau Hu Ben Nghe Doi Te Canal

5.2.1 Impact

a) Water Environment

Process of dredging sediments from canals will result in mixing of pollutants with the water. The settled sediments include inorganic sludge, organic sludge, heavy metals and toxic compounds. Tau Hu Ben Nghe is already seriously polluted and not much negative impact is expected but Saigon river could be seriously affected if proper precautions are not taken. During construction of various facilities such as pumping station, treatment plant wastewater pumped from construction pit will be discharged into the existing drainage network or into canals. If discharged to drainage network, it may cause clogging of pipe and if discharged to water body, it may increase turbidity.

b) Air Environment

During the dredging, anaerobic sediments mix up with water and gases coming from anaerobic degradation dissolve into water and can cause foul odor. The construction will increase the transportation activities, which may cause environmental pollution due to gas and dust emitted from vehicles and construction equipment. Minor short-term negative impact is expected which can be mitigated by proper planning construction activities.

c) Soil Environment

During the construction, the following solid waste will be generated:

- About 5,000 m³ of house wrecks and solid waste from dismantling, destroying houses and works for clearance plan;
- About 1.2 X 10⁶ m³ of sediment from the dredging of Tau Hu-Ben Nghe canal and its related tributary canals;
- About 685,000 m³ (of which, 165,000 m³ in phase 1 and 520,000 m³ in phase 2) of surplus soil from construction of 42 km of interceptor route, 107 km of sewers, wastewater pumping station, 5.5 km of conveyance route;
- The amount of solid waste is discharged from workers working in construction sites (but the amount is not considerable).

The use of dredging sediments and spoil of the execution for land filling will give

benefits not only from environmental aspect but also from economical point of view, such as:

- Reduce transportation cost;
- Mitigate environmental problems;
- Reduce accidents on waterway;
- Prevent landslides;
- Natural resource conservation.

Besides, reuse of sediments for agricultural purposes can also be considered. However strict monitoring of Heavy metal content is necessary. Initial survey shows that concentration of heavy metals is below permissible standards of European countries and Japan.

d) **Human Living Quality**

Negative impacts on the human physical living environment are short term as mentioned below:

- Impacts on the public health due to noise, vibration and air emission from construction activities
- Impacts due to traffic congestion due to increased transportation activities.

Besides these negative impacts, prevention of flood, better employment opportunities for workers, improved environmental quality and better infrastructure for drainage and sewerage management are the positive impacts.

5.2.2 Mitigation Measures

a) **Water Environment**

During the dredging water pollution from sediments can be prevented using the following measures:

- Use of suck pump instead of shovel scurf should be investigated. However solid wastes existing in the sediments may block the suck pump system and pipes. If possible preference should be given to suck pump system.
- At favorable location with existing street, small width of canal etc. shovel surf can be employed to dredge the supernatant nearby the shore during low tide
- Closed container should be used to avoid the spilling of water on the street during transportation;
- The dredging should start as tide start going down in order to avoid the spilling and settling of sediments on the upstream;

The amount of water to be pumped out from construction pits during the execution

of sewerage, components of sewerage system, pumping station and wastewater treatment plant should be treated in big dikes to hold runoff and to settle out suspended solids before pumping into the receiving water.

b) Air Environment and Noise and Vibration

The major air pollutants emitted from construction activities are carbon monoxide (CO), gas, hydrocarbon and fugitive dust particles. These can be generated from construction equipment and transportation vehicles. CO is the only pollutant to be considered potentially hazardous to human health. Gaseous hydrocarbons and nitrogen oxides are not considered harmful at concentration found even in the most heavily trafficked urban area. Pollution can be mitigated by:

- Appropriate planning and scheduling of construction activities to minimize traffic diversion and congestion;
- Delivery of construction materials (raw materials, earth, spoils, concrete, etc.) should be done during off-peak hours to avoid traffic congestion.
- Low emission construction vehicles should be used whenever possible;
- Trucks carrying raw materials, earth, spoils that emit high fugitive dust should be covered while in motion;
- All the stationary equipment should be located as far away as practical from receptor locations to allow dispersion of emitted pollutants;
- Watering the area of execution to reduce the emission of dust.

These ought to apply especially in the areas of 5,840 m interceptor route construction and in the area construction of 6400 m conveyance route cross At Uh - Ben Ngh canals and diorite canals.

