9.2.3 Survey Guidelines

The survey shall be carried out on following guidelines:

- Government Decree on providing guidance for the implementation of the Law on Environmental Protection (No. 175/CP)
- 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 regulations and organization of the 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.

9.3 Scope of Work

The survey include all works such as sampling, analysis of data, preparation of the EIA report and acquisition of the approval for EIA Report from the Appraisal Council of EIA. The format and contents of the EIA report shall follow the contents of EIA report which were defined by MOSTE, as also mentioned in Survey Guidelines.

9.4 Specifications

9.4.1 Data Collection

Information and data are required to be obtained from primary and secondary sources. This data is to be used for identification of environmental impact and assessment. Secondary data is obtained from relevant institutions. Such data could also be obtained from previous relevant studies and investment study. Primary data such as those of physical nature, concerning biological ecosystems, nature resources and quality of life parameters are obtained from field observation and measurement activities.

A) Physical Environment

Meteorology
Hydrology and Water Quality Survey
Air Quality Survey
Noise and Vibration Survey
Geology and Soil

B) Biological Resources and Ecosystem

Land Ecology
Aquatic Ecology

C) Natural Resources

Land Use

D) Quality of life

Demographic and Socioeconomic conditions
Public Utilities
Public Health
Aesthetics
Cultural and Historical Values

9.4.2 Water Quality Survey

A) Surface Water Quality

Sampling points : 18 locations as indicated in Fig. D.3.3.

Total samples : At each location, for 3 cross sections for both high tide and low tide (18 x 3 x 2 = 108).

Parameters : pH, alkalinity, acidity, turbidity, SS, DO, BOD, COD, $N\text{-}NH_3$, $N\text{-}NO_2$, $N\text{-}NO_3$, N-Org, $P\text{-}PO_4^{3-}$, Phenol, Oil, Cr^{3+}, Cd, Pb, As, Hg, Ecoliform, Total Coliform, Pesticides.

B) Groundwater Quality

Sampling points : 5 locations in the industrial area or near the factory and 1 location at treatment plant site as indicated in Fig. D.3.3.

Total samples : 6 locations

Parameters : pH, TDS, turbidity, $N\text{-}NH_3$, $N\text{-}NO_2$, $N\text{-}NO_3$, $P\text{-}PO_4^{3-}$, Fe, Cr^{3+}, Cd, Pb, As, Hg, Ecoliform, Total Coliform.

C) Wastewater from Outlet

Sampling points : 40 locations along Tau Hu-Ben Nghe-Doi-Te canals as indicated by the JICA Study Team.

Total samples : 40 samples

Parameters : pH, alkalinity, acidity, turbidity, SS, BOD, COD, $N\text{-}NH_3$, $N\text{-}NO_2$, $N\text{-}NO_3$, N-Org, $P\text{-}PO_4^{3-}$, Phenol, Oil, Cr^{3+}, Cd, Pb, As, Hg, Pesticides.

9.4.3 Air Quality Survey

Sampling points : 22 locations as shown in Fig. D.3.4.

Parameters : Micro climate (°C, Humidity, Wind), Noise and Vibration, Particulate, NO_2, SO_2, CH_4, NH_3, CO_2, CO, H_2S, Zn, Pb, Microorganism.

9.4.4 Canal Bed Material and Soil Quality Survey

A) Canal Bed Material Quality

Sampling points : Same as that of surface water quality (Fig. D.3.3)

Total Samples : 18 samples

Parameters : Organic matter, PCBs, Organohalogen Pesticides (Polychlorinated biphenyls, Lindane), Organometallics (Mercury alkyl, Nickel carbonyl, Tetraethyl lead,), Heavy metals (Cd, As, Pb, Cr), Major nutrients (phosphorus), sand.

B) Soil Quality

Sampling Point : 2 locations near treatment plant site, 1 location at each pumping station (5 x 1), 4 locations in the area to be rehabilitated as shown in Fig. D.3.5.

Parameters : PCBs, Organohalogen Pesticides (Polychlorinated biphenyls, Lindane), Organometallics (Mercury alkyl, Nickel carbonyl, Tetraethyl lead,), Heavy metals (Cd, As, Pb, Cr), Major nutrients (phosphorus), oil, phenol.

9.4.5 Identification of Impact

Environmental impacts including those positive and negative are to be identified based on collected data utilizing analytical method. The impacts are to be identified for pre-construction, construction and operation stages. In each stage impact is to be identified based on following factors:

- Number of people subject to impact
- Extent of the impact
- Impact duration

- Number of environmental component, which are simulation, affected by the impact
- Cumulative aspects of the impact
- Irreversibility of the impact

9.4.6 Assessment and Evaluation of Impact

The impact assessment on the above environmental parameters resulting from the project should be discussed based on suitable techniques. Quantitative methods for impact assessment should be used wherever applicable to accurately portray the level of impact.

In order to do this, necessary project details, existing and projected, should be used.

9.4.7 Formulation of Environmental Management Plan

An Environmental Management Plan (EMP) should be drawn up to control and curb adverse environmental impact that is determined by the above. The environmental management plan could be of suggested control system as needed as well as a monitoring program. The EMP consists of basic guidance in environmental management based on the observation results. The EMP should be prepared in detail and as complete as possible, covering:

- type of activities that particularly increase the significance of the impact
- type of impacts that should be monitored and managed
- approach of arrangement, control and management for minimization of negative impact and maximization of positive impact.
- type of environmental component that should be monitored.

9.5 Reporting

9.5.1 Submission of Reports

The consultant shall submit following reports to the study Team in the English and Vietnamese (language) according to the following schedule.

1) Inception Report
2) Draft Final Report
3) Final Report

9.5.2 Contents of Report

The format of EIA report shall be based on the following table of contents.

Chapter 1 Introduction
1. Objectives of the Report
2. Status of the Report

3. Assessment method
4. Organization of the study team

Chapter 2 Brief Description of the Project

Chapter 3 Environmental Status at the Project Location

Chapter 4 Impact of the Project Implementation to the Environmental and Natural Resources Factors

4.1 Description of the impact of the project implementation to each environmental factor in the project site
   1) Impact to Physical Environmental Forms
   2) Impact to Biological Resources and Ecosystem
   3) Impact to Natural Resources and Ecosystem
   4) Impact to the direct condition that impact the people living quality

4.2 Compiled Environmental Impact taking place in the case of project implementation

4.3 The mitigating measures to limit negative impacts of the project on the environment

4.4 General Assessment

4.5 Recommendations on the Alternative Project Implementation

9.6 Time of Completion of Work

Expected Survey duration	July - August 99
Approval expected	End of September 99

9.7 Equipment, Materials and Labor

All the necessary equipment, materials and labor for all the above mentioned work shall be provided by the consultant.

10. Status of EIA Survey

At present analysis of EIA survey is going on. Based on results of EIA survey, significant impacts will be identified and mitigation measures of negative impacts will be proposed.

Table D.2.1 Uses of Major Rivers And Canals

River/Canal	Uses
Dong Nai River	Water Supply, Navigation
Saigon River	Navigation, Drainage, Aquatic products
Nha Be River	Navigation, Drainage, Aquatic products
Tan Hoa Canal	Drainage
Lo Gom Canal	Drainage, Transportation
Tham Luong Canal	Drainage
Vam Thuat Canal	Drainage, Transportation
Nhieu Loc Canal	Drainage
Thi Nghe Canal	Drainage
Tau Hu Canal	Drainage, Transportation
Ben Nghe Canal	Drainage
Doi	Drainage, Transportation
Te	Drainage, Transportation

Source : Study Team & PMU

Table D.3.1 Water Quality of Dong Nai River at Hoa An Water Supply Intake

No.	Parameter	Concentration
1	BOD_5 (20°C)	4 – 10 mg/l
2	Dissolved Oxygen	5.6 – 6.6 mg/l
3	Suspended Solids	0 – 15 mg/l
4	Total N	0.3 – 0.7 mg/l
5	Total P	0.01 – 0.07 mg/l
6	Copper	0.00 – 0.002 mg/l
7	Mercury	0.00 – 0.002 mg/l
8	Cadmium	0.00 – 0.001 mg/l
9	Lead	0.00 – 0.002 mg/l
10	Coliform	15 – 90 MPN/100 ml
11	Fecal Coliform	15 – 90 MPN/100ml

Source : Water quality report for HCM city (1997), DOSTE

Table D.3.2 Water Quality of Saigon River

S. No.	Parameter	Concentration
1	BOD_5 (20°C)	7 – 35 mg/l
2	Dissolved Oxygen	4 – 7 mg/l
3	Suspended Solids	5 – 100 mg/l
4	Cadmium	< 0.002 mg/l
5	Lead	0.002 – 0.009 mg/l
6	Copper	0.001 – 0.009 mg/l
7	Mercury	0.002 – 0.020 mg/l
8	Total N	0.3 – 2.8 mg/l
9	Total P	0.03 – 1.8 mg/l
10	Coliform	10 – 95 MPN/100 ml
11	Fecal Coliform	10 – 95 MPN/100 ml

Source: Water quality report for HCM city (1997), DOSTE

Table D.3.3 Water Quality of Nha Be River

S. No.	Parameter	Concentration
1	BOD_5 (20°C)	5 – 15 mg/l
2	Dissolved Oxygen	7.0 – 7.8 mg/l
3	Suspended Solids	10 – 80 mg/l
4	Cadmium	< 0.002 mg/l
5	Lead	0.0 – 0.006 mg/l
6	Copper	0.0 – 0.005 mg/l
7	Mercury	0.0 – 0.005 mg/l
8	Total N	0.4 – 0.9 mg/l
9	Total P	0.02 – 0.30 mg/l
10	Coliform	10 –20 MPN/100 ml
11	Fecal Coliform	5 – 15 MPN/100 ml

Source: Water quality report for HCM city (1997), DOSTE

Table D.3.4 Water Quality of Major Canals in Study Area

No.	Parameter	Concentration				
		Tan Hoa – Lo Gom	Tham Luong – Vam Thuat	Nhieu Loc – Thi Nghe	Tau Hu	Doi - Te
1	Dissolved Oxygen (mg/l)	0	1 – 4	0	0 – 1	0 – 1
2	BOD_5 (20°C) (mg/l)	50 – 420	10 – 60	30 – 100	20 – 200	10 – 120
3	COD (mg/l)	75 – 2000	20 – 175	-	30 – 240	15 – 200
4	Suspended Solids (mg/l)	35 – 230	10 – 115	25 – 285	20 – 150	20 – 105
5	NH4 – N (mg/l)	5 – 24	1 – 7	2-23	4 – 21	3 – 26
6	PO4 – P (mg/l)	0.3 – 7.2	0.5 – 2.4	0.2 – 3.8	0.2 – 3.2	0.2 – 3.6
7	H2S (mg/l)	0.03 – 0.30	0.03 – 0.17	-	0.04 – 0.26	0.03 – 0.30
8	Mercury (mg/l)	0.0	0.0	0.0	0.0	-
9	Lead (mg/l)	0.02 – 0.30	0.01 – 0.03	0.01 –0.02	0.01 – 0.02	-
10	Coliform (MPN/100ml)	4.3 E+02 – 1.1 E+08	1.4 E+02 – 1.1 E+07	-	1.5 E+02 – 4.6 E+07	9.3 E+02 – 1.1E+08
11	Fecal Coliform (MPN/100 ml)	1.5 E+02 – 1.5 E+07	4.0 E+01 – 1.5 E+06	-	1.5 E+01 – 9.3E+06	1.5 E+02 – 4.6E+07

Source: Master Plan on Drainage and Sewerage System (1996), UPI
Water quality report for HCM city (1997), DOSTE
Prefeasibility report on Improvement of Tau Hu – Doi – Te canals (1998), DTCPW
Tau Hu Canal Rehabilitation Prefeasibility Study (1995), UNDP
Prefeasibility report on Improvement of Tan Hoa – Lo Gom canals (1998), DTCPW

Table D.3.5 Characteristics of Bed Sediments in Tau Hu Canal

Parameter	Concentration
PH	7.8
BOD_5 (%)	4.9
COD (%)	5.1
Total N (%)	0.23
N – Dissolved (%)	0.06
Total P (%)	0.04
P – Dissolved (%)	0.004
Cl^- (%)	0
S (%)	0.96
Oil (%)	0.01
Zn (mg/kg)	1.54
Cu (mg/kg)	0.04
Cd (mg/kg)	< 0.04
Pb (mg/kg)	0.04
Hg (mg/kg)	0.64
Cr (mg/kg)	<0.03
Al (mg/kg)	5.21

- Sludge has been taken from upper layer
- % means percentage of total sludge dry weight

Source : Tau Hu rehabilitation prefeasibility study (1995), UNDP

Table D.3.6 Quantity of Wastewater Discharged from Different Sources in Inner City

Canal	Industrial Wastewater (m3/d)	Commercial Wastewater (m3/d)	Domestic Wastewater (m3/d)			Total m3/d
			Household	School	Hospital	
Tham Luong – Vam Thuat	20,956.00	734.00	33,048	766.6	1,055.28	56,559.88
Nhieu Loc - Thi Nghe	3,720.62	11,353.60	97,675	2,646.1	3,065.40	118,460.72
Tan Hoa – Lo Gom	8,413.90	1,566.87	42,939	275.60	39.70	53,235.10
Ben Nghe – Saigon	3,184.00	8,473.27	28,013	978.26	2,035.00	42,683.53
Doi – Te – Tau Hu	8,080.15	5,595.00	82,393	1,691.44	4,896.30	102,655.90
Saigon Than Da	463.93	1414.80	10,940	177.8	9.30	13,005.86
Total	44,818.60	29,137.50	295,008	6,535.8	11,101.10	386,601.00

Source: Master Plan for the Drainage and Sewerage System (1995, UPI)

Table D.3.7 (1/2)Distribution of Industries and Type of Industries

TYPES OF INDUSTRY	DISTRICT																			TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	P.Nhuan	TBinh	G.Vap	B.Thanh	H.Mon	Nha Be	B. Chanh	T.Duc	
Additives	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	12
Agriculture	-	-	-	-	-	101	-	-	-	-	-	-	-	2	2	1	5	-	8	-	119
Animal /Poultry breeding	-	-	-	-	1	1	-	4	-	-	-	-	-	1	-	2	-	-	-	-	9
Animal meat processing	1	-	4	-	-	6	-	-	-	-	3	-	-	-	-	2	-	-	3	-	19
Antiseptic Product	1	-	-	-	-	7	-	-	-	-	3	-	-	-	1	-	-	-	1	-	13
Bamboo screen	8	-	2	-	-	4	-	-	-	-	-	-	2	3	-	-	-	-	1	-	20
Building materials	3	-	-	-	2	8	-	1	-	2	-	-	1	2	9	1	7	-	3	3	42
Canned food	-	-	12	-	-	-	-	-	-	-	4	-	-	2	4	-	-	-	-	-	22
Car washing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Crematories	2	-	2	-	-	-	-	-	-	-	7	-	2	-	-	-	-	-	1	-	14
Chalk, broom	1	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	1	13
Chemicals	15	-	3	5	22	43	-	20	-	4	4	-	2	18	9	11	-	2	-	3	161
Dyeing	3	-	11	-	7	36	-	20	-	5	118	3	1	60	8	4	1	-	-	1	278
Electric & Electronics	6	-	15	3	7	72	-	3	-	6	1	-	6	8	12	7	2	-	9	3	160
Embroidery	7	-	2	-	2	9	-	-	-	-	-	-	2	-	3	-	-	-	7	-	32
Face bricks	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Fertizers	1	-	5	-	-	2	-	-	-	-	-	-	-	-	-	2	1	-	1	-	12
Fine handicraf articles	5	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	6	-	25
Flowered enamelled tiles	3	-	-	-	2	20	-	6	-	-	-	-	1	21	8	9	-	-	-	-	70
Foam making	-	-	-	-	-	2	-	-	-	-	2	-	2	-	1	2	-	-	4	-	13
Food for animal	12	-	-	-	1	4	-	1	-	-	-	-	-	2	4	1	-	-	-	-	25
Food processing	43	-	18	28	23	123	-	47	-	12	16	4	10	82	62	32	10	2	8	13	533
Glass	-	-	-	1	1	6	-	-	-	-	22	-	3	3	3	2	1	-	-	-	42
Glue	1	-	-	-	1	9	-	4	-	-	4	-	1	3	1	-	1	-	-	-	25
Gypsum	3	-	-	-	-	9	-	-	-	-	-	-	-	-	-	1	-	-	6	-	19
Health care products	1	-	8	-	-	4	-	-	-	-	-	-	-	4	-	2	-	-	1	-	20
Ice	24	-	9	5	11	5	-	25	-	8	7	-	4	29	19	21	-	-	1	-	168
Incense	1	-	-	-	-	25	-	-	-	-	13	-	-	3	-	-	-	-	6	-	48
Lacquer	4	-	9	4	-	9	-	-	-	2	-	-	3	12	3	11	-	-	-	-	57
Leather	3	-	2	26	-	9	-	2	-	6	14	-	1	47	3	1	4	-	3	-	121
Lubricant/ Oil	4	-	6	1	11	14	-	5	-	-	13	-	4	36	5	8	4	-	4	-	115
Matches	2	-	4	-	-	5	-	-	-	-	3	-	-	-	2	-	5	-	1	-	22
Mechanical equipment	107	0	15	50	264	672	-	67	-	24	75	-	27	75	38	28	13	2	4	2	1463

Table D.3.7 (2/2)Distribution of Industries and Type of Industries

TYPES OF INDUSTRY	DISTRICT																			TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	P.Nhuan	TBinh	G.Vap	B.Thanh	H.Mon	Nha Be	B. Chanh	T.Duc	
Medicinal Cotton	1	-	2	-	-	9	-	-	-	-	-	-	3	1	-	-	5	-	1	1	23
Metal processing	15	-	3	-	-	42	-	-	-	5	52	-	9	38	15	15	14	-	7	-	215
Paint	-	-	-	-	1	12	-	1	-	1	-	-	-	4	-	4	-	-	-	1	24
Paper processing	8	-	2	1	5	122	-	11	-	5	18	3	1	25	15	1	3	-	2	10	232
Pharmaceutical	2	-	5	5	1	-	-	1	-	2	-	-	2	4	3	-	3	-	2	1	31
Plastic processing	16	-	8	9	92	579	-	47	-	1	135	-	12	72	5	3	3	-	6	1	989
Polishing	7	-	4	2	20	21	-	10	-	24	78	-	-	3	-	7	-	-	-	-	176
Printing	4	-	4	1	14	22	-	1	-	2	5	-	3	1	1	2	-	-	-	-	60
Procelain	2	-	-	3	-	4	-	1	-	-	-	-	5	-	1	1	-	-	2	-	19
Rubber processing	8	-	-	8	9	19	-	5	-	3	106	1	-	41	15	5	2	-	20	4	246
Salt	2	-	-	-	-	12	-	1	-	-	-	-	-	1	3	3	1	-	3	-	26
Seafood processing	10	-	9	3	4	15	-	14	-	1	1	-	2	6	2	5	-	-	5	2	79
Sewing	32	-	10	23	6	89	-	4	-	7	-	-	11	40	22	3	-	-	8	1	256
Soft drink, brewery, alco.	4	-	13	4	6	6	-	8	-	7	1	2	5	18	29	21	3	-	-	3	130
Spices	1	-	-	2	3	19	-	15	-	1	2	-	-	11	6	2	-	-	-	1	63
Stationary	3	-	-	-	2	30	-	-	-	-	-	-	1	-	1	1	-	-	-	-	38
Sugar	-	-	-	1	2	-	-	19	-	-	-	-	-	2	1	1	-	-	-	-	26
Textile	4	-	-	4	2	126	-	2	-	2	-	-	2	53	56	13	22	-	7	5	298
Tobacco	-	-	-	2	1	2	-	-	-	-	-	-	-	-	2	-	2	-	1	-	10
Ware house	-	-	-	-	0	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Welding	-	-	-	2	1	15	-	-	-	-	-	-	-	2	-	-	-	-	-	-	20
Wood processing	4	-	2	4	17	23	-	-	-	1	-	-	1	9	24	1	17	-	2	8	113
Linh Trung Processing Zone																				Many Factories	
Binh Chieu Industrial Park																				23	
TOTAL	384	N.A.	202	197	541	2,383	N.A.	345	N.A.	131	707	13	129	756	399	236	130	6	144		

Source : Master Plan on Sewerage and Drainage (1996), UPI

District Office

Table D.3.8 (1/4)Major Polluting Industries in the Study Area

No.	Name of Industry	Type of Industry	Location (District)	No. of Employees	Year of Survey
1	Vinh Hoi Tobacco Factory	Tobacco	Q 4	1368	1994
2	Khanh Hoi Glass Factory	Glass	Q 4	600	1994
3	Chien Thang Exported Products Processing Enterprise	Sea Food Processing	Q 4	150	1997
4	Imported-Exported and Sea Products Processing Enterprise No. 4	Sea Food Processing	Q 4	174	1997
5	Saigon Brewery Factory	Brewery	Q 5	1560	1994
6	Phuong Dong Company	Detergent	Q 5	260	1994
7	Saigon Tobacco Factory	Tobacco	Q 5	2200	1994
8	Cho Quan Electricity Factory	Electricity	Q 5	250	1994
9	Binh Tay Wine Company	Brewery	Q 6	360	1994
10	Viet Pho Wool Textile, Dyeing and Weaving Company	Weaving & Dyeing	Q 6	800	1997
11	Binh Tay Steel Net Company	Polishing & Plating the metal products	Q 6	300	1997
12	Binh Tay Instant Noodle Company	Food Processing (Noodles)	Q 6	331	1997
13	Cat Tuong Private Company	Food Processing (Bread)	Q 6	26	1997
14	Hung Vuong Congelation Enterprise	Sea Food Processing	Q 6	150	1997
15	Viet Phu Congealed Sea Products Company	Sea Food Processing	Q 6	100	1997
16	Congealed Sea Products Enterprise No. 3	Sea Food Processing	Q 6	409	1997
17	Cuu Long Glass Factory	Glass	Q 8	110	1994
18	Giang Hung Polishing and Plating Workshop	Polishing & Plating the metal products	Q 8	16	1997
19	Binh Dong Wheat Powder Company	Food Processing (Wheat)	Q 8	350	1997
20	Nam Duong Sauce Enterprise	Food Processing (Sauce)	Q 8	79	1997
21	Exported Products Processing Enterprise	Sea Food Processing	Q 8	180	1997
22	Congealed Sea Products Enterprise No. 4	Sea Food Processing	Q 8	180	1997
23	Viet Long Congelation Enterprise	Sea Food Processing	Q 8	400	1997
24	Casting Factory No. 1	Cast Iron	Q 11	94	1994
25	Quyet Thang Textile Factory	Textile	Q Go Yap	243	1994
26	Govap Glass Factory	Glass	Q Go Vap	350	1997
27	Phu Dong Forest Products Producing Company	Furniture made of wood	Q Go Yap	80	1997
28	Duc Thanh Wood Producing Company	Furniture made of wood	Q Go Yap	350	1997
29	Thanh Cong Textile Factory	Textile	Q Tan Binh	4000	1994
30	Thang Loi Textile Factory	Textile	Q Tan Binh	4230	1994
31	Chan A Textile Factory	Textile	Q Tan Binh	650	1994
32	Domatex JV Enterprise	Weaving & Dyeing	Q Tan Binh	64	1997

Table D.3.8 (2/4)Major Polluting Industries in the Study Area

No.	Name of Industry	Type of Industry	Location (District)	No. of Employees	Year of Survey
33	Tan Binh Chemical Factory	Chemical	Q Tan Binh	175	1994
34	Tico Detergent Company	Detergent	Q Tan Binh	630	1994
35	Bach Tuyet Cotton Factory	Cotton	Q Tan Binh	200	1994
36	Tan Binh Stel Factory	Steel	Q Tan Binh	235	1994
37	Tamico JV Company	Leather	Q Tan Binh	120	1997
38	Vifon Company	Food Processing	Q Tan Binh	1000	1994
39	Vifon – Acecook JV Company	Food Processing (Noodles)	Q Tan Binh	150	1997
40	Tan Binh Oil Factory	Food Processing (Refined Oil)	Q Tan Binh	250	1997
41	Tuong An Oil Factory	Food Processing (Vegetable Oil)	Q Tan Binh	338	1997
42	Cau Tre Exported Food Processing Factory	Sea Food Processing	Q Tan Binh	235	1994
43	Exported Seafood Processing Company	Sea Food Processing	Q Tan Binh	1200	1994
44	Nhan Hoa Water and Sea Products Processing Company	Sea Food Processing	Q Tan Binh	100	1997
45	Van Hung Sea Products Limited Company	Sea Food Processing	Q Tan Binh	100	1997
46	Toan Luc Rubber Factory	Rubber Tire	Q Phu Nhuan	32	1994
47	Seaprodex Instant Noodle Enterprise	Food Processing (Noodles)	Q Phu Nhuan	40	1997
48	Gia Dinh Textile Factory	Textile	Q Binh Thanh	1450	1994
49	Binh Loi Blanket Weaving Company	Weaving & Dyeing	Q Binh Thanh	700	1997
50	Binh Loi Leather Company	Leather	Q Binh Thanh	34	1997
51	Vissan Company	Meat Processing	Q Binh Thanh	1282	1994
52	Duc Hoang Weaving – Dyeing – Embroider Workshop	Weaving & Dyeing	Q Hoc Mon	40	1997
53	Satimex Exported Wood Producing Factory	Producing Wood	Q Hoc Mon	700	1997
54	Military Zone 7 Cement Factory	Cement	Q Hoc Mon	148	1994
55	Saigon Vewong JV	Food Processing	Q Hoc Mon	300	1994
56	Orsan Sodium Glutamate Factory	Food Processing (Sodium Glutamate)	Q Hoc Mon	130	1997
57	Sunnimex Exported Agricultural Products Purchasing Station	Food Processing (Cashew nut)	Q Hoc Mon	500	1997

Table D.3.8 (3/4)Major Polluting Industries in the Study Area

No.	Name of Industry	Type of Industry	Location (District)	No. of Employees	Year of Survey
58	Thien Huong Food Company	Food Processing (Noodles, Spices)	Q Hoc Mon	630	1997
59	Binh Dien Cement Factory	Cement	Q Binh Chanh	140	1994
60	Binh Hung Hoa Crematory	Corpses	Q Binh Chanh	12	1994
61	Tan Thuan Antiseptic Factory	Chemical	Q Nha Be	90	1994
62	Saigon Insecticide Factory	Insecticide	Q Nha Be	80	1994
63	Nha Be Steel Factory	Steel	Q Nha Be	476	1994
64	Nha Be Iron – Alley Company	Steel	Q Nha Be	350	1997
65	Trung Viet Food Processing Workshop	Food Processing (Fruit Juices)	Q Nha Be	60	1997
66	Golden Hope JV Company	Food Processing (Refined Oil)	Q Nha Be	300	1997
67	Viet Thang Textile Factory	Textile	Q Thu Duc	5500	1994
68	Phuc Long Textile Factory	Textile	Q Thu Duc	1400	1994
69	Phong Phu Textile Factory	Textile	Q Thu Duc	2470	1994
70	Dong Phuong Knitting Company	Weaving & Dyeing		456	1997
71	Binh Trieu Antiseptic Factory	Chemical	Q Thu Duc	151	1994
72	Viso Detergent Company	Detergent	Q Thu Duc	506	1994
73	Thu Duc Steel Factory	Steel	Q Thu Duc	447	1994
74	Thu Du Electricity Factory	Electricity	Q Thu Duc	346	1994
75	Ha Tien Cement Co No. 1	Cement	Q Thu Duc	1454	1994
76	Binh Tan Consumer Goods Producing Company	Rubber Foot Wear		404	1997
77	Vinh Hue Paper Company	Paper	Q Thu Duc	1382	1994
78	Xuan Duc Paper Factory	Paper	Q Thu Duc	127	1994
79	Liksin Paper Company	Paper	Q Thu Duc	362	1994
80	Linh Xuan Paper Company	Paper	Q Thu Duc	303	1997
81	Miliket Food and Cereals Enterprise	Food Processing (Noodles)	Q Thu Duc	615	1997
82	Truong Tho Milk Factory	Food Processing (Milk)	Q Thu Duc	195	1997
83	Thong Nhat Milk Factory	Food Processing (Milk)	Q Thu Duc	273	1997
84	Cofidec Congelation Enterprise	Sea Food Processing	Q Thu Duc		1997
85	3/2 Hoggery Factory	Meat Processing	Q Thu Duc	85	1994
86	Phuoc Long Hoggery Factory	Meat Processing	Q Thu Duc	69	1994

Table D.3.8 (4/4)Major Polluting Industries in the Study Area

No.	Name of Industry	Type of Industry	Location (District)	No. of Employees	Year of Survey
87	VN Sanofi Pharmacy	Pharmaceutical	Q Thu Duc	318	1997
88	JV Goldrafi Company	Wood Furniture	Q Thu Duc	187	1997
89	Cooking Oil Factory	Cooking Oil	Q Thu Duc	43	1997
90	Medical Rubber Joint Enterprise Lafrodex	Rubber Bags	Q Thu Duc	100	1997
91	Linh Xuan Exported Canned Enterprise	Soya milk	Q Thu Duc	120	1997
92	Dong Hiep Breeding Pig Farm	Piggery Farm	Q Thu Duc	77	1997
93	Duong Sanh Breeding Pig Farm	Piggery Farm	Q Thu Duc	85	1997
94	Thai Van Paper Company	Paper	Q Thu Duc	55	1997
95	First Grade Breeding Pig Farm	Piggery Farm	Q Thu Duc	200	1997
96	Binh Tien Paper Company	Paper	Q Thu Duc	15	1997
97	Lix Detergent Company	Detergent	Q Thu Duc	300	1997
98	Linh Xuan Food Enterprise	Malt	Q Thu Duc	40	1997
99	Phuong Dong Trading Co. Ltd.	Seafood Processing	Q Thu Duc	70	1997
100	Vieko Fishing Net Weaving Enterprise	Weaving & Dyeing	Q Thu Duc	230	1997
101	Chuong Duong Cocola Soft Drink Co. Ltd.	Brewery (Soft Drink)	Q Thu Duc	707	1997
102	Viet Thang Textile Co.	Textile	Q Thu Duc	350	1997
103	Linh Trung Processing Zone	Many Factories	Q Thu Duc		1997
104	Binh Chieu Industrial Park	23 Factories	Q Thu Duc		1997

Source : Overview on pollution of typical industrial areas in HCMC (Black Book, 1994) DOSTE
Overview on pollution of typical industrial areas in HCMC (Black Book, 1997) DOSTE
HCMC environmental improvement project (1998), ADB

Table D.3.9 (1/5)Wastewater Characteristics, Treatment and Disposal for Major Polluting Industries

No.	Name of Industry	Type of Industry	Waste-water Generated m3/d	Wastewater Character-istics	Waste-water Treatment	WW Discharge location
1	Vinh Hoi Tobacco Factory	Tobacco			None	Doi Canal
2	Khanh Hoi Glass Factory	Glass		COD 1180 mg/l	Oil Separating Tank	Tau Hu Canal
3	Chien Thang Exported Products Processing Enterprise	Sea Food Processing	30	BOD 560 mg/l	None	Ben Nghe canal
4	Imported – Exported and Sea Products Processing Enterprise No. 4	Sea Food Processing	160	BOD 1800 mg/l	None	Ben Nghe canal
5	Saigon Brewery Factory	Brewery		COD 460 mg/l	None	Public Sewer
6	Phuong Dong Company	Detergent		COD 208 mg/l	None	Public sewer
7	Saigon Tobacco Factory	Tobacco			None	Public Sewer
8	Cho Quan Electricity Factory	Electricity			None	Doi canal
9	Binh Tay Wine Company	Brewery		COD 6,704 mg/l	Primary sedimentation	Public Sewer (to Tau Hu Canal)
10	Viet Pho Wool Textile, Dyeing and Weaving Company	Weaving & Dyeing	70		None	Public sewer
11	Binh Tay Steel Net Company	Polishing & Plating the metal products		COD 105 – 226 mg/l	None	
12	Binh Tay Instant Noodle Company	Food Processing (Noodles)	70	COD 305 mg/l	None	Public sewer
13	Cat Tuong Private Company	Food Processing (Bread)		BOD 8500 mg/l		Public sewer
14	Hung Vuong Congelation Enterprise	Sea Food Processing	30	COD 1351 mg/l	None	Public sewer
15	Viet Phu Congealed Sea Products Company	Sea Food Processing	20	BOD 1230 mg/l	None	Public sewer
16	Congealed Sea Products Enterprise No. 3	Sea Food Processing		BOD 356 mg/l	None	Public sewer
17	Cuu Long Glass Factory	Glass	50	COD 180 mg/l	None	Doi canal
18	Giang Hung Polishing and Plating Workshop	Polishing & Plating the metal	8	Cr 29 mg/l Ni 16.7 mg/l	None	Public sewer
19	Binh Dong Wheat Powder Company	Food Processing (Wheat)	40	COD 450 mg/l	WWT	Doi canal
20	Nam Duong Sauce Enterprise	Food Processing (Sauce)	60	COD 623 mg/l	None	Doi canal

Table D.3.9 (2/5)Wastewater Characteristics, Treatment and Disposal for Major Polluting Industries

No.	Name of Industry	Type of Industry	Waste-water Generated m3/d	Wastewater Character-istics	Waste-water Treatment	WW Discharge location
21	Exported Products Processing Enterprise	Sea Food Processing	40	COD 444 mg/l	None	Doi canal
22	Congealed Sea Products Enterprise No. 4	Sea Food Processing	30	COD 1351 mg/l	None	Doi canal
23	Viet Long Congelation Enterprise	Sea Food Processing	20	COD 823 mg/l	None	Doi canal
24	Casting Factory No. 1	Cast Iron			None	Public sewer
25	Quyet Thang Textile Factory	Textile	400	COD 862 mg/l	None	Ben Cat River
26	Govap Glass Factory	Glass	100		None	Public sewer
27	Phu Dong Forest Products Producing Company	Wood Furniture	5		Septic Tank	Public sewer
28	Duc Thanh Wood Producing Company	Wood Furniture	10		Septic Tank	Public sewer
29	Thanh Cong Textile Factory	Textile	6500	COD 654 mg/L	None	Tham Luong Canal
30	Thang Loi Textile Factory	Textile	5000	COD 600 mg/l	None	Tham Luong Canal
31	Chan A Textile Factory	Textile		COD 2860 mg/l	None	Tan Hoa Canal
32	Domatex JV Enterprise	Weaving & Dyeing	200	COD 600 mg/l		Public sewer
33	Tan Binh Chemical Factory	Chemical			None	Tham Luong Canal
34	Tico Detergent Company	Detergent		COD 1720 mg/l	Sedimentation	Partly reused & remaining discharged to Tan Hoa canal
35	Bach Tuyet Cotton Factory	Cotton		COD 21000 mg/l	Primary Sedimentation	Tham Luong Canal
36	Tan Binh Stel Factory	Steel			None	Public sewer
37	Tamico JV Company	Leather	30	COD 1410 mg/l Cr 0.415 mg/l	None	Public sewer
38	Vifon Company	Food Processing		COD 750mg/l	None	Tham Luong canal
39	Vifon – Acecook JV Company	Food Processing (Noodles)	40	COD 750 mg/l	None	Tham Luong canal
40	Tan Binh Oil Factory	Food Processing (Refined Oil)	200		Only oil removal	Public sewer
41	Tuong An Oil Factory	Food Processing (Vegetable Oil)	850		Only oil removal	Tham Luong canal

Table D.3.9 (3/5)Wastewater Characteristics, Treatment and Disposal for Major Polluting Industries

No.	Name of Industry	Type of Industry	Waste-water Generated m3/d	Wastewater Character-istics	Wastewater Treatment	WW Discharge location
42	Cau Tre Exported Food Processing Factory	Sea Food Processing		COD 1442 mg/l	None	Tan Hoa canal
43	Exported Seafood Processing Company	Sea Food Processing		COD 1442 mg/l	None	Tan Hoa canal
44	Nhan Hoa Water and Sea Products Processing Company	Sea Food Processing	100	BOD 570 mg/l	None	Tan Hoa canal
45	Van Hung Sea Products Limited Company	Sea Food Processing	60	COD 920 mg/l	None	Public sewer
46	Toan Luc Rubber Factory	Rubber Tire	4		None	Public sewer
47	Seaprodex Instant Noodle Enterprise	Food Processing (Noodles)	5	COD 250 mg/l	None	Public sewer
48	Gia Dinh Textile Factory	Textile			None	Public Sewer
49	Binh Loi Blanket Weaving Company	Weaving & Dyeing			None	Public sewer
50	Binh Loi Leather Company	Leather	50	COD 1210 mg/l	None	Public sewer
51	Vissan Company	Meat Processing	1500	COD 1840 mg/l	None	Public sewer→ Saigon river
52	Duc Hoang Weaving – Dyeing – Embroider Workshop	Weaving & Dyeing	80		Chemical Treatment	Public Sewer
53	Satimex Exported Wood Producing Factory	Producing Wood	80	COD 516 mg/l		Public sewer
54	Military Zone 7 Cement Factory	Cement			None	Cho Dem river
55	Saigon Vewong JV	Food Processing	1000		PST + Pond	Saigon river
56	Orsan Sodium Glutamate Factory	Food Processing (Sodium Glutamate)	50	COD 21258 mg/l	Lime treatment	Tham Luong canal
57	Sunnimex Exported Agricultural Products Purchasing Station	Food Processing (Cashew nut)	5		None	Soil absorption well
58	Thien Huong Food Company	Food Processing (Noodles, Spices)	57	COD 632 mg/l	None	Tham Luong canal
59	Binh Dien Cement Factory	Cement			None	CHO Dem river
60	Binh Hung Hoa Crematory	Corpses			None	
61	Tan Thuan Antiseptic Factory	Chemical	20	COD 297 mg/l	Primary Sedimentation	On Chon Canal
62	Saigon Insecticide Factory	Insecticide	20	COD 375 mg/l	Sedimentation	Ong Chon Canal
65	Trung Viet Food Processing Workshop	Food Processing (Fruit Juices)	60	BOD 175 mg/l	None	Saigon river

Table D.3.9 (4/5)Wastewater Characteristics, Treatment and Disposal for Major Polluting Industries

No.	Name of Industry	Type of Industry	Waste-water Generated m3/d	Wastewater Character-istics	Wastewater Treatment	WW Discharge location
66	Golden Hope JV Company	Food Processing (Refined Oil)	240	COD 202 mg/l	Only oil removal	Saigon river
67	Viet Thang Textile Factory	Textile	5000	COD 565 mg/l	None	Suoi Canal
68	Phuc Long Textile Factory	Textile	1800	COD 486 mg/L	Septic Tank (DS)	Rach Chiec Canal
69	Phong Phu Textile Factory	Textile	3600	COD 480 mg/l	Septic Tank (DS) Settling Tanks out of order	Rach Chiec Canal
70	Dong Phuong Knitting Company	Weaving & Dyeing	400 – 800	COD 980 – 8500 mg/l	None	Public Sewer
71	Binh Trieu Antiseptic Factory	Chemical	15	COD 280 mg/l	Biological and Chemical Treatment	Mon Canal
72	Viso Detergent Company	Detergent	180	COD 57 mg/l	Sedimentation	Treated WW reused
73	Thu Duc Steel Factory	Steel			Primary sedimentation	Chiec canal
74	Thu Du Electricity Factory	Electricity			None	Saigon river
75	Ha Tien Cement Co No. 1	Cement			None	Saigon river
76	Binh Tan Consumer Goods Producing Company	Rubber Foot Wear	200	BOD 220 mg/l	None	Public sewer
77	Vinh Hue Paper Company	Paper	3,700	COD 1200 mg/l	None	Cai spring → Dong Nai river
78	Xuan Duc Paper Factory	Paper	250	COD 1425 mg/l	None	Suoi Cai
79	Liksin Paper Company	Paper	3000	COD 1850 mg/l	None	Chiec canal
80	Linh Xuan Paper Company	Paper	1000	COD 1850 mg/l	None	Suoi Cai
81	Miliket Food and Cereals Enterprise	Food Processing (Noodles)	120	BOD 165 mg/l	None	Public sewer
82	Truong Tho Milk Factory	Food Processing (Milk)	650	COD 735 mg/l	None	Truong Tho
83	Thong Nhat Milk Factory	Food Processing (Milk)	800	BOD 430 mg/l	None	Stream
84	Cofidec Congelation Enterprise	Sea Food Processing	90	BOD 162 mg/l	None	Ditch
85	3/2 Hoggery Factory	Meat Processing	300	COD 2215 mg/l	PST	Suoi Cat canal
86	Phuoc Long Hoggery Factory	Meat Processing	400	COD 6570 mg/l	PST	Chiec canal
87	VN Sanofi Pharmacy	Pharmaceutical	115	COD 350 mg/l	None	Truong Tho

Table D.3.9 (5/5)Wastewater Characteristics, Treatment and Disposal for Major Polluting Industries'

No.	Name of Industry	Type of Industry	Waste-water Generated m3/d	Wastewater Character-istics	Wastewater Treatment	WW Discharge location
88	JV Goldrafi Company	Wood Furniture	17			Suoi Cai
89	Cooking Oil Factory	Cooking Oil		COD 220 mg/l	None	Suoi Cai
90	Medical Rubber Joint Enterprise Lafrodex	Rubber Bags	200	COD 560 mg/l	None	Suoi Cai
91	Linh Xuan Exported Canned Enterprise	Soya milk	205	COD 1600 mg/l	None	Suoi Cai
92	Dong Hiep Breeding Pig Farm	Piggery Farm	25	COD 3000 mg/l	None	Suoi Cai
93	Duong Sanh Breeding Pig Farm	Piggery Farm	195	COD 3000 mg/l	None	Suoi Cai
94	Thai Van Paper Company	Paper	1000	COD 2000 mg/l	None	Truong Tho
95	First Grade Breeding Pig Farm	Piggery Farm	500	COD 288 mg/l	None	Suoi Cai
96	Binh Tien Paper Company	Paper	500	COD 1500 mg/l	None	Suoi Cai
97	Lix Detergent Company	Detergent	120	COD 50 mg/l	WWT	Suoi Cai
98	Linh Xuan Food Enterprise	Malt	1200		None	Suoi Cai
99	Phuong Dong Trading Co. Ltd.	Seafood Processing	30	COD 50 mg/l	WWT	Suoi Cai
100	Vieko Fishing Net Weaving Enterprise	Weaving & Dyeing	30	COD 1200 mg/l	None	Suoi Cai
101	Chuong Duong Cocola Soft Drink Co. Ltd.	Brewery (Soft Drink)	1000	COD 550 mg/l	WWT	Suoi Cai
102	Viet Thang Textile Co.	Textile	350	COD 1200 mg/l	None	Truong Tho
103	Linh Trung Processing Zone	Many Factories			WWT Under Construc-tion	
104	Binh Chieu Industrial Park	23 Factories			WWT Capcacity 1000 m3/d	