Organic matters of sediment that are stagnant for a long time at canal bottom in anaerobic condition generates foul odor. The adverse impacts from this pollution source can be treated using 1 liter of effective microorganism (EM) per 1000 kg of sediments. EM has applied for solid waste and wastewater successfully.

The following mitigation measures can be applied to mitigate noise and vibration pollution:

- Use special vehicles and construction equipment that emit low level of noise and vibration;
- Schedule construction so that the unavoidable vibration occurs during hours when occupancy of building is low;
- Restrict the use of high vibration construction equipment to very short operation hours per day;
- Minimize the use of many vibration and noise -causing pieces of equipment at any one time;

- Inform residents the expected duration of particular noise activities to minimize complaints.

c) Soil Environment

The big amount of spoil can cause land pollution and water quality degradation if it is inappropriate disposal. The disposal sites should be properly selected so they do not cause surface or ground water pollution. If it is dumped in agricultural region, a big area of 45 ha will be lost. Therefore, the reuse of excess spoil as the ground level material will give many benefits such as saving the fee of sand exploration, resources and environmental conservation, monitoring the traffic density of waterway. However, in order to apply in ground level purpose at right place and following the city planning, the project authorities should cooperate with other judicial organizations before implementing.

Domestic solid waste generated from temporary workers' housing and offices during the period of execution should be collected and disposed according to the regulations of the local municipal authorities.

d) Living Environment

To avoid traffic congestion and discomfort from noise and vibration following measures can be applied:

- Using appropriate construction techniques that emit low level of vibration;
- Appropriate planning and scheduling of construction activities to minimize traffic diversions
- Plan construction period to minimize duration of high noise exposure;
- Use of quietest equipment that is economically suited for construction use;
- Try to meet guaranteed levels of maximum noise exposure levels;
- Phased utilization of vibration-cause equipment to reduce the magnitude of vibration.

Regarding labor safety, Project Management Unit and Contractors have the responsibility to realize strict labor safety for workers in order to avoid accidents during the period of execution.

5.3 Operation Stage

5.3.1 Impact

a) Water Environment

In this project it is proposed that wastewater from domestic and public services will be intercepted and conveyed to the wastewater treatment plant to be built at Phuoc

Loc Ward, Nha Be district. Treated wastewater will be discharged to Cay Kho canal with BOD 50 mg/l in Phase I and 20 mg/l in Final Phase. This will improve the water quality of Tau Hu Ben Nghe, Doi Te canal.

In rainy season a part of storm water will be intercepted and remaining will be discharged without treatment which may be the only source of pollution to the canal but impact may not be significant as wastewater is diluted by rain water.

Effluent from wastewater treatment plant satisfies Vietnamese effluent standard TCXD 188-1996. Further to assess the impact of effluent discharge on water quality of receiving Cay Kho canal, flow measurement and water quality survey of Cay Kho canal was conducted. Maximum flow of the canal is as high as 90.6 m³/sec, which is 55 times the discharge from treatment plant in Phase I, and 15 times in Final Phase. Flow measurement at Cay Kho canal, for 24 hrs, showed that Cay Kho canal is influenced by tide. After taking into account inward and outward movement of canal it has been found that about 1.5 million cum of water is flowing in one day. Thus no major impact is expected on the water quality of Cay Kho Canal.

If the wastewater treatment plant of the project is operated in proper way to meet the regulated standard of discharging water, there will be almost no impact on the botanic and zoological system of the receiving - Cay Kho canal and consequently it can be use to water and rinse salty alum in large surrounding agricultural area. During the project operation, the water environment is gradually improved, consequently facilitates the existing water botanic and zoo system to grow and develop.

b) Air Environment

One of the air pollution sources in operation phase project is air emission from the anaerobic degradation of organic matters. This volume of air emits from all of the drainage pipes. This impact can be treated by design and drainage and sewerage pipe structure. During periodical dredging the foul smell will contaminate the environment along the dredged pipelines and during the time of conveying sludge to dumping site.