DS Domestic Sewage
PST Primary Sedimentation Tank
WWT. Wastewater Treatment

Source : Overview on pollution of typical industrial areas in HCMC (Black Book, 1994) DOSTE
Overview on pollution of typical industrial areas in HCMC (Black Book, 1997) DOSTE
HCMC environmental improvement project (1998), ADB

Table D.3.10 (1/2)Location of Water Quality Survey

Survey Item	Location	No of Samples				Type of Sample
		Dry Season		Rainy Season		
		Low Tide	High Tide	Low Tide	High Tide	
A Water Quality of Rivers						
A1 Saigon						
A1.1Saigon (upstream) at Ba Thon	Starting Point of Study Area	1	1	1	1	G*
A1.2 Saigon at Tan Thuan reach	The point where Kinh Te joins Saigon River	1	1	1	1	G
A1.3 Saigon at Thanh Da	The point where Canal Thanh Da joins Saigon river	1	1	1	1	G
A2 Dong Nai						
A2.1 Dong Nai at Hoa An bridge	From water intake of Water treatment plant	1	1	1	1	G
B Water Quality of Canals						
B1 Nhieu loc – Thi Nghe						
B1.1 Thi Nghe canal at Ba Son bridge	The point before discharging to Saigon River	1	1	1	1	G
B1.2 Thi Nghe at Cong ly bridge	At Cong ly bridge	1	1	1	1	G
B2 Ben Nghe – Tau hu – Ben Nghe						
B2.1 Ben Nghe at Khanh Hoi bridge	The point before discharging to Saigon River	1	1	1	1	G
B2.2 Tau hu at Y bridge	The point where Tau hu canal and Doi canal meet	1	1	1	1	G
B3 Doi – Te						
B3.1 Te at Tan Thuan bridge	The point before discharging to Saigon River	1	1	1	1	G
B3.2 Doi at Nhi Thien Duong bridge	At Nhi Thien Duong bridge	1	1	1	1	G
B4 Tan Hoa – Lo Gom						
B4.1 Tan Hoa at Tan Hoa street	The point where Tan Hoa street cosses the canal	1	1	1	1	G
B4.2 Lo Gom at Tran Van Kieu street	The point where Lo Gom intersects with Ben Nghe	1	1	1	1	G
B5 Ong Lon – Cay Kho						
B5.1 Ong Lon	The point where Ong Nho Canal joins Ong Lon canal	1	1	1	1	G
B6 Cau Kinh – Vinh Binh						
B6.1 Ving Binh at Ving Binh bridge	At Vinh Binh bridge	1	1	1	1	G

Table D.3.10 (2/2)Location of Water Quality Survey

Survey Item	Location	No of Samples				Type of Sample
		Dry Season		Rainy Season		
		Low Tide	High Tide	Low Tide	High Tide	
B7 Tham Luong -- Vam Thuat						
B7.1 Vam Thuat	The point before discharging to Saigon River	1	1	1	1	G
B7.2 Vam Thuat at Ben Phan bridge	The point where Ben Cat river joins vam Thuat canal	1	1	1	1	G
B7.3 Tham Luong at Cho Cau bridge	At Cho Cau bridge	1	1	1	1	G
B8 Nuoc Len						
B8.1 Nuoc Len at An Lac bridge	The point where Nuoc Len discharges to Canal Cho Dem	1	1	1	1	G
B9 Ben Luc						
B9.1 Ben Luc	T joint with Kenh Sang and Ben Luc	1	1	1	1	G
.0 Suoi Cai – Nhum						
B10.1 Suoi Cai at Linh Trung ward	The point where Suoi Cau da discharges to Nhum canal	1	1	1	1	G

G* : Grab sample

Table D.3.11 Analytical Methods Used for Water Quality Analysis

S. No	Water Quality Parameter	Analytical Method
1	Temperature C	Mercury Thermometer
2	PH	PH meter (WTW -- Germany)
3	DO, mg/l	Winkler, Azide Modification
4	BOD5, mg/l	Dilution and Winkler, Azide Modification
5	COD, mg/l	Dichromate Reflux method
6	SS, mg/l	Total Non-filtrable Residue at 103-105 C
7	Total Nitrogen (T-N), mg/l	Persulfate Oxidation and Nitrate Determination
8	Total Phosphorus (T-P), mg/l	Persulfate Oxidation and Phosphate Determination
9	Total Coliform, MPN/100ml	Multiple Tubes Fermentation Method
10	Fecal Coliform, MPN/100ml	Multiple Tubes Fermentation Method
11	SO4 (-2) (mg/l)	Turbidity with BaCl2 for saline water and ion chromotography for fresh water samples
12	Chloride (Cl-), mg/l	Ion chromatography fo fresh water samples and titration with Hg(NO3)2 for other waters
13	Cadmium, µg/l	Atomic Absorption Spectrometric Method
14	Lead, µg/l	Atomic Absorption Spectrometric Method
15	Hexavalent Chromiun (Cr6+), µg/l	Atomic Absorption Spectrometric Method
16	Arsenic (As), µg/l	Atomic Absorption Spectrometric Method
17	Total Mercury (Hg), µg/l	Atomic Absorption Spectrometric Method

Table D.3.12 Location of Samples for River/Canal Bed Deposit

Survey Item	Location	Number of Samples (Dry Season)	Type of Sample
A Characteristics of River bed Deposits			
A1 Saigon			
A1.1Saigon (upstream) at Ba Thon	Starting Point of Study Area	1	G*
A1.2 Saigon at Tan Thuan reach	The point where Kinh Te joins Saigon River	1	G
A1.3 Saigon at Thanh Da	The point where Canal Thanh Da joins Saigon river	1	G
A2 Dong Nai			
A2.1 Dong Nai at Hoa An bridge	From water intake of water treatment plant	1	G
B Characteristics of Canal Bed deposit			
B1 Nhieu loc – Thi Nghe			
B1.1 Thi Nghe canal at Ba Son bridge	The point before discharging to Saigon River	1	G
B1.2 Thi Nghe at Cong ly bridge	At Cong ly bridge	1	G
B2 Ben Nghe – Tau hu – Ben Nghe			
B2.1 Ben Nghe at Khanh Hoi bridge	The point before discharging to Saigon River	1	G
B2.2 Tau hu at Y bridge	The point where Tau hu canal and Doi canal meet	1	G
B3 Doi – Te			
B3.1 Te at Tan Thuan bridge	The point before discharging to Saigon River	1	G
B3.2 Doi at Nhi Thien Duong bridge	At Nhi Thien Duong bridge	1	G
B4 Tan Hoa – Lo Gom			
B4.1 Tan Hoa at Tan Hoa street	The point where Tan Hoa street cosses the canal	1	G
B4.2 Lo Gom at Tran Van Kieu street	The point where Lo Gom intersects with Ben Nghe	1	G
B5 Ong Lon – Cay Kho			
B5.1 Ong Lon	The point where Ong Nho Canal joins Ong Lon canal	1	G
B6 Cau Kinh – Vinh Binh			
B6.1 Ving Binh at Ving Binh bridge	At Vinh Binh bridge	1	G
B7 Tham Luong – Vam Thuat			
B7.1 Vam Thuat	The point before discharging to Saigon River	1	G
B7.2 Vam Thuat at Ben Phan bridge	The point where Ben Cat river joins vam Thuat canal	1	G
B7.3 Tham Luong at Cho Cau bridge	At Cho Cau bridge	1	G
B8 Nuoc Len			
B8.1 Nuoc Len at An Lac bridge	The point where Nuoc Len discharges to Canal Cho Dem	1	G
B9 Ben Luc			
B9.1 Ben Luc	T joint with Kenh Sang and Ben Luc	1	G
B10 Suoi Cai – Nhum			
B10.1 Suoi Cai at Linh Trung ward	The point where Suoi Cau da discharges to Nhum canal	1	G

G* : Grab sample

Table D.3.13 Water Quality of Rivers (Rainy Season)

Parameter	Saigon River						Dong Nai River	
	At Ba Thon		At Thanh Da		At Tan Thuan Reach		At Hoa An Bridge	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	28.6	30.0	28.3	29.9	27.9	29.9	27.7	30.1
PH	4.5	4.6	6.1	5.9	6.2	6.0	6.7	6.6
DO, mg/l	6.3	6.0	2.8	3.8	3.3	1.3	6.5	6.9
Conductivity, mS/m	7.1	7.2	22.9	13.8	54.0	27.5	3.7	3.5
BOD5, mg/l	10.0	9.0	58.0	61.0	75.0	211.0	7.0	8.2
COD, mg/l	38.0	44.0	144.0	135.0	124.0	261.0	16.0	11.0
Total Solids, mg/l	9.0	8.0	32.0	69.0	41.0	101.0	31.0	60.0
Total Nitrogen (T-N), mg/l	0.9	0.7	1.4	1.3	1.7	1.9	0.8	0.9
Total Phosphorus (T-P), mg/l	0.07	0.06	0.09	0.06	0.08	0.1	0.05	0.06
Total Coliform, MPN/100 ml	9.30E+05	4.60E+06	9.30E+04	1.10E+07	9.00E+02	4.30E+03	2.10E+04	2.10E+03
Fecal Coliform, MPN/100ml	1.50E+04	9.00E+04	7.00E+02	1.50E+04	7.00E+01	9.00E+02	1.50E+03	9.00E+02
$SO_4^{(-2)}$, mg/l	13.4	13.3	23.5	12.9	26.8	23.0	3.1	6.3
Chloride (Cl^-), mg/l	5.5	7.3	38.5	17.7	105.1	42.8	1.7	1.7
Cadmium, µg/l	<1	<1	2.8	1.6	1.6	1.3	2.7	1.8
Lead, µg/l	2.2	<2	<2	<2	<2	<2	<2	2.3
Hexavelent Chromium Cr^{6+}, µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Arsenic (As), µg/l	0.2	0.4	<0.2	0.9	0.7	1.0	<0.2	1.1
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.14 Water Quality of Rivers (Early Dry Season)

Parameter	Saigon River						Dong Nai River	
	At Ba Thon		At Thanh Da		At Tan Thuan Reach		At Hoa An Bridge	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	27.5	28.0	26.9	27.5	26.1	27.0	27.0	29.0
PH	5.1	4.7	6.3	6.2	6.4	6.3	7.0	7.0
DO, mg/l	7.2	7.0	6.8	7.0	7.2	3.6	6.2	6.0
Conductivity, mS/m	6.0	5.6	10.3	9.4	8.3	10.8	3.8	4.3
BOD5, mg/l	7.0	8.0	19.0	29.0	28.0	52.0	5.0	9.0
COD, mg/l	40.0	42.0	39.0	45.0	56.0	90.0	43.0	42.0
Total Solids, mg/l	2.0	8.0	38.0	26.0	21.0	21.0	94.0	60.0
Total Nitrogen (T-N), mg/l	0.41	0.4	1.3	0.9	0.6	0.8	0.3	0.3
Total Phosphorus (T-P), mg/l	0.21	0.3	0.4	0.6	0.4	0.5	0.2	0.2
Total Coliform, MPN/100 ml	9.30E+04	4.60E+06	1.50E+05	1.10E+07	1.50E+05	1.10E+07	1.50E+05	2.10E+06
Fecal Coliform, MPN/100ml	4.30E+04	4.30E+05	2.00E+04	4.60E+06	2.00E+04	2.80E+05	2.10E+04	9.30E+05
$SO_4^{(-2)}$, mg/l	13.3	12.5	15.1	15.4	9.6	14.4	1.8	1.2
Chloride (Cl^-), mg/l	7.3	6.8	13.8	11.5	11.3	15.4	3.8	3.4
Cadmium, µg/l	4.3	3.6	3.7	4.1	2.8	3.2	2.2	2.8
Lead, µg/l	<2	2	<2	<2	<2	<2	<2	4
Hexavelent Chromium Cr^{6+}, µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Arsenic (As), µg/l	0.2	0.4	<0.2	0.9	0.7	1.0	<0.2	1.1
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.15 (1/3)Water Quality of Canals/1 (Rainy Season) .

Parameter	Tan Hoa – Lo Gom Canal				Tham Luong – Vam Thuat Canal					
	Tan Hoa at Tan Hoa Street		Lo Gom at Tran Van Kieu street		Tham Luong at Cho Cau Bridge		Vam Thuat at Ben Phan Bridge		Vam Thuat at Vam Thuat	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	28.4	30.0	28.5	29.7	28.2	30.1	29.7	29.6	28.6	29.6
PH	5.9	5.8	6.5	6.3	6.5	6.6	5.4	6.5	5.3	6.4
DO, mg/l	0.0	0.0	0.0	0.0	0.7	1.0	3.5	2.1	4.3	3.0
Conductivity, mS/m	104.0	125.0	310.0	152.0	30.0	27.0	10.0	29.0	13.0	27.0
BOD5, mg/l	326.0	536.0	309.0	320.0	152.0	181.0	64.0	143.0	31.0	82.0
COD, mg/l	1456.0	988.0	1279.0	1528.0	310.0	240.0	98.0	260.0	46.0	124.0
Total Solids, mg/l	1420.0	272.0	33.0	104.0	32.0	98.0	36.0	90.0	45.0	210.0
Total Nitrogen (T-N), mg/l	38.2	46.2	11.3	31.6	4.8	2.0	1.4	10.8	1.4	15.4
Total Phosphorus (T-P), mg/l	2.0	2.9	0.8	1.8	0.6	0.2	0.1	0.7	0.1	0.79
Total Coliform, MPN/100 ml	1.10E+07	1.50E+07	4.60E+06	1.10E+07	1.10E+07	1.50E+07	1.50E+06	2.10E+06	9.30E+05	1.20E+06
Fecal Coliform, MPN/100ml	1.50E+06	2.10E+05	1.50E+05	1.50E+06	1.50E+06	2.10E+06	9.30E+04	1.10E+06	1.50E+04	1.10E+06
$SO_4^{(-2)}$, mg/l	32.4	46.0	109.9	24.9	21.4	19.0	16.1	17.5	16.2	20.7
Chloride (Cl^-), mg/l	117.5	159.1	802.9	229.7	33.7	26.6	12.5	34.3	32.5	179.9
Cadmium, µg/l	<1	<1	<1	<1	<1	<1	1.1	<1	2.4	6.4
Lead, µg/l	2.6	5	<2	3.3	4.2	<2	<2	2	<2	<2
Hexavelent Chromium Cr^{6+}, µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Arsenic (As), µg/l	1.8	2.1	1.1	1.0	0.9	0.6	0.5	0.9	0.5	1.4
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.15 (2/3) Water Quality of Canals/2 (Rainy Season)

Parameter	Nhieu Loc – Thi Nghe Canal				Tau Hu – Doi - Te Canal					
	Thi Nghe at Ba Son Bridge		Thi Nghe at Cong Ly Bridge		Tau Hu at Y Bridge		Doi at Nhi Thien Duong Bridge		Te at Tan Thuan Bridge	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	28.5	29.8	27.6	30.0	28.4	29.9	28.7	29.9	28.2	30.1
PH	6.2	6.5	6.6	6.7	6.7	6.6	6.8	6.6	6.2	6.4
DO, mg/l	5.8	0.0	0.4	0.0	2.8	0.0	2.6	2.7	3.4	2.1
Conductivity, mS/m	24.0	52.0	60.0	3.7	306.0	331.0	313.0	335.0	57.0	155.0
BOD5, mg/l	14.0	174.0	165.0	208.0	151.0	251.0	90.0	82.0	40.0	109.0
COD, mg/l	28.0	234.0	208.0	239.0	249.0	400.0	126.0	180.0	100.0	207.0
Total Solids, mg/l	23.0	76.0	118.0	150.0	70.0	216.0	115.0	300.0	48.0	90.0
Total Nitrogen (T-N), mg/l	1.4	13.2	16.3	20.9	2.0	11.2	2.5	3.3	2.1	2.3
Total Phosphorus (T-P), mg/l	0.1	1.3	1.7	2.0	0.1	0.6	0.1	0.2	0.2	0.1
Total Coliform, MPN/100 ml	9.30E+04	1.10E+07	1.10E+06	1.10E+07	1.50E+06	2.10E+06	2.10E+06	1.10E+07	1.10E+03	9.30E+03
Fecal Coliform, MPN/100ml	4.00E+02	4.30E+04	7.00E+02	9.00E+03	9.30E+04	2.10E+05	9.30E+04	1.50E+05	2.80E+02	1.50E+03
$SO_4^{(-2)}$, mg/l	18.3	12.8	14.5	13.5	81.1	97.4	86.4	92.1	27.3	52.3
Chloride (Cl^-), mg/l	54.7	81.7	82.7	70.3	769.6	782.1	823.6	844.4	117.5	533.0
Cadmium, µg/l	1.3	1.5	<1	<1	<1	<1	<1	1.0	1.4	2.5
Lead, µg/l	<2	2.2	<2	2	<2	<2	<2	2	4.4	2
Hexavelent Chromium Cr^{6+}, µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.004	<0.04	<0.04
Arsenic (As), µg/l	<0.2	2.0	<0.2	1.5	0.9	0.3	0.7	<0.2	0.7	0.8
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.15 (3/3)Water Quality of Canals/3 (Rainy Season)

Parameter	Ben Nghe at Khanh Hoi Bridge		Ong Lon at Ong Lon		Vinh Binh at Vinh Binh Bridge		Nuoc Len at An Lac Bridge		Ben Luc at Ben Luc		Suoi Cai at Linh Trung Ward	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	27.9	29.9	28.1	29.7	27.9	29.9	28.7	30.2	28.8	30.2	28.3	30.0
PH	6.1	6.4	6.6	6.6	5.3	5.9	6.8	6.7	6.7	6.4	6.6	6.5
DO, mg/l	2.6	0.2	4.0	0.0	3.1	2.4	3.7	2.4	2.3	2.6	1.9	1.2
Conductivity, mS/m	38.0	214.0	289.0	327.0	5.7	12.0	373.0	316.0	355.00	251.0	36.0	42.0
BOD5, mg/l	81.0	157.0	80.0	252.0	29.0	79.0	47.0	67.0	108.0	120.0	102.0	127.0
COD, mg/l	200.0	211.0	123.0	320.0	58.0	155.0	106.0	157.0	162.0	172.0	270.0	250.0
Total Solids, mg/l	11.0	41.0	80.0	262.0	15.0	56.0	201.0	372.0	35.0	118.0	94.0	130.0
Total Nitrogen (T-N),mg/l	1.6	10.4	1.3	9.5	0.7	1.2	2.6	2.9	2.3	1.6	6.3	10.3
Total Phosphorus (T-P), mg/l	0.1	0.9	0.1	0.6	0.04	0.1	0.07	0.09	0.08	0.07	0.9	1.8
Total Coliform, MPN/100 ml	9.0E+02	9.3E+03	9.3E+03	1.5E+04	7.5E+02	1.5E+03	1.1E+07	1.2E+07	4.6E+06	1.1E+07	2.1E+05	1.1E+07
Fecal Coliform, MPN/100ml	2.1E+02	5.7E+03	1.5E+03	2.8E+03	7.5E+02	9.0E+02	2.1E+06	2.1E+06	1.5E+06	1.5E+06	4.3E+03	1.5E+04
$SO_4^{(--)}$, mg/l	26.9	317.3	96.0	118.1	7.5	17.1	127.2	121.9	116.2	125.8	9.5	12.7
Chloride (Cl^-), mg/l	123.1	520.4	545.4	802.9	11.5	14.2	998.1	574.4	885.9	595.2	17.3	17.9
Cadmium, µg/l	2.7	3.8	<1	<1	1.8	1.3	3.2	<1	<1	1.4	3.0	2.3
Lead, µg/l	<2	2.2	<2	<2	<2	<2	<2	<2	<2	2.3	<2	3.5
Hexavelent Chromium (Cr^{6+}),µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Arsenic (As), µg/l	0.6	2.8	0.3	1.5	0.7	1.0	0.6	<0.2	<0.2	0.7	<0.2	2.1
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.16 (1/3)Water Quality of Canals/1 (Early Dry Season)

Parameter	Tan Hoa – Lo Gom Canal				Tham Luong – Vam Thuat Canal					
	Tan Hoa at Tan Hoa Street		Lo Gom at Tran Van Kieu street		Tham Luong at Cho Cau Bridge		Vam Thuat at Ben Phan Bridge		Vam Thuat at Vam Thuat	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	28.5	32.0	27.0	28.0	28.0	27.9	28	28.1	28.0	28.2
PH	6.3	6.3	6.7	6.7	6.5	6.7	6.5	6.6	6.1	6.5
DO, mg/l	0.0	0.0	2.2	1.8	3.5	2.9	5.3	3.7	7.4	5.9
Conductivity, mS/m	118.0	139.2	70.4	78.3	22.8	31.0	15.0	25.0	10.0	24.0
BOD5, mg/l	409.0	500.0	82.0	151.0	71.0	93.0	35.0	77.0	24.0	39.0
COD, mg/l	780.0	1178.0	204.0	253.0	148.0	175.0	8.0	144.0	110.0	85.0
Total Solids, mg/l	54.0	420.0	82.0	140.0	12.0	46.0	57.0	71.0	14.0	28.0
Total Nitrogen (T-N), mg/l	32.3	41.0	3.9	4.3	1.1	1.3	1.0	1.5	0.8	1.3
Total Phosphorus (T-P), mg/l	5.9	16.1	2.8	1.6	1.5	1.8	0.9	1.9	0.6	1.8
Total Coliform, MPN/100 ml	2.10.E+06	1.10.E+07	2.10E+05	9.30E+05	1.10E+06	2.10E+06	4.60E+06	1.50E+05	1.10E+06	1.10E+07
Fecal Coliform, MPN/100ml	2.00.E+05	2.00.E+05	9.30E+03	4.00E+05	7.00E+03	9.30E+05	1.50E+05	4.30E+04	4.30E+04	2.10E+05
$SO_4^{(-2)}$, mg/l	61.9	63.4	43.5	38.1	15.1	37.4	18.9	24.7	16.2	22.0
Chloride (Cl^-), mg/l	153.3	181.1	130.4	143.7	30.1	31.2	18.5	31.6	12.4	31.2
Cadmium, µg/l	0.0	0.0	0.5	0.0	4.6	3.6	3.2	2.9	5.2	4.3
Lead, µg/l	<2	<2	<2	3	2.3	<2	<2	<2	2	2
Hexavelent Chromium Cr^{6+}, µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Arsenic (As), µg/l	1.8	2.1	1.1	1.0	0.9	0.6	0.5	0.9	0.5	1.4
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.16 (2/3)Water Quality of Canals/2 (Early Dry Season)

Parameter	Nhieu Loc – Thi Nghe Canal				Tau Hu – Doi - Te Canal					
	Thi Nghe at Ba Son Bridge		Thi Nghe at Cong Ly Bridge		Tau Hu at Y Bridge		Doi at Nhi Thien Duong Bridge		Te at Tan Thuan Bridge	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	26.8	27.2	27.1	28.2	26.3	28.0	26.5	28.0	26.1	27.0
PH	6.4	6.9	6.8	6.9	6.8	6.8	6.9	6.7	6.6	6.9
DO, mg/l	5.7	3.2	1.3	0.8	4.6	1.9	3.8	4.5	5.2	4.0
Conductivity, mS/m	12.4	53.3	59.1	61.1	41.0	64.0	50.0	63.0	8.9	40.0
BOD5, mg/l	13.0	48.0	120.0	138.0	84.0	124.0	43.0	59.0	28.0	68.0
COD, mg/l	40.0	86.0	170.0	196.0	125.0	200.0	94.0	119.0	66.0	94.0
Total Solids, mg/l	14.0	25.0	42.0	237.0	67.0	92.0	106.0	122.0	6.0	84.0
Total Nitrogen (T-N), mg/l	1.2	8.9	10.0	10.6	1.9	3.1	2.6	1.4	0.7	2.6
Total Phosphorus (T-P), mg/l	0.7	1.3	1.4	6.5	1.1	2.5	2.2	1.2	0.4	2.1
Total Coliform, MPN/100 ml	2.10E+05	1.10E+06	1.20E+05	1.50E+06	1.10E+06	1.50E+06	4.60E+5	4.30E+04	1.50E+05	2.10E+06
Fecal Coliform, MPN/100ml	2.10E+04	9.30E+04	2.00E+04	1.50E+05	2.00E+04	5.70E+05	9.30E+04	4.30E+03	1.50E+04	2.00E+05
$SO_4^{(-2)}$, mg/l	16.3	15.8	16.9	16.0	25.0	43.1	30.7	44.9	11.0	25.4
Chloride (Cl^-), mg/l	17.4	63.1	73.3	71.4	78.0	120.6	91.0	125.0	12.2	69.6
Cadmium, µg/l	2.6	3.1	1.9	1.6	2.9	2.1	3.7	2.5	0.0	0.0
Lead, µg/l	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Hexavelent Chromium Cr^{6+}, µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Arsenic (As), µg/l	<0.2	2.0	<0.2	1.5	0.9	0.3	0.7	<0.2	0.7	0.8
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.16 (3/3)Water Quality of Canals/3 (Early Dry Season)

Parameter	Ben Nghe at Khanh Hoi Bridge		Ong Lon at Ong Lon		Vinh Binh at Vinh Binh Bridge		Nuoc Len at An Lac Bridge		Ben Luc at Ben Luc		Suoi Cai at Linh Trung Ward	
	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide	High Tide	Low Tide
Temperature, C	26.0	28.5	26.0	27.5	27.2	28.1	26.9	27.9	26.0	27.9	27.2	28.0
PH	6.7	6.9	6.8	6.8	5.8	6.1	6.7	6.7	6.7	6.4	6.8	8.6
DO, mg/l	3.4	0.6	4.5	1.8	7.2	6.9	5.6	3.3	5.4	6.4	4.3	2.1
Conductivity, mS/m	30.0	57.0	32.6	63.7	7.2	12.4	59.0	54.0	58.0	55.0	37.0	99.0
BOD5, mg/l	50.0	104.0	50.0	95.0	11.0	35.0	25.0	38.0	31.0	37.0	35.0	119.0
COD, mg/l	98.0	176.0	82.0	153.0	54.0	95.0	65.0	84.0	72.0	86.0	126.0	250.0
Total Solids, mg/l	33.0	38.0	40.0	232.0	12.0	6.0	62.0	168.0	27.0	67.0	111.0	62.0
Total Nitrogen (T-N), mg/l	1.5	8.0	1.3	3.4	0.6	1.0	1.3	2.7	1.0	1.1	5.50	10.2
Total Phosphorus (T-P), mg/l	1.6	6.2	1.2	2.4	0.4	1.0	0.9	2.1	0.5	0.6	2.4	14.9
Total Coliform, MPN/100 ml	1.10E+06	1.10E+06	1.10E+07	2.10E+06	1.10E+06	9.30E+05	1.10E+07	2.10E+06	9.30E+04	1.50E+06	1.10E+06	1.10E+07
Fecal Coliform, MPN/100ml	5.70E+04	1.50E+05	1.50E+05	5.70E+05	2.00E+04	1.50E+05	1.10E+05	2.10E+05	7.00E+03	1.50E+06	2.00E+04	2.80E+05
$SO_4^{(-2)}$, mg/l	19.0	22.1	24.3	41.2	15.3	21.2	42.1	37.9	44.3	45.9	17.2	26.7
Chloride (Cl^-), mg/l	49.0	74.3	60.4	118.2	9.1	16.9	136.8	104.6	115.1	111.8	22.6	33.4
Cadmium, µg/l	3.7	4.1	4.3	4.7	3.9	4.5	3.5	4.3	2.8	3.4	4.6	3.9
Lead, µg/l	<2	<2	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Hexavelent Chromium (Cr^{6+}), µg/l	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Arsenic (As), µg/l	0.6	2.8	0.3	1.5	0.7	1.0	0.6	<0.2	<0.2	0.7	<0.2	2.1
Total Mercury (Hg), µg/l	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

Table D.3.17 Bed Characteristics of Rivers

Parameter	Saigon River			Dong Nai River
	At Ba Thon	At Thanh Da	At Tan Thuan Reach	At Hoa An Bridge
Aluminium (Al), mg/kg	81,000	53,000	61,000	79,000
Copper (Cu), mg/kg	75.52	39.82	23.91	46.11
Cadmium (Cd), mg/kg	0.37	0.32	2.71	2.62
Lead (Pb), mg/kg	44.91	56.92	48.71	44.11
Mercury (Hg), mg/kg	0.81	1.31	0.72	0.41
Alkyl Mercury (R2Hg) mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chromium (Cr) mg/kg	108.39	111.39	112.88	154.03
Zinc (Zn), mg/kg	194.37	502.72	187.52	98.49
Cyanide (Cn), mg/kg	< 0.005	< 0.005	< 0.005	< 0.005
Arsenic (As), mg/kg	15.44	15.54	13.94	10.27
Total P, mg/kg	1,000	1,300	410	370
PCB, µg/kg	19.77	65.53	21.87	129.33

Table D.3.18 (1/2)Bed Characteristics of Canals/1

Parameter	Tan Hoa – Lo Gom		Tham Luong – Vam Thuat			Nhieu Loc – Thi Nghe	
	Tan Hoa at Tan Hoa street	Lo Gom at Tran Van Kieu street	Tham Luong at Cho Cau bridge	Vam Thuat at Ben Phan bridge	Vam Thuat at Vam Thuat	Thi Nghe at Ba Son bridge	Thi Nghe at Cong Ly bridge
Aluminium (Al), mg/kg	59,000	53,000	94,700	111,000	116,000	61,000	74,000
Copper (Cu), mg/kg	51.37	147.02	41.82	20.63	32.81	114.62	210.01
Cadmium (Cd), mg/kg	1.98	1.33	2.29	0.41	0.38	0.32	1.99
Lead (Pb), mg/kg	178.8	112.8	47.26	58.46	45.49	57.71	119.6
Mercury (Hg), mg/kg	1.01	0.85	12.56	0.61	0.12	0.71	2.21
Alkyl Mercury (R_2Hg) mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chromium (Cr) mg/kg	234.47	335.8	141.21	111.17	95.81	77.26	148.72
Zinc (Zn), mg/kg	2140.99	1840.69	332.46	295.35	102.72	218.24	2306.59
Cyanide (Cn), mg/kg	0.014	0.018	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Arsenic (As), mg/kg	22.11	15.48	9.59	15.55	14.16	17.83	15.85
Total P, mg/kg	1,500	2,300	620	1,700	310	530	3,200
PCB, mg/kg	537.21	642.6	226.22	35.07	116.20	131.05	920.59

Table D.3.18 (2/2)Bed Characteristics of Canals/2 .

Parameter	Tau Hu – Doi - Te			Ben Nghe	Ong Lon	Vinh Binh	Nuoc Len	Ben Luc	Suoi Cai
	Tau Hu at Y bridge	Doi at Nhi Thien Duong bridge	Te at Tan Thuan bridge	At Khanh Hoi bridge	At Ong Lon	At Vinh Binh bridge	At An Loc bridge	At Ben Luc	At Linh Trung Ward
Aluminium (Al), mg/kg	68,000	108,000	79,000	102,000	123,000	95,000	99,000	97,000	97,000
Copper (Cu), mg/kg	158.91	100.64	34.68	65.61	96.56	49.12	34.04	43.32	57.63
Cadmium (Cd), mg/kg	2.63	2.45	0.32	0.37	4.32	3.51	2.11	2.21	2.71
Lead (Pb), mg/kg	81.56	62.91	65.91	57.32	62.73	43.02	57.42	84.58	65.39
Mercury (Hg), mg/kg	0.42	1.62	1.22	1.32	1.07	0.32	0.69	1.11	0.25
Alkyl Mercury (R_2Hg) mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chromium (Cr) mg/kg	125.35	171.18	99.71	130.61	156.16	86.69	116.26	104.96	47.15
Zinc (Zn), mg/kg	389.61	694.97	322.27	1303.45	852.29	146.46	256.96	7181.42	137.86
Cyanide (Cn), mg/kg	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.023	< 0.005
Arsenic (As), mg/kg	12.81	12.95	12.06	15.01	15.11	10.91	12.28	14.71	3.93
Total P, mg/kg	210	690	1,100	1,000	230	370	1,000	670	160
PCB, µg/kg	38.00	539.5	47.74	73.89	86.00	43.54	26.73	44.1	86.24

Table D.3.19 Regulation Standards for Heavy Metals in the Sediments to be usedon land or for agricultural purpose

Parameter	Japanese Standard*	EU Directive*	Netherlands Standard#	Italy Standard*
Cu (mg/kg)		1000-1750	75	1000
Cd (mg/kg)	5	20-40	1.25	20
Pb (mg/kg)		750-1200	100	750
Hg (mg/kg)	2	16-25	0.75	10
Cr (mg/kg)			75	
Zn (mg/kg)			300	2500
As (mg/kg)	50			

* to be used for agricultural purpose
# to be used on land

Table D.4.1 Number of Ground Water Wells managed by Dept. of Industry and Withdrawal Capacity in Each District

District	Number of wells	Withdrawl capacity (m3/day)
Q1	45	9,236.00
Q2	478	2,418.20
Q3	1,615	5,301.00
Q4	19	570.00
Q5	18	765.00
Q6	539	7,325.00
Q7	85	1,032.90
Q8	258	5,741.00
Q9	732	9912.00
Q10	1,970	14,480.00
Q11	2513	25934.00
Q12	3827	20036.00
Thu Duc	3,741	36,076.00
Go Vap	11,955	33,081.00
Tan Binh	27216	172789.00
Phu Nhuan	4,445	7,468.00
Binh Thanh	2,192	11983.00
Huyen Hoc Mon	6,719	33,676.00
Huyen Binh Chanh	9,308	60,498.00
Huyen Nha Be	493	2,011.10

Source: Dept. of Industry

Table D.4.2 Summary of Ground Water Wells Being Managed by Dept. of Industry

District	No. of Wells			Capacity (m3/d)				
	Total	N2	Q I-III	Total	N2	Q I-III	Industrial	Domestic
Q 1	45	1	44	9,326.00	450.00	8,786.00	8,601.00	635.00
Q 2	478	209	269	2,418.00	1813.70	604.50	1,638.00	780.00
Q 3	1,615		1615	5,301.00		5,301.00	2,756.00	2,545.00
Q 4	19	8	11	570.00	369.00	201.00	539.00	31.00
Q 5	18	2	16	765.00	120.00	645.00	120.00	645.00
Q 6	539	331	208	7,325.00	6,677.00	648.00	5,259.00	2,066.00
Q 7	85	70	15	1,032,90	990.50	42.40	30.00	1,002.90
Q 8	258	233	25	5,741.00	5,428.00	313.00	4,473.00	1,268.00
Q 9	732	51	681	9,912,30	8,930.70	981.60	8,957.50	954.80
Q 10	1,970	4	1,966	14,480.00	5,960.00	8,520.00	10,954.00	3,526.00
Q 11	2,513	203	2,310	25,934.00	4,276.00	21,658.00	16,146.00	9,788.00
Q 12	3,827	348	3,479	20,036.00	13,900.20	6,135.80	11,854.90	8.181.10
Thu Duc	3,741	2,527	1,214	36,076,20	25,373.40	10,702.80	25,421,50	10,654.70
Go Vap	11,955	8	11,947	33,081.00	1,890.00	31191.00	17,007.00	16,074.00
Tan Binh	27,216	806	26,410	172,789.00	81,496.00	91,293.00	124,301.00	48.488.00
Phu Nhuan	4,445	10	4,435	7,486.00	318.00	7,168.00	2,092.00	5,394.00
Binh Thanh	2,192	49	2,143	11,983.00	612.00	11,371.00	7,523.00	4,460.00
Hoc Mon	6,719	207	6,512	33,676.00	4,548.00	29,128.00	8,584,10	25,091.90
Binh Chanh	9,308	6008	3,300	60,498.00	46,338.00	14,160.00	34,264.00	26,234.00
Nha Be	493	493		2,011,10	2,011.10		670.00	1341.10

QI-III Pleistocen aquifer: < 10 m deep
N2B Pliocen aquifer: 50 – 160 m deep
N2A Plitocen aquifer: 110 – 210 m deep

Table D.4.3 Water Quality of Groundwater Wells in HCM City

District	Depth	pH	Cl (mg/l)	Fe (mg/l)	NO3 (mg/l)
1	4 –50	5.9		0.45-1.80	7.40 - 23.82
2	4 –30	5.37	87.80	0.07	
3	40 – 50	4.2 - 6.5		rack	
4	30 –100				
5	43 – 180	4.5 – 6.3		9.33	1.27
6	40 – 157	5.4 – 7.7	2 - 108	0.15 – 1.78	0.09 – 0.48
7	40 – 70	4.7 – 8.4	187.89 – 470.54	6.45 – 31.47	0.30 – 0.35
8	80 – 200	4.4 – 8.12	14.04 – 669.90	0.2 – 75.70	0.20 – 2.31
9	40 - 60	4.3 – 7.1	7.09 - 53.82	0. 00 - 0.24	0.33 – 355.00
10	112 – 200	6.6		0.92	
11	50 – 104	4.2 – 8.2	17.55 - 221	0.03 – 11.35	0.01 – 0.04
12	60 – 99	4.5 – 6.8	11.700– 146.25	0.08 – 3.91	0.10 - 33
Thuû Nöùc	35 – 95	4.5 – 8.5	152 - 760.50	0.02 – 3.65	0.00 – 15.55
Goø Vaáp	69 – 81	3.8 –8.2	5.80 – 107.00	0.07 – 0.59	0.10 – 18.10
Taân Bình	40 – 180	4.1 – 7.3	1 – 80	0.04 – 13.70	0.02 – 16.13
Phu Nhuan	34 – 42	5.7 – 7.9	11.34 – 21.45	0.06 – 0.80	2.54
Bình Thaïnh	60 – 100	4.1 – 6.6	75 – 198.90	0.60 – 0.65	16.67 – 42.80
Bình Chaùnh	80 – 248	1.7 – 8.6	10.00 – 140.21	0.20 – 7.03	0.00 – 1.94
Nhaø Beø	193	6.2 – 7.7			

Table D.5.1 Incidence of Water-borne Diseases for Different Districts

Name of District	Year 1993 Total Population: 3,988,000		Year 1994 Total Population: 4,055,680		Year 1995 Total Population: 4,386,837		Year 1996 Total Population: 4,257,11		Year 1997 Total Population: 4,479,633	
	Cases	Cases/100000	Cases	Cases/100000	Cases	Cases/100000	Cases	Cases/100000	Cases	Cases/100000
Q1	241	6.04	114	2.81	522	11.90	423	9.94	455	10.16
Q2									75	1.67
Q3	255	6.39	123	3.03	329	7.50	283	6.65	354	7.90
Q4	190	4.76	66	1.63	295	6.72	284	6.67	365	8.15
Q5	233	5.84	137	3.38	630	14.36	456	10.71	615	13.73
Q6	290	7.27	270	6.66	678	15.46	495	11.63	712	15.89
Q7									93	2.08
Q8	262	6.57	163	4.02	1312	29.91	971	22.81	1427	31.86
Q9									118	2.63
Q10	315	7.90	162	3.99	400	9.12	301	7.07	348	7.77
Q11	250	6.27	127	3.13	313	7.13	220	5.17	292	6.52
Q12										
Go Vap	151	3.79	80	4.19	184	4.19	163	3.83	273	6.09
Tan Binh	450	11.28	290	12.70	557	12.70	456	10.71	529	11.81
Binh Thanh	473	11.86	258	11.51	505	11.51	445	10.45	545	12.17
Phu Nhuan	160	4.01	89	5.22	229	5.22	137	3.22	228	5.09
Thu Duc	451	11.31	335	9.99	483	9.99	316	7.42	414	9.24
H. Binh Chanh	109	2.73	93	7.32	321	7.32	237	7.68	381	8.51
H. Nha Be	136	3.41	40	8.55	375	8.55	398	9.35	69	1.54

Table D.5.2 Relation of Water-borne Diseases with Population Density

District	Population Density (p/ha)	Water-borne Diseases Cases
Q1	371	455
Q2	19	75
Q3	543	354
Q4	552	365
Q5	613	615
Q6	400	712
Q7	27	93
Q8	185	1427
Q9	11	118
Q10	476	348
Q11	520	292
Q12	24	
Thu Duc	36	414
Go Vap	122	273
Tan Binh	133	529
Phu Nhuan	397	228
Binh Thanh	204	545
Huyen Binh Chanh	9	381
Huyen Nha Be	6	69

Table D.5.3 Major Water-borne Diseases in the Study Area

Name of Disease	Year 1993 Total Population : 3,988,000		Year 1994 Total Population : 4,055,680		Year 1995 Total Population: 4,386,837		Year 1996 Total Population: 4,257,111		Year 1997 Total Population: 4,479,633	
	Cases	Cases/100000	Cases	Cases/100000	Cases	Cases/100000	Cases	Cases/100000	Cases	Cases/100000
Diarrhoea	1,807	45.30	289	7.13	2,658	60.59	2,365	55.55	3,282	73.26
Dysentry	1,430	35.85	1,319	34.15	2,133	48.62	2,083	48.93	2,438	54.42
Typhoid	410	10.28	413	10.18	605	13.79	305	7.87	973	21.72
Hepatitus	175	4.39	257	6.34	1,607	37.18	606	14.23	727	16.23
Measles	114	2.86	69	1.70	130	2.96	176	4.13	162	3.62