Besides that, a considerate amount of air emission has been created from pumping stations and wastewater treatment plant, especially from the anaerobic process such as H₂S, NH₃. These substances can be corrosive and affect the environment. This impact becomes serious if the above sources are near the residential areas. However, if some proper treatment measures are applied the pollution can be controlled below the permitted standards.

c) Soil Environment

A considerable amount of waste will be established during the operation of the drainage and sewerage system including sewerage network and wastewater treatment plant. An amount of solid waste collected from screen system of pumping stations is expected to be about 4 - 6 tons/day. The ingredients include leftover food, paper, wood, nylon, rubber, cloths, etc. About 67 m³/day (% water content = 30 %) of sludge in phase I and 241 m³/d (% water content = 30 %) in final phase will be generated. The sludge volume with quite high nutrient and organic concentration (60 - 70 % dry weigh) can be treated at landfill, but it is better to reuse it in agriculture at surrounding area. In co-operation with the reuse of treated wastewater, the project of sludge reuse for agriculture has high feasibility.

d) Human Living Quality

During the operation stage, impacts on the living environment are primarily positive. The provision of a wastewater collection system to convey wastewater away from the residential area will enhance the public health status especially in terms of waterborne diseases.

Besides improvement of environmental quality the problem of flooding will be solved. situation of whole area. The impacts, which are primarily positive in nature, are listed below:

- Getting rid of flooding problem at hundreds of places of HCM city
- loss of billions of VND due to damage from flood will be avoided
- Creating employment for thousands of labors;
- Making people pay environmental fees, will reduce Government's burden.

5.3.2 Mitigation Measures

a) Water Environment

No major negative impact is predicted during operation of the drainage and sewerage system. Proper operation and maintenance of treatment plant is necessary to avoid process failure.

b) Air Environment

Exhaust gas generates from the periodical dredging of canals and from anaerobic degradation in sewer will be mitigated and treated as mentioned in the previous section. However, exhaust gas from anaerobic degradation in sewer is not much and very difficult to collect. Therefore, the simplest measure is provision of good ventilation during installation. This matter can be solved by designing of flow in the sewer. Exhaust gas coming from pumping station and wastewater treatment

plant due to organic degradation can also be simply solved by good ventilation. Foul odor can be removed using EM. It is also possible to provide good ventilation and extraction fan facility to mitigate against odor problems.

Noise could be along term and persistent nuisance to the workers and the adjacent population if suitable mitigation is not incorporated into the preliminary and detailed design of the facility. Sources of noise include the pump sets and the screens. The selection of non-clog submersible pumps that are installed below water and are normally enclosed in a confined structure would reduce noise from the process. However, the operation of the screens might pose a severe problem if installed at ground level rather than deep in the wet well. If ground-level screens are adapted, a suitable buffer and noise barrier, use of quieter screens, and suitable enclosure should serious be considered. Monitoring of noise level at the boundary of any nearby sensitive receptors is recommended.

c) Soil Environment

Solid waste from screening system of pumping station should be collected and disposed according to the local regulations on domestic solid waste disposal. Sludge generated from wastewater treatment plant will be properly treated by composting before disposal or reuse. Hence no negative impact is expected.

5.4 Monitoring Program

5.4.1 Water Quality Monitoring

During construction stage monitoring is recommended at 6 cross sections in related rivers and canals as follows:

- Upstream: in Cho Dem river, about 100 m from the point of intersection of Tau Hu canal and Doi canal;
- Downstream: in Sai Gon river branch, about 100 m from Tan Thuan Bridge;
- Tau Hu-Ben Nghe canal: one cross section at Quoi Duoc Bridge (Tau Hu canal) and the other one about 500 m from Khanh Hoi Bridge (Ben Nghe canal);
- Doi-Te canal: one cross section at Nhi Thien Duong Bridge and the other one about 1,5 km from Tan Thuan Bridge in the upstream direction.

During operation stage monitoring should be carried out at 10 cross sections in related rivers and canals as follows:

- Upstream: in Cho Dem river, about 100 m from the point of intersection of Tau Hu canal and Doi canal;
- Downstream: in Sai Gon river branch, about 100 m from Tan Thuan Bridge;
- In Tau Hu- Ben Nghe canals, monitoring at 3 cross sections:
 - + Quoi Duoc Bridge;

- + About 1500 m from Tan Thuan Bridge in the upstream direction;
- + Y bridge.
- In Doi-Te canals, monitoring at 2 cross sections:
 - + Nhi Thien Duong Bridge;
 - + About 500 m from Khanh Hoi Bridge.
- In Cay Kho canal which receives treated wastewater from wastewater treatment plant:
 - + Point of discharge of treated wastewater into Cay Kho canal;
 - + About 500 m from discharging point in the upstream direction;
 - + About 500 m from discharging point in the downstream direction.