Table D.6.1 Laws, Regulations and Standards on Environmental Protection

Name of the Laws, Regulations and Ordinance	Year Enacted	Remarks
Law on Environmental Protection	1993	Requires EIA report for new activities/projects affecting the Environment be submitted to State Management Agency for environmental protection for appraisal
TCVN 5942 – 1995 Water Quality : Surface Water Quality Standards	1995	Specifies parameters and their maximum allowable concentrations in surface water
TCVN 5943 – 1995 Water Quality : Coastal Water Quality Standards	1995	Specifies parameters and their maximum allowable concentrations in coastal water
TCVN 5944 – 1995 Water Quality : Ground Water Quality Standards	1995	Specifies parameters and their maximum allowable concentrations in ground water
TCVN 5945 – 1995 Effluent Standards : Industrial Wastewater Discharges	1995	Specifies pollutants and their maximum allowable concentrations in Industrial wastewater to be discharged to public water bodies
TCVN 5937 – 1995 Air Quality : Ambient Air Quality Standards	1995	Specifies maximum allowable concentrations for the common pollutants in ambient air.
TCVN 5938 – 1995 Air Quality : Maximum Allowable Concentrations of Hazardous Substances and Dusts	1995	Specifies maximum allowable concentrations of hazardous substances in ambient air including inorganic and organic toxic substances
TCVN 5939 – 1995 Air Quality : Industrial Emission Standards for inorganic substances and Dusts	1995	Specifies maximum allowable concentrations of inorganic substances in industrial emissions discharged to the atmosphere
TCVN 5940 – 1995 Air Quality : Industrial Emission Standards for organic substances	1995	Specifies maximum allowable concentrations of organic substances in industrial emissions discharged to the atmosphere
TCVN 5941 – 1995 Soil Quality : Maximum Allowable Limits of Pesticides Residues in the Soil	1995	Specifies maximum allowable limits of pesticide residues in the soil

Table D.6.2 Maximum Permissible Concentration of Pollutants in Surface Water (TCVN 5942 – 1995)

No.	Parameter	Unit	Maximum Permissible Concentration	
			A	B
1	pH		6.0 – 8.0	5.5 – 9.0
2	BOD_5 (20°C)	mg/l	< 4	< 25
3	COD	mg/l	< 10	< 35
4	Dissolved Oxygen	mg/l	> 6	> 2
5	Suspended Solids	mg/l	20	80
6	Arsenic	mg/l	0.05	0.10
7	Barium	mg/l	1	4
8	Cadmium	mg/l	0.01	0.02
9	Lead	mg/l	0.05	0.10
10	Chromium (Hexavalent)	mg/l	0.05	0.05
11	Chromium (Trivalent)	mg/l	0.1	1
12	Copper	mg/l	0.1	1
13	Zinc	mg/l	1	2
14	Manganese	mg/l	0.1	0.8
15	Nickel	mg/l	0.1	1
16	Iron	mg/l	1	2
17	Mercury	mg/l	0.001	0.002
18	Tin	mg/l	1	2
19	Ammonia (as N)	mg/l	0.05	1
20	Fluoride	mg/l	1	1.5
21	Nitrate (as N)	mg/l	10	15
22	Nitrite (as N)	mg/l	0.01	0.05
23	Cynaide	mg/l	0.01	0.05
24	Phenol Compounds	mg/l	0.001	0.02
25	Oil and Grease	mg/l	Not detectable	0.3
26	Detergent	mg/l	0.5	0.5
27	Coliform	MPN/100 ml	5000	10000
28	Total Pesticides (except DDT)	mg/l	0.15	0.15
29	DDT	mg/l	0.01	0.01
30	Gross alpha activity	Bq/l	0.1	0.1
31	Gross beta activity	Bq/l	1.0	1.0

Note

- Values in the Column A are applied to the surface water being used as a source of domestic water supply with appropriate treatment
- Values in the Column B are applied to the surface water being used for the purposes other than domestic water supply

Table D.6.3 Maximum Permissible Concentration of Pollutants in Coastal Water (TCVN 5943 – 1995)

No.	Parameter	Unit	Maximum Permissible Concentration		
			Bathing and recreation area	Aquatic Cultivation area	Others
1	Temperature	°C	30	-	-
2	Odor		Unobjectionable	-	-
3	pH		6.5 – 8.5	6.5 – 8.5	6.5 – 8.5
4	Dissolved Oxygen	mg/l	> 4	> 5	> 4
5	BOD_5 (20°C)	mg/l	<20	< 10	< 20
6	Suspended Solids	mg/l	25	50	200
7	Arsenic	mg/l	0.05	0.01	0.05
8	Ammonia (as N)	mg/l	0.1	0.5	0.5
9	Cadmium	mg/l	0.005	0.005	0.01
10	Lead	mg/l	0.1	0.05	0.1
11	Chromium (Hexavalent)	mg/l	0.05	0.05	0.05
12	Chromium (Trivalent)	mg/l	0.1	0.1	0.2
13	Chloride	mg/l	-	0.01	-
14	Copper	mg/l	0.02	0.01	0.02
15	Fluoride	mg/l	1.5	1.5	1.5
16	Zinc	mg/l	0.1	0.01	0.1
17	Manganese	mg/l	0.1	0.1	0.1
18	Iron	mg/l	0.1	0.1	0.3
19	Mercury	mg/l	0.005	0.005	0.01
20	Sulfide	mg/l	0.01	0.005	0.01
21	Cynaide	mg/l	0.01	0.01	0.01
22	Phenol Compounds	mg/l	0.001	0.001	0.002
23	Oil and Fat film	mg/l	none	none	0.3
24	Oil and Fat suspension	mg/l	2	1	5
25	Total Pesticides	mg/l	0.05	0.01	0.05
26	Coliform	MPN/100ml	1000	1000	1000

Table D.6.4 Maximum Permissible Concentration of Pollutants in Ground Water (TCVN 5944 – 1995)

No.	Parameter	Unit	Maximum Permissible Concentration
1	pH		6.5 – 8.5
2	Colour	Pt – Co	5 – 50
3	Hardness (as $CaCo_3$)	mg/l	300 – 500
4	Total Solids	mg/l	750 – 1500
5	Arsenic	mg/l	0.05
6	Cadmium	mg/l	0.01
7	Chloride	mg/l	200 – 600
8	Lead	mg/l	0.05
9	Chromium (Hexavalent)	mg/l	0.05
10	Cyanide	mg/l	0.01
11	Copper	mg/l	1.0
12	Fluoride	mg/l	1.0
13	Zinc	mg/l	5.0
14	Manganese	mg/l	0.1 – 0.5
15	Nitrate	mg/l	45
16	Phenol Compound	mg/l	0.001
17	Iron	mg/l	1 – 5
18	Sulfate	mg/l	200 – 400
19	Mercury	mg/l	0.001
20	Selenium	mg/l	0.01
21	Fecal Coli	MPN/100 ml	Not detectable
22	Coliform	MPN / 100 ml	3

Table D.6.5 Maximum Permissible Concentration of Pollutants for the Discharge of Industrial Wastewater (TCVN 5945 – 1995)

No.	Parameter	Unit	Maximum Permissible Concentration		
			A	B	C
1	Temperature	OC	40	40	45
2	PH		6 – 9	5.5 – 9	5 – 9
3	BOD_5 (20°C)	mg/l	20	50	100
4	COD	mg/l	50	100	400
5	Suspended Solids	mg/l	50	100	200
6	Arsenic	mg/l	0.05	0.1	0.5
7	Cadmium	mg/l	0.01	0.02	0.5
8	Lead	mg/l	0.1	0.5	1
9	Residual Chlorine	mg/l	1	2	2
10	Chromium (VI)	mg/l	0.05	0.1	0.5
11	Chromium (III)	mg/l	0.2	1	2
12	Mineral Oil and Fat	mg/l	Not detectable	1	5
13	Animal-vegetable Fat and Oil	mg/l	5	10	30
14	Copper	mg/l	0.2	1	5
15	Zinc	mg/l	1	2	5
16	Manganese	mg/l	0.2	1	5
17	Nickel	mg/l	1	1	2
18	Organic Phosphorus	mg/l	0.2	0.5	1
19	Total Phosphorus	mg/l	4	6	8
20	Iron	mg/l	1	5	10
21	Tetrachloroethylene	mg/l	0.02	0.1	0.1
22	Tin	mg/l	0.2	1	5
23	Mercury	mg/l	0.005	0.005	0.01
24	Total Nitrogen	mg/l	30	60	60
25	Trichloroethylene	mg/l	0.05	0.3	0.3
26	Ammonia (as N)	mg/l	0.1	1	10
27	Fluoride	mg/l	1	2	5
28	Phenol	mg/l	0.001	0.05	1
29	Sulfide	mg/l	0.2	0.5	1
30	Cyanide	mg/l	0.05	0.1	0.2
31	Coliform	MPN/100ml	5000	10000	-
32	Gross alpha activity	Bq/l	0.1	0.1	-
33	Gross beta activity	Bq/l	1.0	1.0	-

Note

- Industrial wastewaters containing the values of parameters and concentration pf substances which are equal to or lower than the values specified in the column A can be discharged into the water bodies being used as source of domestic water supply.
- Industrial wastewaters containing the values of parameters and concentration of substances which are lower than or equal to those specified in the column B can be discharged only into those water bodies being used for navigation, irrigation, aquatic breeding and cultivation etc.
- Industrial wastewaters containing the values of parameters and concentration of substances which are greater than those specifiedin the Column B but not exceeding those specified in column C can be discharged only into specific waterbodies permitted by authorized agencies.
- Industrial wastewaters containing the values of parameters and concentration of substances which are greater than those specified in the column C shall not be discharged into surroundings.

Table D.7.1 List of Rare Fish Species Found within the Study Area

No.	Scientific Name	Common Name
1	*Cirrhinus microlepis Sauvage*	Murigal
2	*Morulis chrysophekadion*	Black shark
3	*Clarias batracus*	
4	*Bagarius bagarius*	
5	*Ophicephalus micropeltes C & V*	
6	*Ophicephalus straitus Bloch*	
7	*Toxotes chatareus*	Archerfish
8	*Datnioides quadrifasciatus*	Tiger fish

Table D.7.2 List of Rare Reptile Species Found within the Study Area

No.	Scientific Name	Common Name
1	*Gekko gekko*	Gekko
2	*Physignathus cocinci*	
3	*Varanus salvator*	
4	*Python molorus bivitattus*	Indian python
5	*Python reticulatus*	Reticulated python
6	*Ptyas korros*	Indo-chinese rat snake
7	*Ptyas mucosus*	Oriental rat snake
8	*Bungarus fasciatus*	Banded krait

Table D.7.3 List of Rare Mammnal Species Found within the Study Area

No.	Scientific Name	Common Name
1	*Suncus murinus*	House shrew
2	*Cynopterus brachyotis*	Short nosed fruit bat
3	*Cynopterus sphinx*	Greater short-nosed fruit bat
4	*Rousettus leschenaulti*	Leschenault's rousettus
5	*Macroglossus minimus*	Long tongue nectar bat
6	*Taphozous melanopogon*	Black beared tomb bat
7	*Myotis adversus*	Gray large footed bat
8	*Scotophilus heathii*	Asiatic greater yellow house bat
9	*Viverra megaspila*	Large spotted civet
10	*Herpestes javanicus*	Small asian mangoose
11	*Callosciurus flavimanus*	Belly banded squirrel
12	*Callosciurus nigrovittatus*	Black banded squirrel
13	*Callosciurus notatus*	Plantain squirrel
14	*Tamiops rodolphei*	Cambodian striped tree squirrel
15	*Sundasciurus hippurus*	Horse tailed squirrel
16	*Mus musculus*	House mouse
17	*Rattus argentiventer*	Rice field rat
18	*Ruttus exulans*	Polynesian rat
19	*Ruttus flavipectus*	Roof rat
20	*Ruttus norvegicus*	Norway rat
21	*Lepus nigricollis*	Indian hare

Table D.7.4 Tree Structure in the Planted Forests in the Suburban Area of HCMC

No.	Scientific Name	Common Name
Upper Stratum		
1	*Dipterocarpus alatus*	Gurjun oil tree
2	*Shorea guiso*	Shorea
3	*Anisoptera cochinchinesis*	Mersawa
4	*Hopea odorata*	Thingan merawan
Lower Stratum		
5	Sindora cochinchinensis	Sepetir
6	*Garcinia handburgi*	
7	*Callophyllum saigonese*	Beauty-leaf
8	*Syzygium sp.*	Clove tree, Rose apple
9	*Grewia paniculata*	Grewia
10	*Calamus sp.*	Rattan palm
11	*Licuala sp.*	Licuala palm
Shrub stratum		
12	*Euphorbiaceae sp.*	Spurge family
13	*Morina sp.*	
14	*Vitex sumatra*	Chaste tree

Table D.7.5 Dominant Species for the Substitutive Community in the Suburban Area of The HCMC

No.	Scientific Name	Common Name
Woody plants		
1	Grewia paniculata	Grewia
2	*Memecylon edule*	
3	*Connarus cochinchinensis*	
4	*Aporsa ficifola*	
Herbs		
5	Eupatorium odoratum	Boneset / Thoroughwort
6	*Imprerata cylindrica*	Satin tail
7	*Mimosa pudica*	Sensitive plant
8	*Aristida balansae*	Three-awned grass

Table D.7.6 The Distribution of Different Types of Green Areas in the Existing Urban Area

District	Public green area (m^2)			Green area in campus (m^2)	Canal green area (m^2)		Farm land (m^2)	Total (m^2)
Total	Roadside	Parks	Total		Tree	Water		
	923,725	2,342,656	3,266,381	6,649,557	198,770	1,199,191	17,421,049	28,734,948
Dist. 1	318,490	658,857	977,347	157,740	3,335	1,068	8,360	1,147,850
3	167,070	23,472	190,542	104,735	9,030	850	34,390	339,547
4	10,680	0	10,680	149,161	7,470	18,892	26,576	212,779
5	161,130	53,642	214,772	71,380	655			286,807
6	13,655	52,451	66,106	211,772	86,230	409,105	185,883	959,096
8	16,070	0	16,070	722,101	92,050	208,974	4,145,776	5,184,971
10	103,780	166,336	270,116	169,015		14,810	33,360	487,301
11	43,590	538,992	582,582	82,995		11,150	60,190	736,917
Go Vap	18,480	0	18,480	1,552,557		92,482	4,743,234	6,406,753
Tan Binh	42,370	99,608	141,978	1,777,195		407,860	4,761,031	7,088,064
Binh Than	9,140	175,119	184,259	1,444,861		31,420	3,269,599	4,930,139
Phu Nhuan	19,270	574,179	593,449	206,045		2,580	152,650	954,724

Table D.7.7 Dominant Species of Roadside Trees in Old Districts

No.	Scientific Name	Common Name
1	*Dipterocarp sp.*	Grewin oil tree
2	*Peltophorum sp.*	
3	*Hura crepitans*	Sandbox tree
4	*Tamarindus indica*	Tamarind
5	*Hopea ordorata*	Thingan merawan
6	*Eucalyptus sp.*	Eucalyptus family
7	*Khaya senegalensis*	Senegal Khaya
8	*Swietenia macrophylla*	Mahogany
9	*Acacia auriculaeformis*	Acacia
10	*Delonix regia*	Flamboyant / Royal Poinciana
11	*Salmanaea saman*	
12	*Cocos nucifera*	Coconut palm
13	*Mesua ferrera*	Ceylon ironwood
14	*Hydnocarpus anthelmintica*	Chaulmoogra tree

Table D.7.8 Dominant Species of Roadside Trees in New Districts

No.	Scientific Name	Common Name
1	*Acacia auriculaeformis*	Acacia
2	*Terminalia catappa*	Tropical almond
3	*Eucalyptus camaldulensis*	Eucalyptus
4	*Cocos nucifera*	Coconut Palm
5	*Khaya senegalensi*	Senegal Khaya
6	*Mimusops elengi*	Bulletwood
7	*Acacia auriculaeformis*	
8	*Dipterocarpus sp.*	Grewin oil tree
9	*Delonix regia*	Flamboyant / Royal Poinciana
10	*Muntigia calabura*	Jamaica cherry
11	*Hura crepitans*	Sandbox tree
12	*Peltophorum pterocarpum*	

Table D.8.1 Initial Environmental Examination For Tau-Hu - Ben Ngh 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 squatters exist along the canal. Detailed analysis required.
2.	Economic activities	Rehabilitated 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	Existence 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.