At each cross section, samples will be taken at 3 locations: right side, left side and middle, at 2 depth levels: 1 m from the surface and 1 m from the bottom of the canal during both high and low tide. For cross sections of rivers, sampling will be done at 2 depth levels: 1 m and 6 m from the surface. Water quality will be monitored using the following parameters: pH, suspended solid (SS), dissolved oxygen (DO), chemical oxygen demand (COD), Biochemical oxygen demand (BOD₅), ammonia (N-NH₃), nitrate (N-NO₃⁻), total Coliform. Monitoring should be carried out once each month at both high and low tide under the supervision of the Department of Science, Technology and Environment of Ho Chi Minh City.

5.4.2 Air Quality, Noise and Vibration Monitoring

During construction stage monitoring should be carried out at the following locations:

- Interceptor construction region along Ton Duc Thang-Ham Nghi -Tran Hung Dao Street:
 - + Ton Duc Thang Street : 02 locations;
 - + Ham Nghe Street : 02 locations;
 - + Tran Hung Dao Street : 04 locations.
- Conveyance construction region: 03 locations;
- Pumping station construction region: 02 locations;
- Wastewater treatment plant construction region: 02 locations;
- Tau Hu-Ben Nghe-Doi-Te canals: 6 - 10 locations;
- Residential areas which are subjected to excavation and construction activities: 5 - 8 locations;

During operation stage monitoring should be carried out at the following locations:

- Pumping station region: 02 locations;
- Wastewater treatment plant region: 02 locations;
- Tau Hu-Ben Nghe-Doi-Te canals: 6 - 10 locations;

Air quality shall be monitored by the following parameters: noise, vibration, dust, NO_x,

SO_x, CO. For locations along canals, it is necessary to measure H₂S and CH₄. Monitoring shall be carried out once each month under the supervision of the Department of Science, Technology and Environment of Ho Chi Minh City.

5.4.3 Solid Waste Disposal Monitoring

Disposal of solid waste directly into canals is one of reasons of heavy pollution of the canal water. Therefore, a monitoring network shall be arranged by the People Committee of Wards and Districts in Tau Hu-Ben Nghe-Doi-Te basin and under the supervision of the Department of Science, Technology and Environment.

5.4.4 Labor Safety and Health Care

During the construction period, Project Management Unit and Contractors have the responsibility to realize strict labor safety for workers in order to avoid accidents during the period of execution. Provisional houses for workers have to satisfy sanitary requirements

Table H.1 Initial Environmental Examination for Tau Hu - Ben Nghe Project

No.	Environmental Item	Initial Environmental Examination
Social Environment		
1.	Resettlement	Improvement of Tau Hu-Ben Nghe-Doi-Te canal will involve resettlement as many illegal squatter exist along the canal. Detailed analysis required.
2.	Economic activities	Rehabilitaed people may lose their job. This issue should be studied along with resettlement issue.
3.	Traffic and public facilities	Not much impact expected. Temporary impact during construction stage may be there.
4.	Split of regional communities	No such impact expected
5.	Cultural Property	Existance of any cultural monuments/property should be examined along the interceptor route and treatment plant site.
6.	Water Rights and Rights of common	Obstructing of fishing rights at Nha Be river d/s of treatment plant should be studied.
7.	Public health condition	Public health will be improved as wastewater will be treated before discharging to public water bodies.
8.	Waste	Proper sites for construction waste, sludge generated need to be identified
9.	Hazard	Sludge characteristics of Tau hu Canal to be rehabilitated should be analyzed before formulating disposal measures.
Natural Environment		
10.	Topography and Geology	Change of topography and geology due to excavation and earthfill at treatment plant site should be investigated.
11.	Groundwater	Treatment of wastewater will prevent further pollution of groundwater in the study area.
12.	Fauna and Flora	Although not much negative impact expected, further analysis of impact of project activities on Flora and Fauna should be done.
13.	Landuse	Landuse plan of treatment plant site will be changed, impact should be studied.
Pollution		
14.	Air Pollution	Not much impact is expected from the gases produced at treatment plant site. Detailed analysis will be done in EIA study.
15.	Water pollution	Wastewater will be collected and treated and pollution in water bodies will reduce. Water quality of rivers in the priority project area and at effluent disposal point should be investigated.
16.	Soil Contamination	Soil contamination due to disposal of sludge from canals should be analyzed by analyzing sludge characteristics.
17.	Noise and Vibration	Impact during construction phase and also in operation phase due to operation of pumps should be studied.
18.	Land Subsidence	No such danger of land subsidence expected and should be studied during detailed EIA study
19.	Offensive Odor	Due to operation of wastewater treatment plant offensive odor will be produced. Impact should be minimized by construction of buffer zone.

Table H.2 Significant Impact Matrix

Project activity	Natural Environment							Social Environment				
	Aesthetic View	Surface water	Ground water	Air Environment	Soil Environment	Biological Resources & Ecosystem	Prevention of flood	Living Environment (Public health)	Infrastructure	Relocation	Employment opportunity	
1 Pre Construction Stage												
Land procurement	-	-	-	-	-	CB	-	-	-	-	AA	-
2 Construction Stage												
2.1 Construction of Sewers and Rehabilitation of Existing Sewers												
Transportation of construction material	CB	CB	-	CB	-	-	-	CB	-	-	-	P
Excavation work	BB	CB	-	CB	-	-	CB	-	CB	-	-	P
Transportation and disposal of spoil	BB	BB	-	CB	BA	-	-	-	-	-	-	P
Transportation and disposal of sediment	BB	BB	-	CB	BA	-	-	-	-	-	-	P
2.2 Improvement of Tau Hu-Ben Nghe, Doi-Te Canals												
Dredging of sediment from THBN canal	CB	AB	-	CB	-	CB	P	CB	CB	-	-	P
Construction of THBNDT canals	CB	BB	-	CB	-	CB	P	-	P	-	-	P
Transportation and disposal of sediments	CB	BB	-	CB	BA	CB	-	CB	-	-	-	P
3 Operation Stage												
3.1 Operation of Sewerage System and Tau Hu - Ben Nghe Canal												
Disposal of sewer sediment	CB	CB	-	CB	CA	-	-	CB	-	-	-	P
Disposal of sediment dredging	CB	CB	-	CB	CA	-	-	CB	-	-	-	P
Wastewater discharge	-	CA	P	CA	P	P	P	P	-	-	-	-
3.2 Operation of Wastewater Treatment Plant												
Treated wastewater discharge	-	P	P	P	P	P	-	P	-	-	-	P
Disposal of solid waste from pumping stations	CB	CB	-	CB	BA	-	-	CB	-	-	-	P
Disposal of sludge from wastewater treatment plant	CB	CB	-	CB	BA	-	-	CB	-	-	-	P

Note P=> Positive Impact

AA => Serious Negative Long-term Impact

AB=> Serious Negative Short-term Impact

BA=> Moderate Negative Long-term Impact

BB=> Moderate Negative Short-term Impact

CA => Minor Negative Long-term Impact

CB=> Minor Negative Short-term Impact

Table H.3 Summary of Significant Environmental Impacts Mitigation/Compensation Measures

PROJECT ACTIVITY	IMPACT DESCRIPTION	CATEGORY	IMPACT	MITIGATION
1. Pre-Construction Stage (immediate impact)				
Land procurement for interceptor and WTP	<ul style="list-style-type: none"> - Domestic life - Culture - Activity of factory in project area 	Social	Serious	<ul style="list-style-type: none"> - Ensure procurement - Compensation - Relocation program - Creation of new jobs
2. Construction Stage (immediate or short-term impacts)				
- Dredging and excavation works	<ul style="list-style-type: none"> - Water pollution by sediment - Drilling of spoil and filling construction material 	Physical	Moderate	<ul style="list-style-type: none"> - Proper procedure for dredging - Temporary storage - Proper operation and maintenance of vehicles and equipment
- Transportation of sediment, spoil, fill material	<ul style="list-style-type: none"> - Air pollution by CO₂, NO_x, SO₂ from construction vehicles and equipment - Traffic 			<ul style="list-style-type: none"> - Proper operation and maintenance of vehicles and equipment and use of EM product to avoid smell from sediment - Proper levelling program
- Disposal of sediment and spoil	<ul style="list-style-type: none"> - Air pollution by CO₂, NO_x, SO₂, H₂S, CH₄ from construction vehicles and sediment - Spoil and sediment pollution - Soil pollution 			
- Construction activity	<ul style="list-style-type: none"> - Noise, vibration and air pollution - Strain on infrastructure due to labour influx 			<ul style="list-style-type: none"> - Take proper construction procedure to avoid wash away of material - Provide waste disposal facilities for temporary shelters for labour