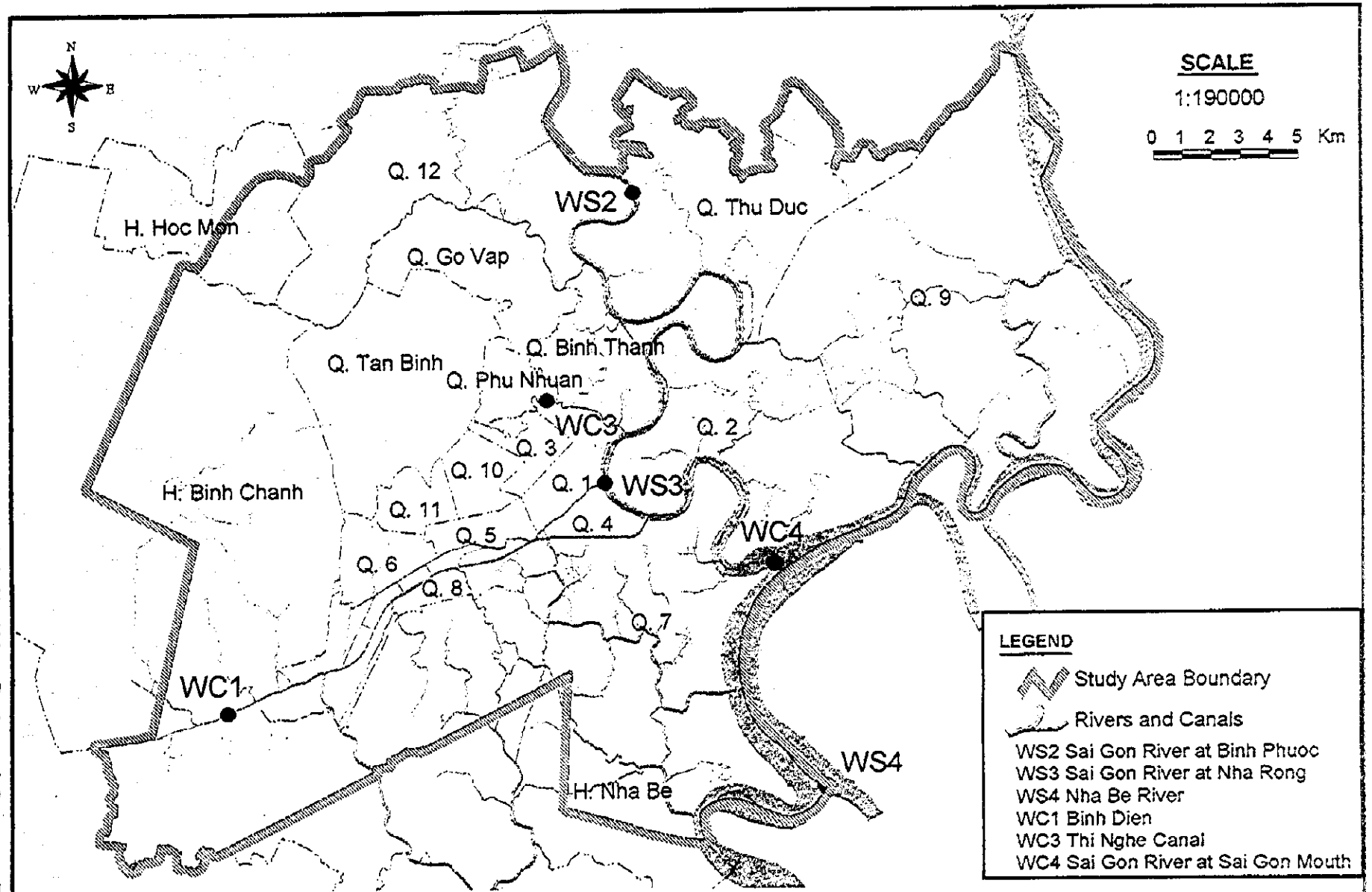


Fig. D.3.1 Location of Monitoring Station

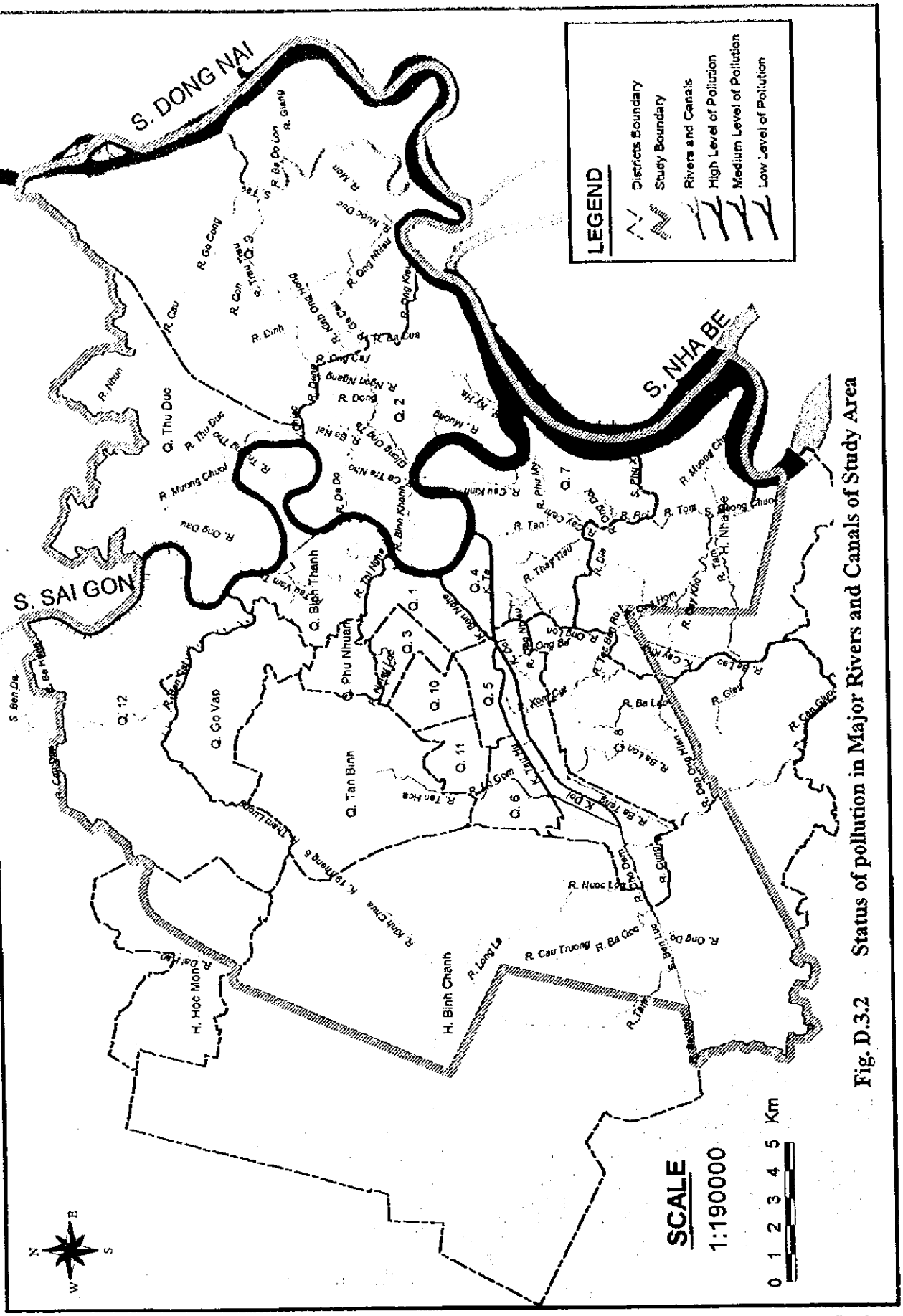


Fig. D.3.2 Status of pollution in Major Rivers and Canals of Study Area

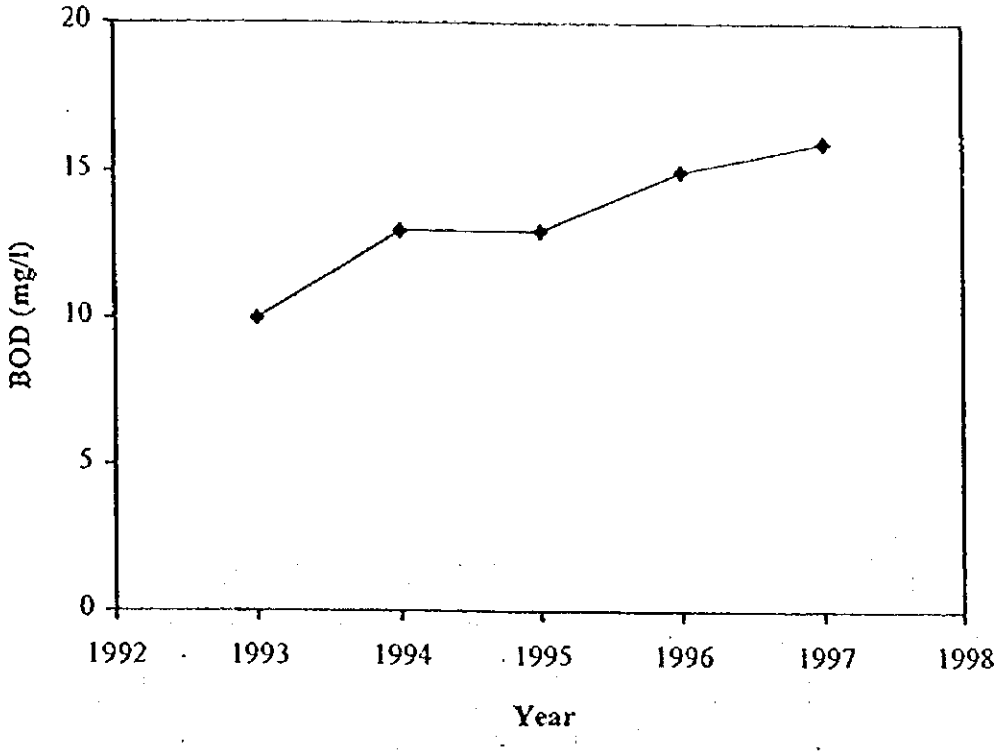
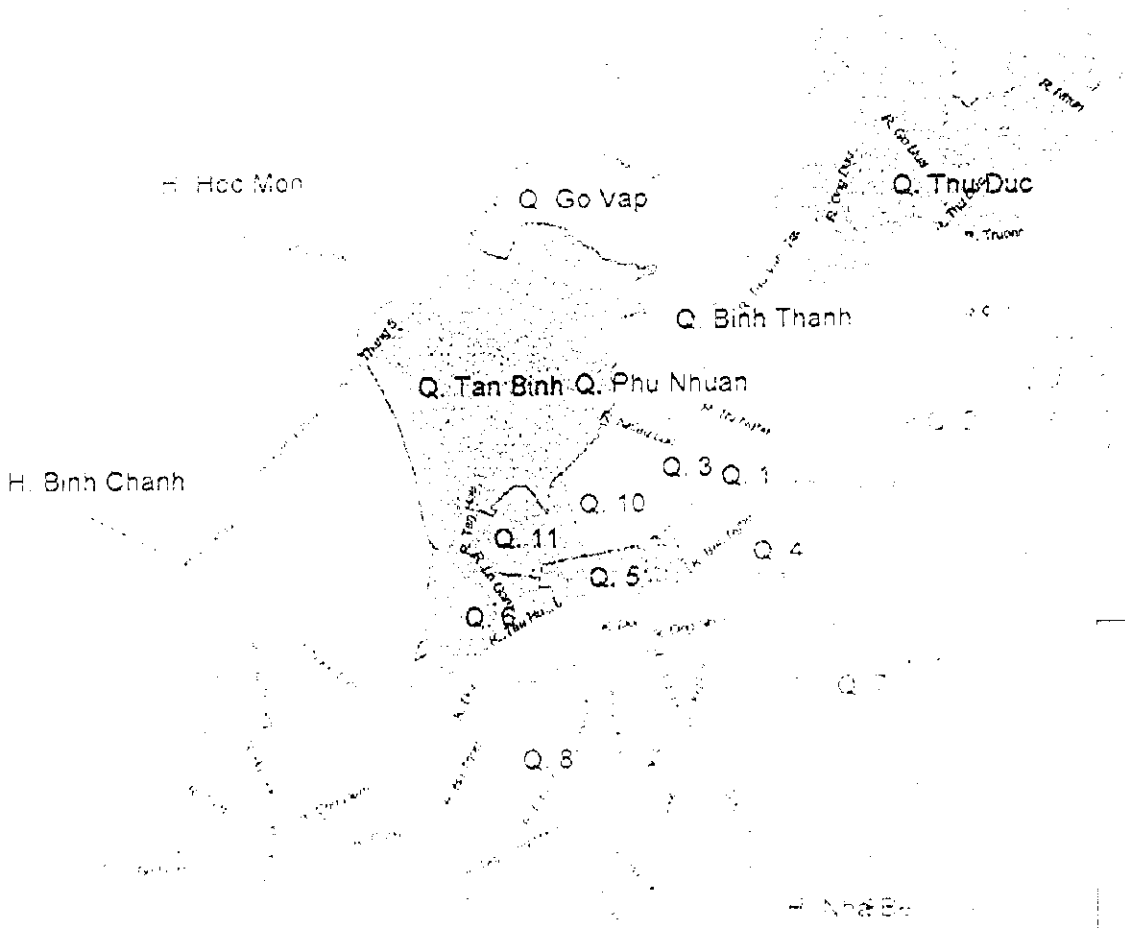


Fig. D.3.3 Change of Water Quality of Sai Gon River at Nha Rong

Fig. D.3.4 Distribution of Industries in the Study Area


H. Hoc Mon
Q. Go Vap
Q. Thu Duc
Q. Binh Thanh
Q. Tan Binh
Q. Phu Nhuan
H. Binh Chanh
Q. 3
Q. 1
Q. 10
Q. 11
Q. 4
Q. 5
Q. 8