The Study on Urban Drainage and Sewerage System for Ho Chi Minh City

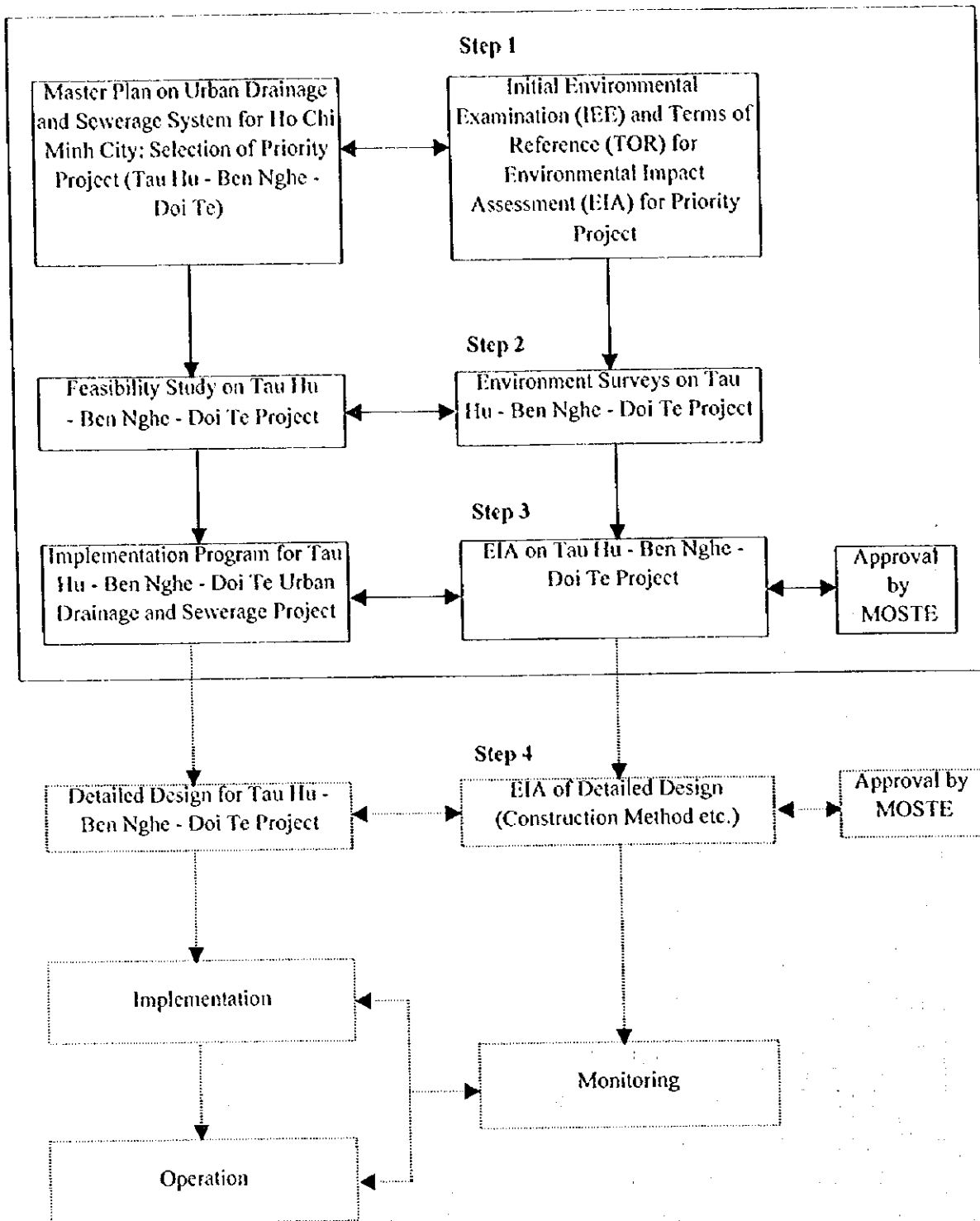


Fig H.1 Steps in Environmental Impact Assessment