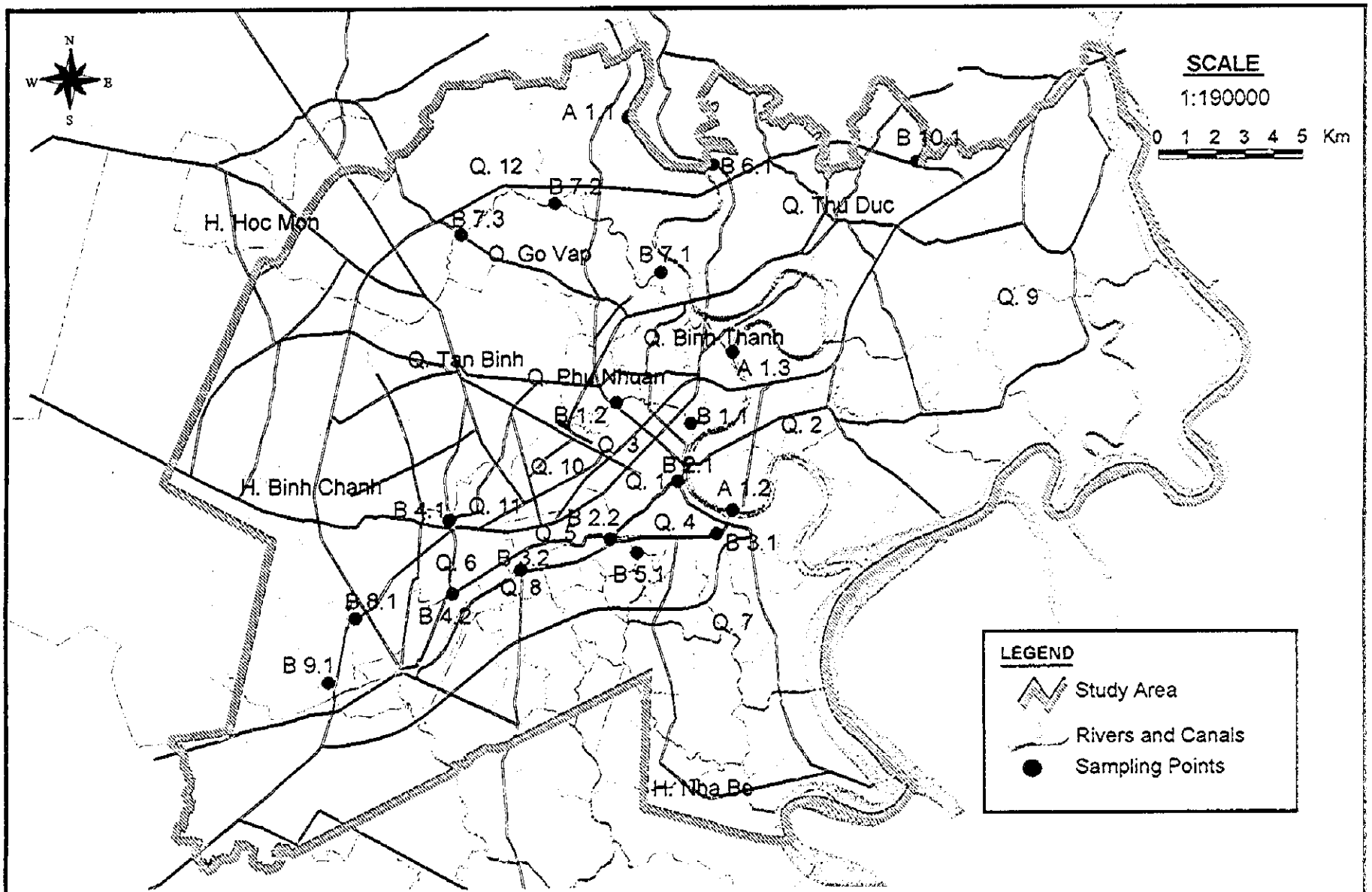


Fig. D.3.5 Location of Sampling Points for Water Quality and Bed Deposits

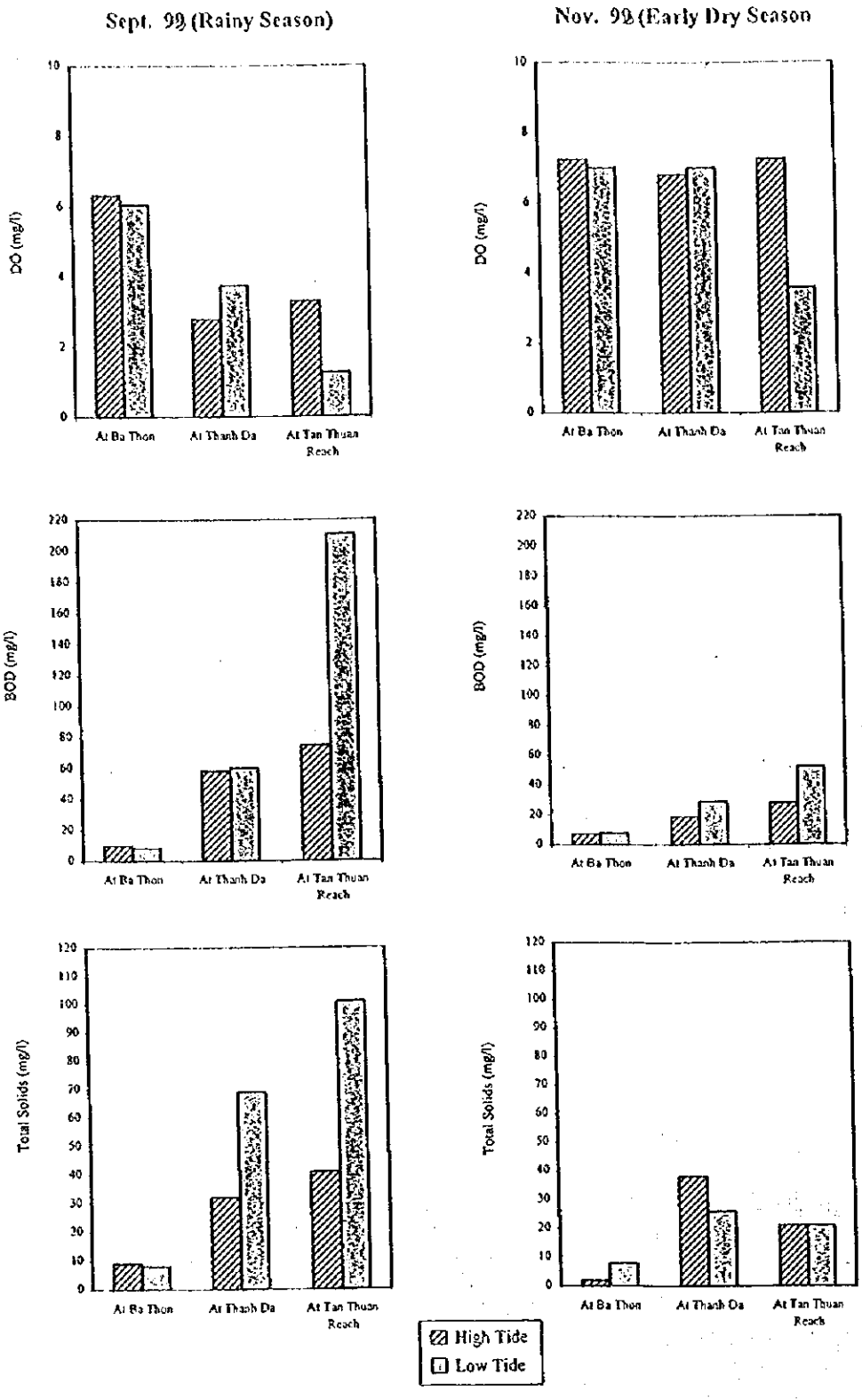


Fig. D.3.6 (1) Organic Pollution in Saigon River

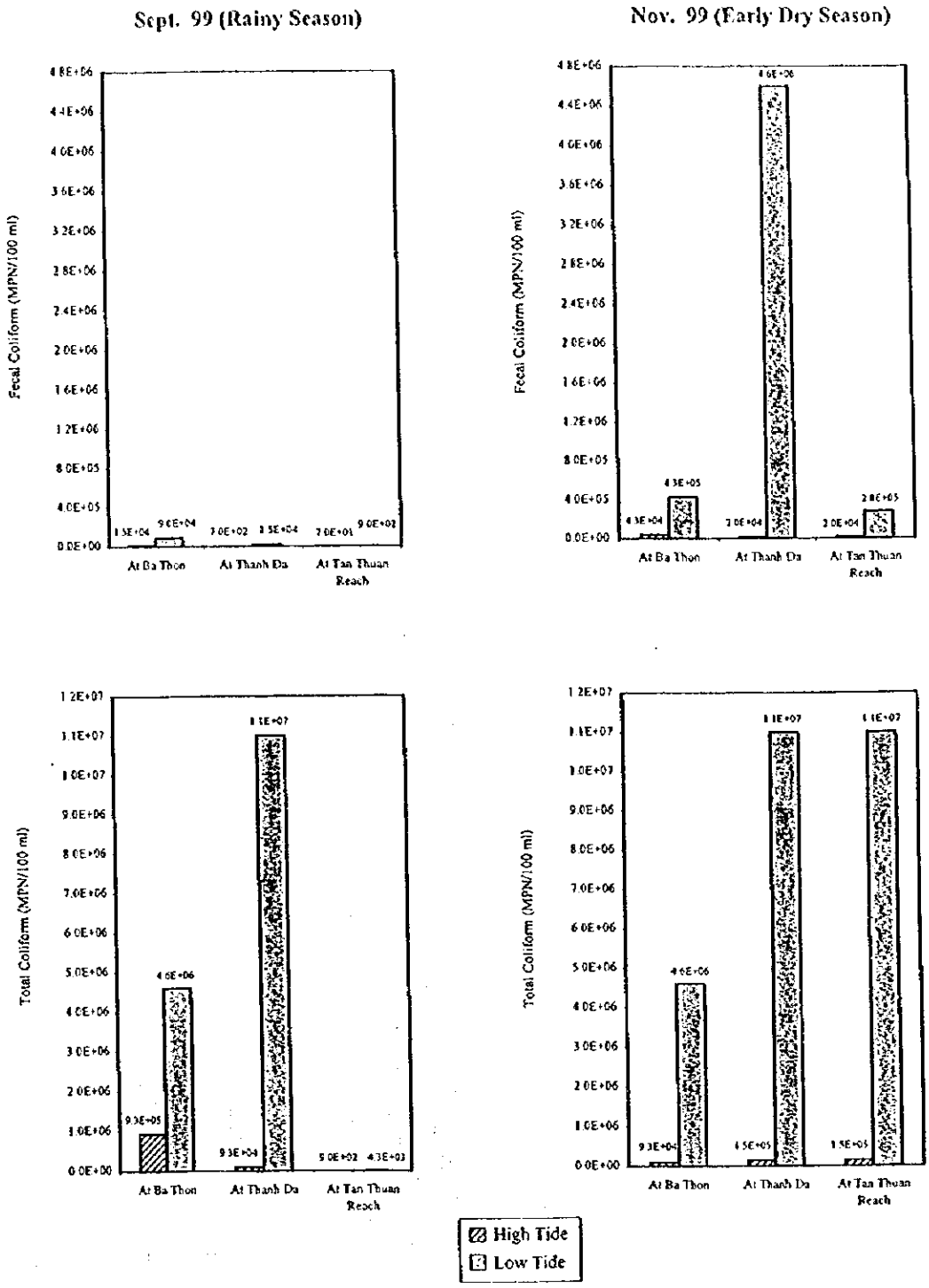


Fig. D.3.6 (2) Fecal Contamination in Saigon River

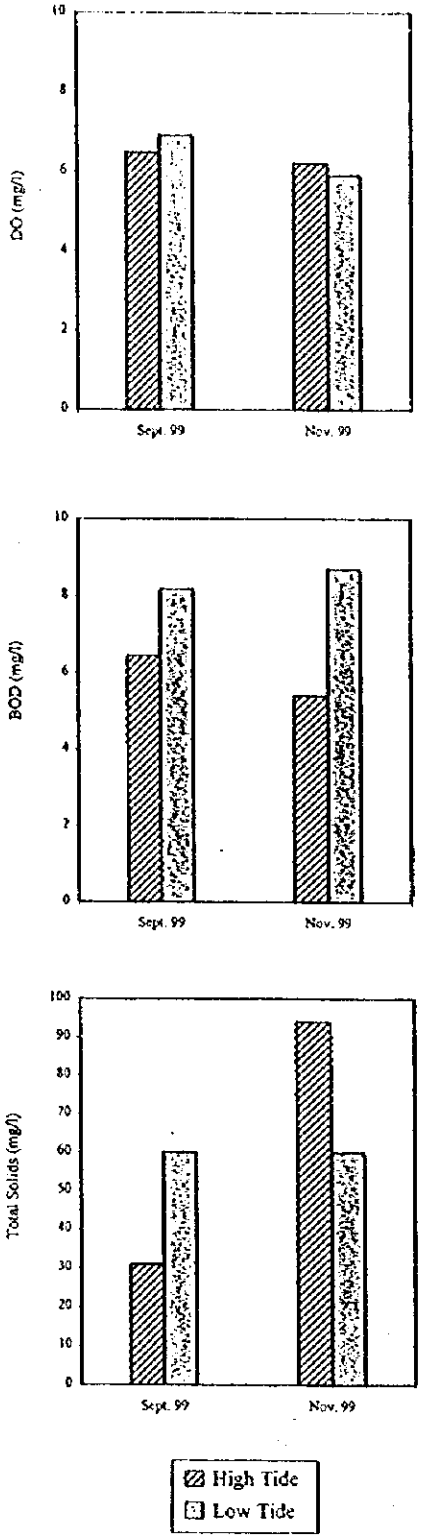


Fig. D.3.7 (1) Organic Pollution in Dong Nai River at Hoa An bridge

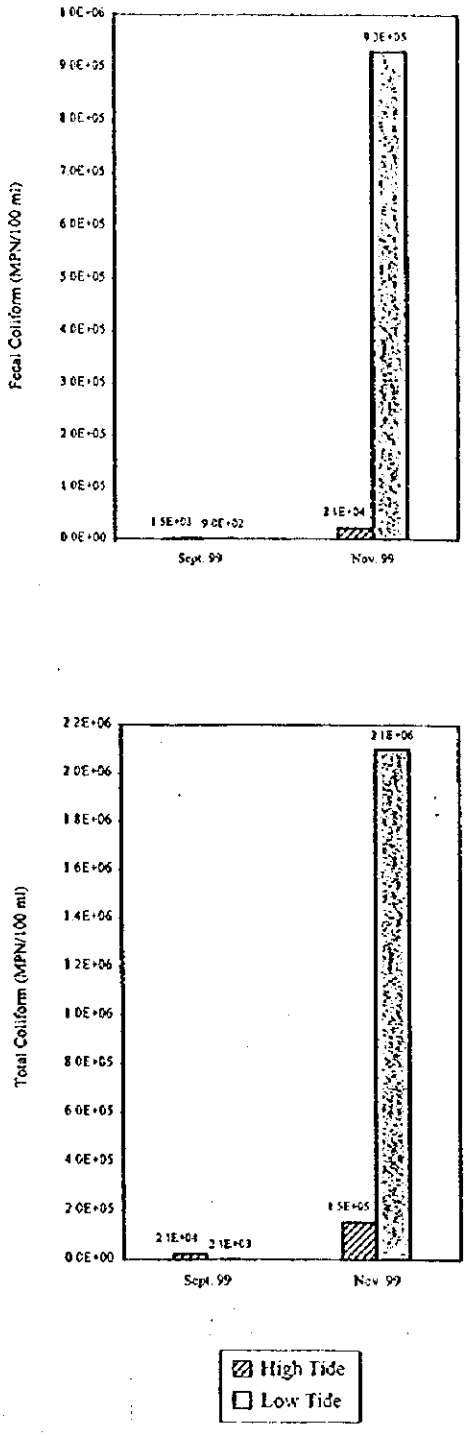


Fig. D.3.7 (2) Fecal Contamination in Dong Nai River at Hoa An bridge

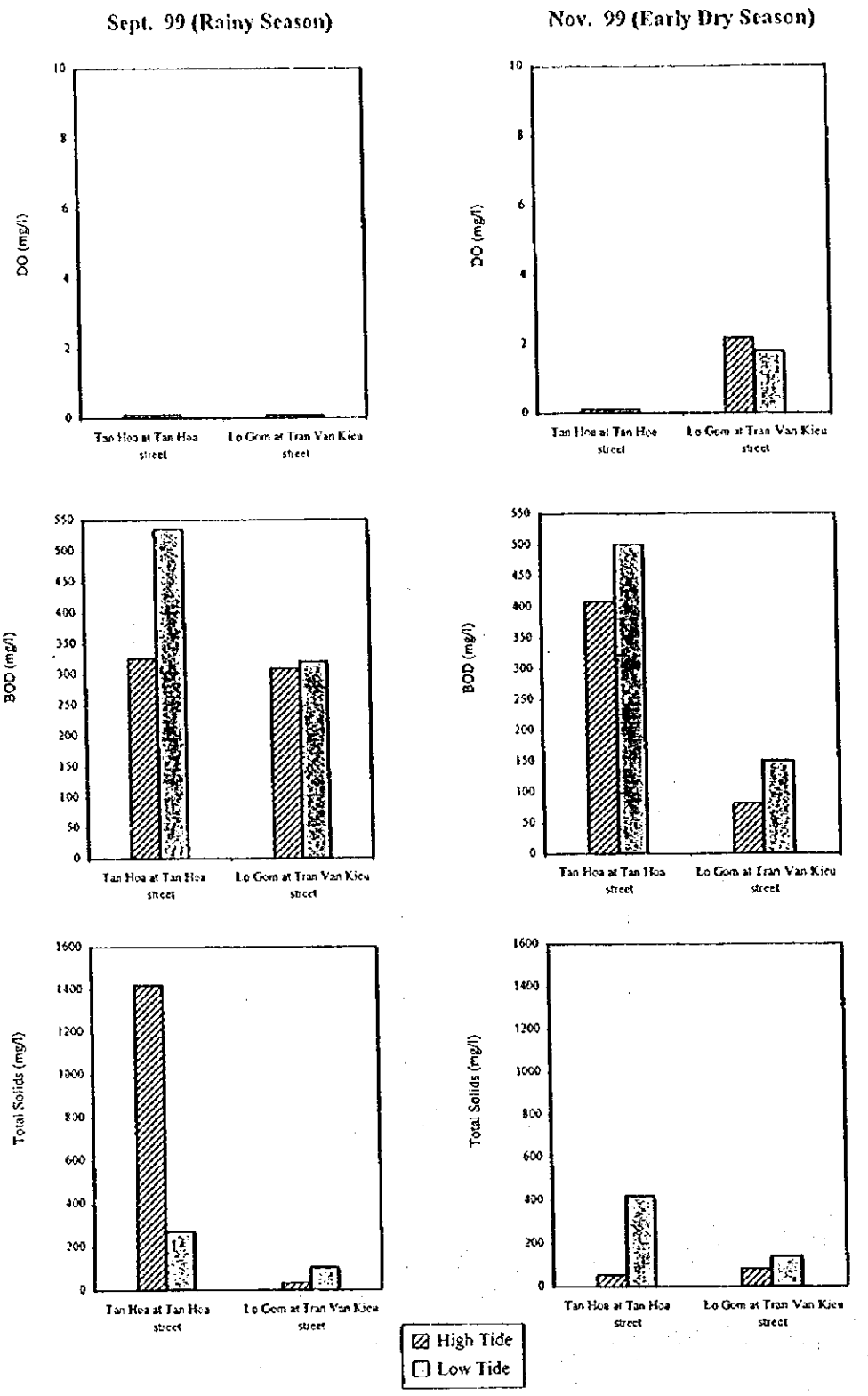


Fig. D.3.8 (1) Organic Pollution in Tan Hoa – Lo Gom Canal

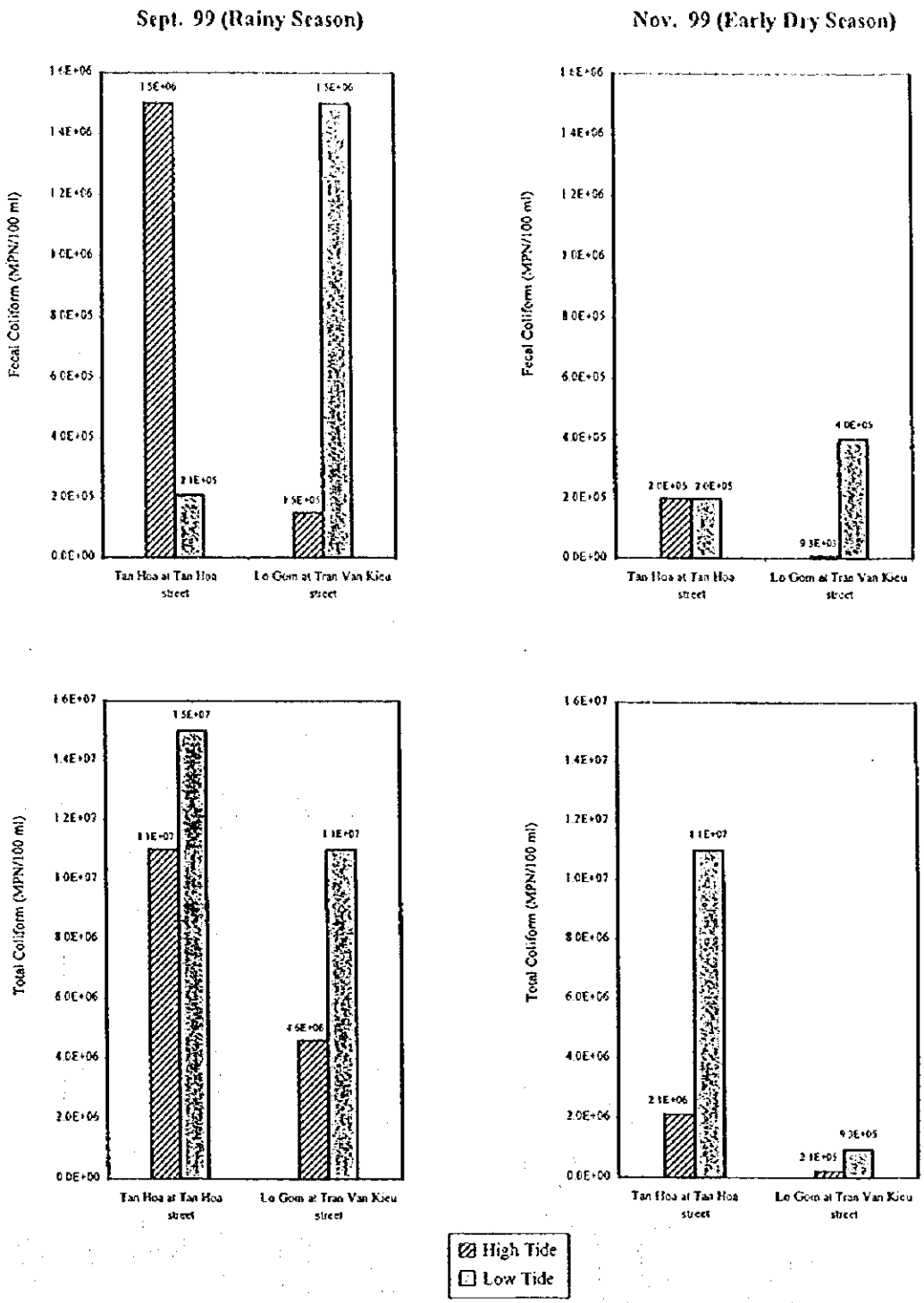


Fig. D.3.8 (2) Fecal Contamination in Tan Hoa – Lo Gom Canal

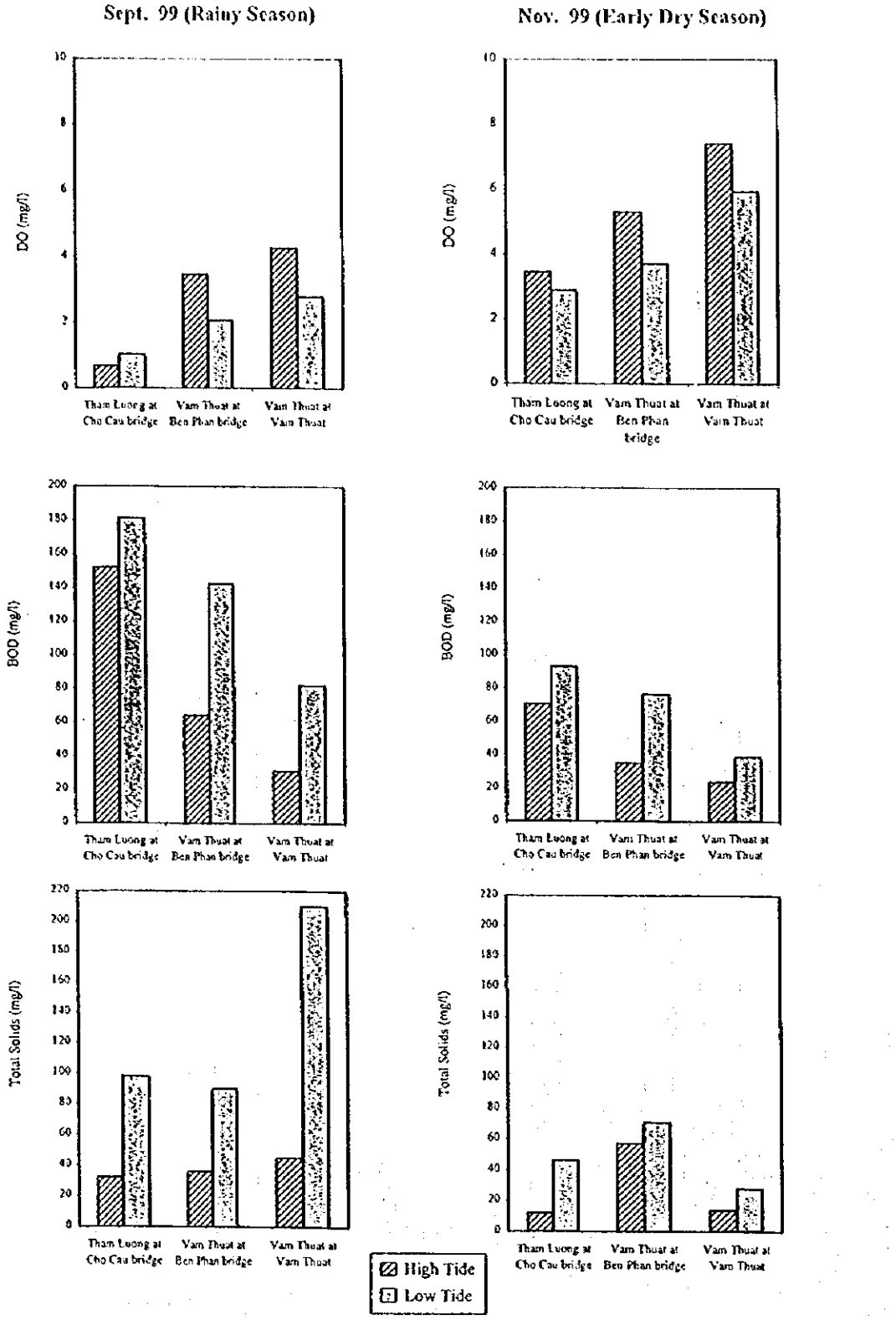


Fig. D.3.9 (1) Organic Pollution in Tham Luong – Vam Thuat Canal

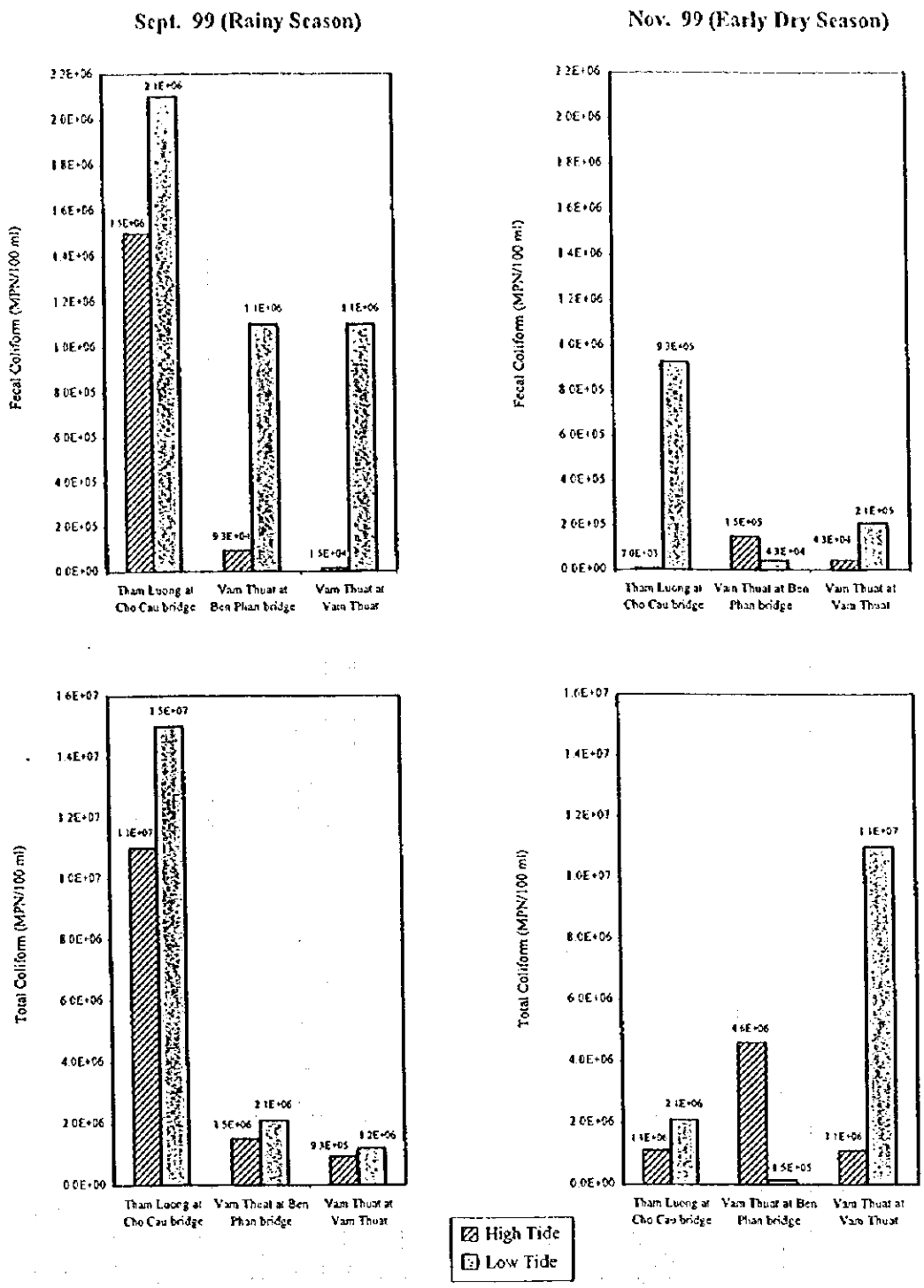


Fig. D.3.9 (2) Fecal Contamination in Tham Luong – Vam Thuat Canal

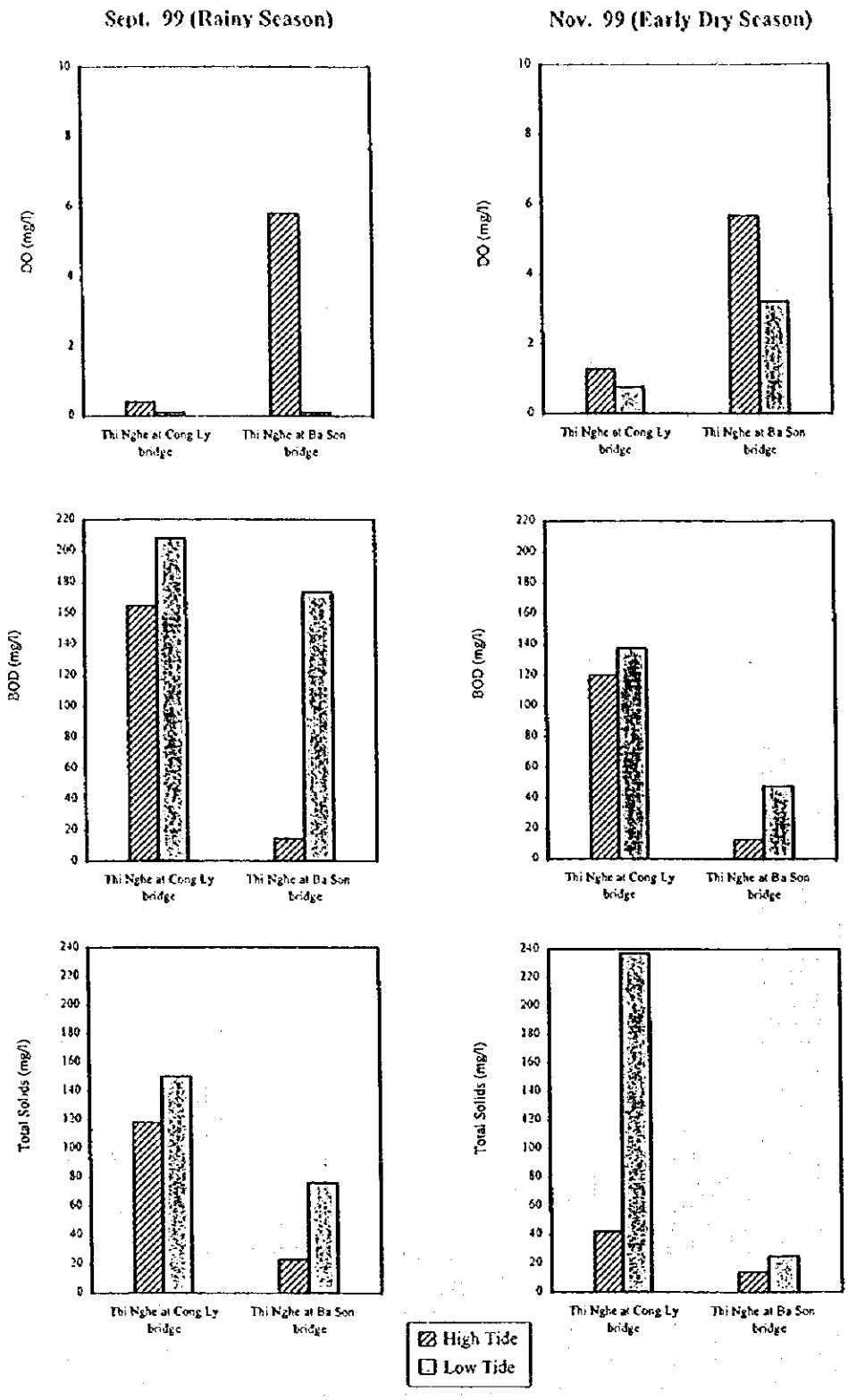


Fig. D.3.10 (1) Organic Pollution in Nhieu Loc – Thi Nghe Canal

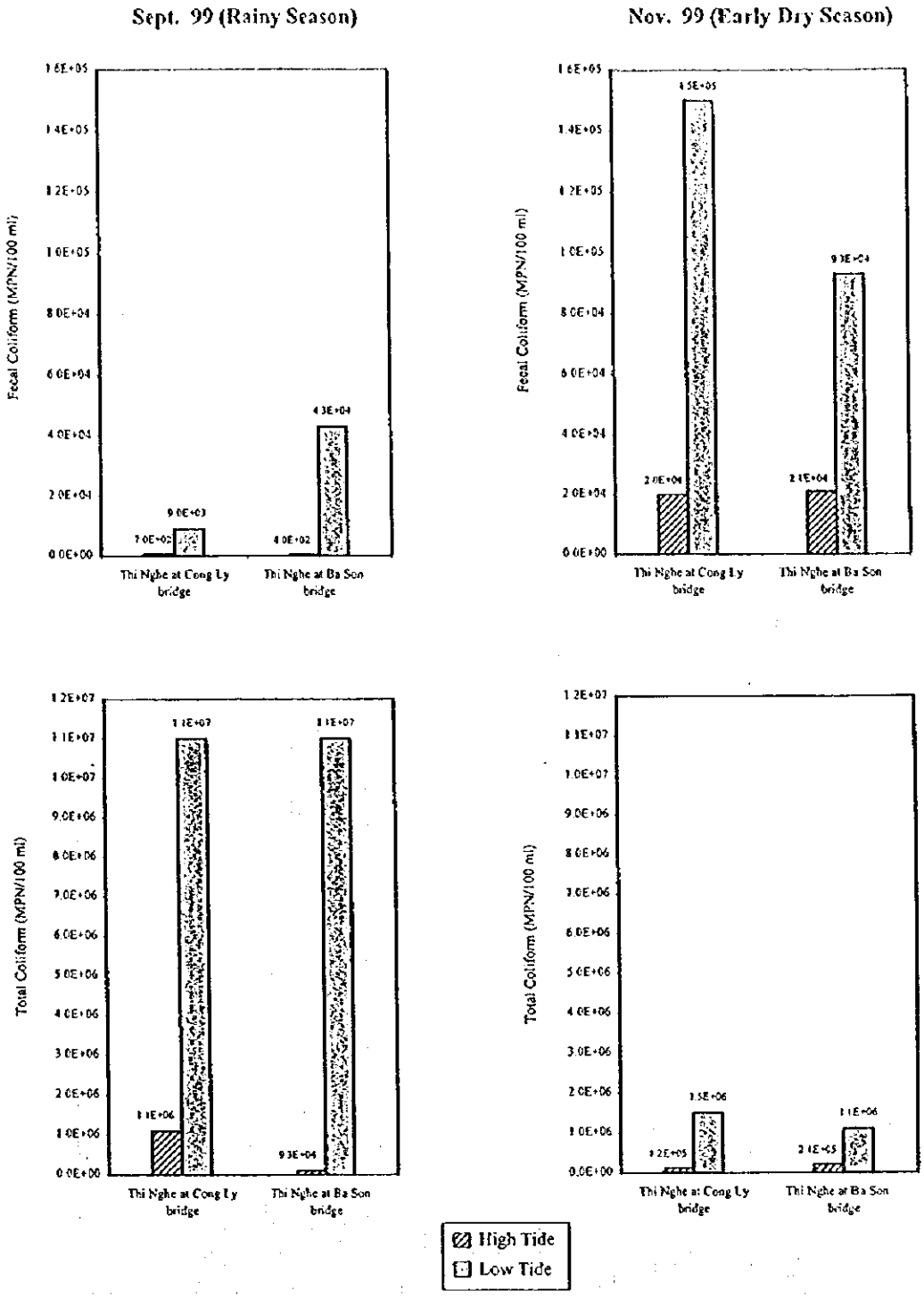


Fig. D.3.10 (2) Fecal Contamination in Nhieu Loc – Thi Nghe Canal

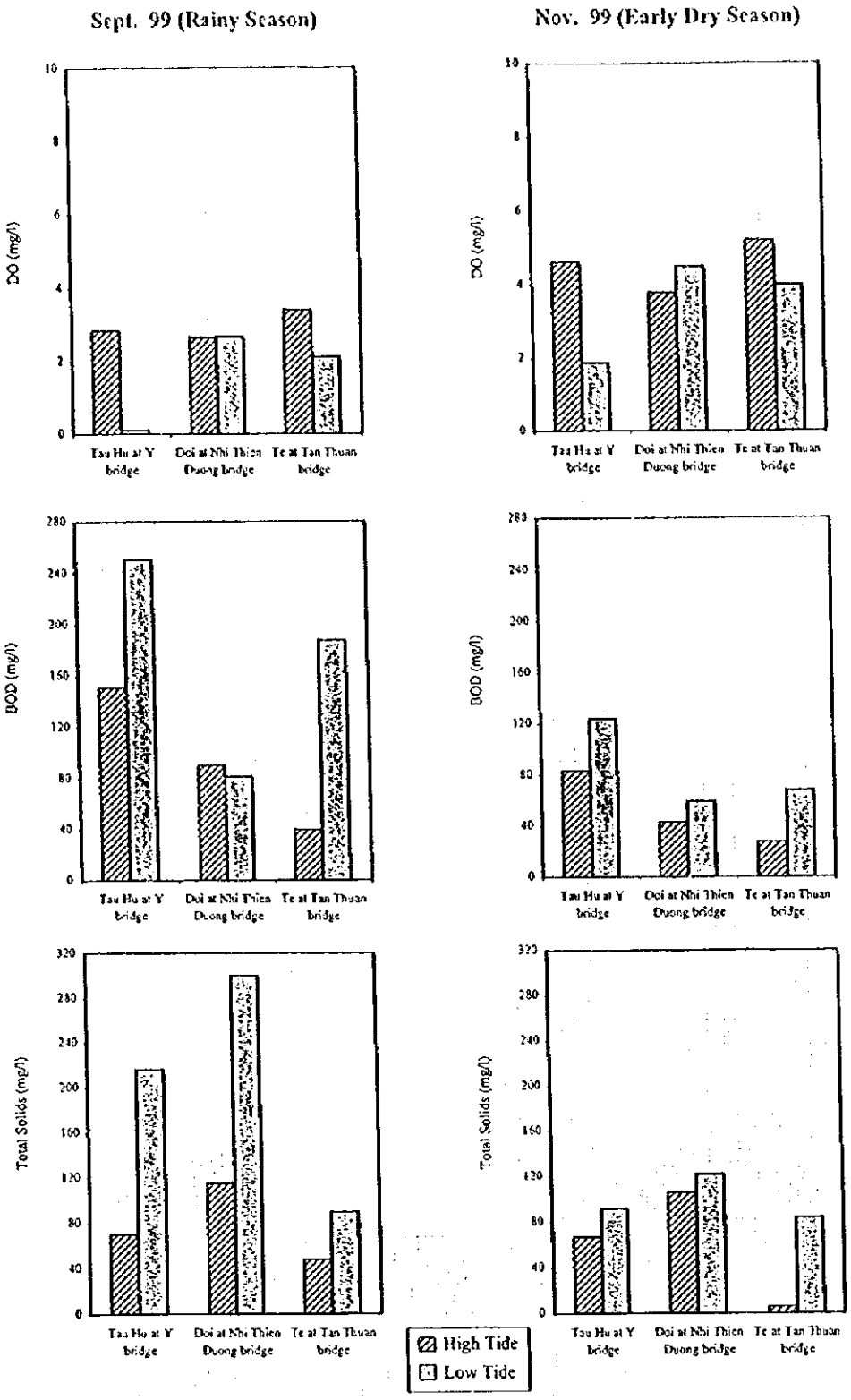


Fig. D.3.11 (1) Organic Pollution in Tau Hu – Doi – Te Canal

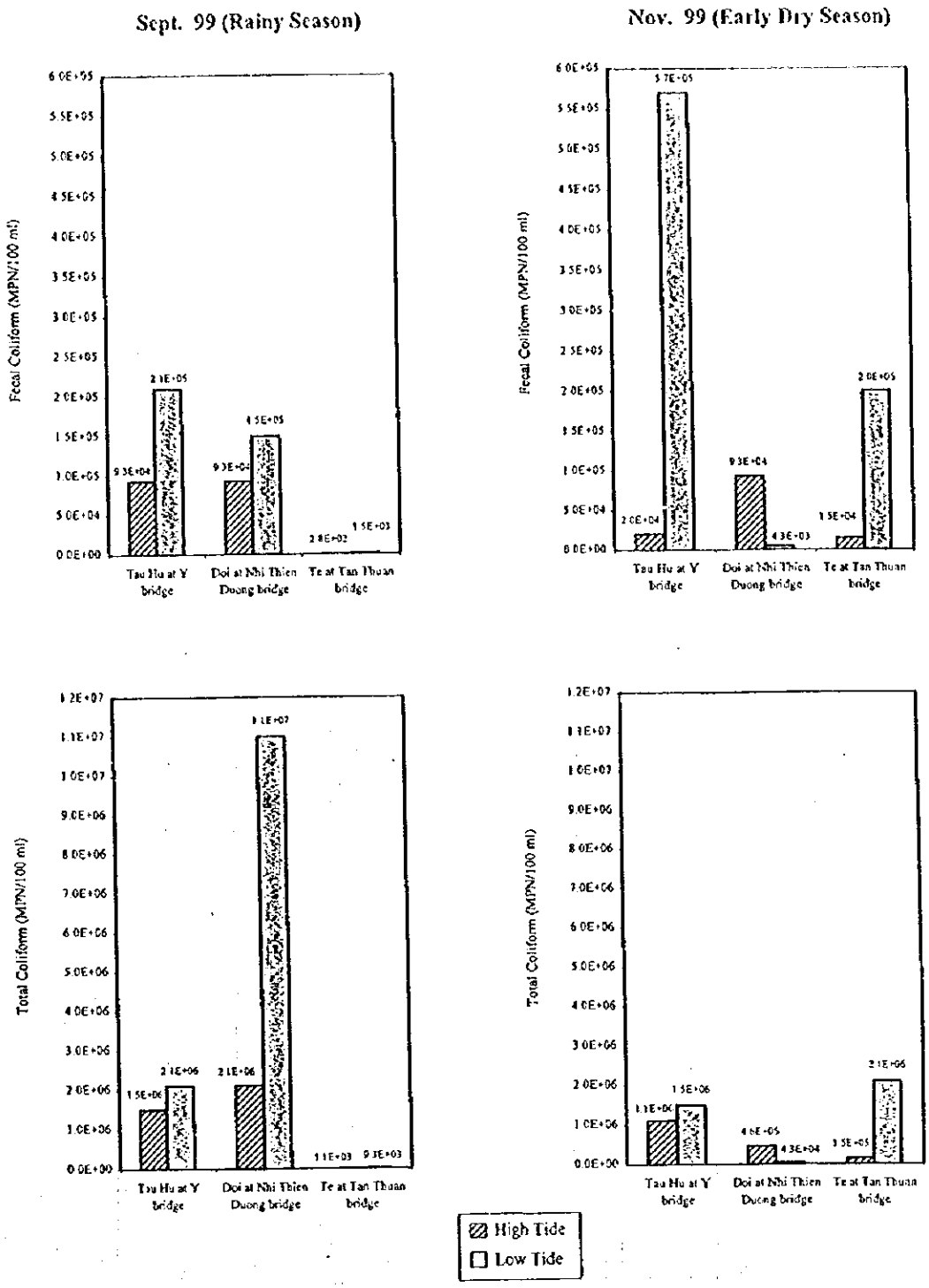


Fig. D.3.11 (2) Fecal Contamination in Tau Hu – Doi – Te Canal

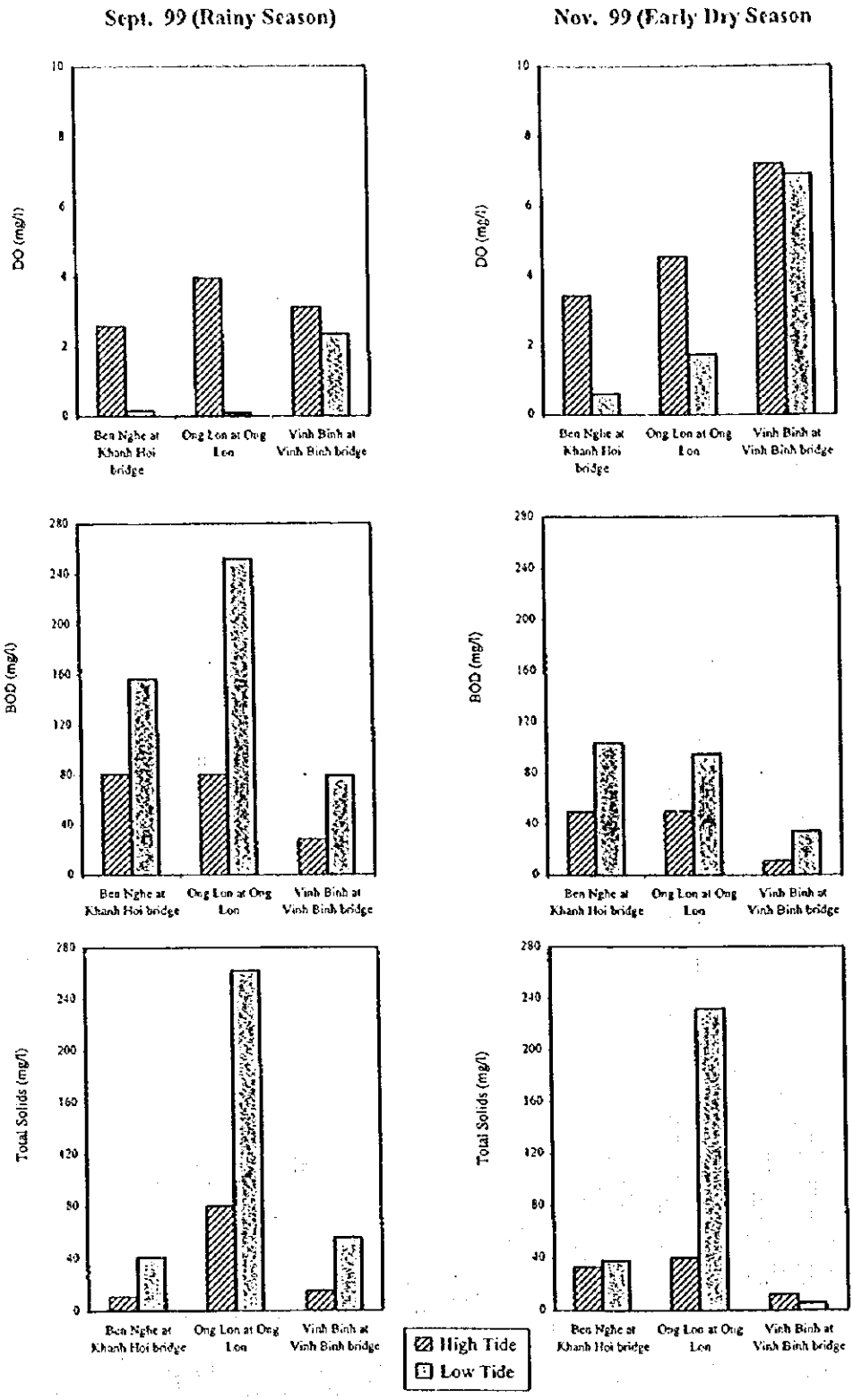


Fig. D.3.12 (1) Organic Pollution in Ben Nghe, Ong Lon and Vinh Binh Canal

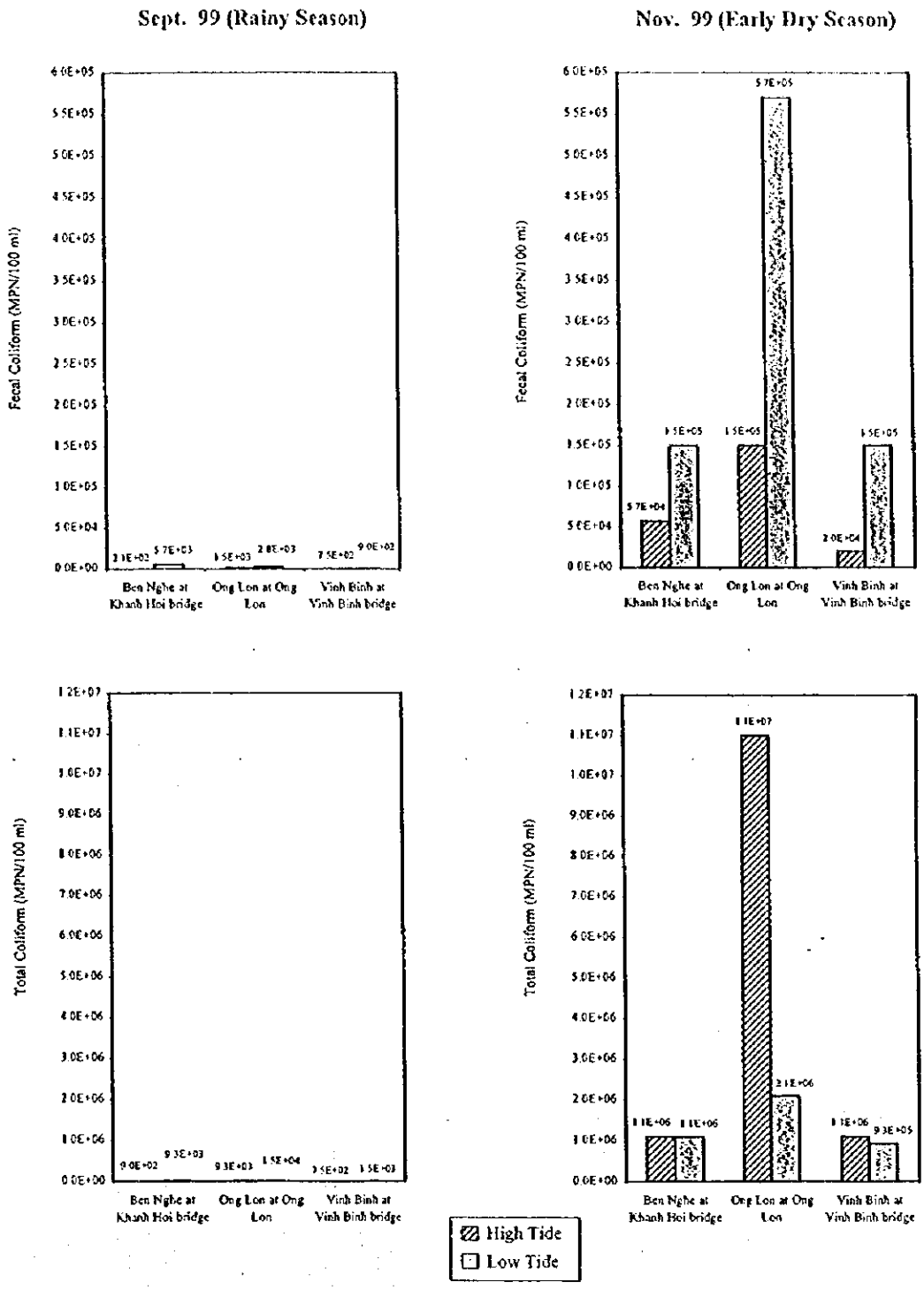


Fig. D.3.12 (2) Fecal Contamination in Ben Nghe, Ong Lon and Vinh Binh Canal