

**The Klang River Environmental Problems :  
An Overview**

**By**

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*River &  
Environment  
Malaysia*

THE KLANG RIVER ENVIRONMENTAL PROBLEMS  
: AN OVERVIEW

by

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25 September 1987

## GLOSSARY

**Ammoniacal Nitrogen (AN)** - an indicator of organic pollution from human and animal wastes.

**Biochemical Oxygen Demand (BOD)** - dissolved oxygen needed by microorganisms to break down organic waste matter in water.

**Biodegradable** - capable of being broken down by bacteria into basic elements and compounds. Most organic waste and paper is biodegradable

**Degradable pollutant** - water or soil pollutant (such as organic wastes) that can be naturally broken by natural microorganisms

**Detergent** - synthetic, organic, liquid, or water soluble cleansing agent that has wetting-agent and emulsifying-agent properties. Unlike soap, detergents are not manufactured from fats and oils.

**Dissolved Oxygen (DO)** - extent to which oxygen occurs dissolved in water or wastewater. It is usually expressed as concentration, in parts per million, or percent of saturation.

**Ecology** - study of relationships of living organisms with each other and with their environment, study of structure and function of nature.

**Effluent** - any solid, liquid or gas that enters the environment from a point source but usually restricted to liquid. Generally refers to wastewater from the sewage treatment or industrial plant.

**Environment** - aggregate of external conditions that influence the life of individual organism or population.

**Eutrophication** - condition of high nutrient enrichment in an aquatic ecosystem, supporting a larger amount of aquatic life, which depletes the oxygen supply.

**Hardness** - condition of water, caused by dissolved calcium, magnesium and iron such as bicarbonates, carbonates, sulphate, chloride and nitrates.

**Heavy Metals** - group of metallic elements with relatively high atomic weights. They include mercury, iron, cobalt, cadmium, lead, nickel and a number of others.

**Lagoon** - in sewage treatment, pond in which sunlight, algae and oxygen interact to restore water to a quality equal to effluent from a secondary treatment plant.

**Methylene Blue Active Substances (MBAS)** - invariably refers to synthetic detergents

**Nitrate (NO<sub>3</sub><sup>-</sup>)** - negatively charged chemical group consisting of one and three oxygen atoms. A major component of some chemical fertilizers.

**pH** - numeric value that indicates the relative acidity or alkalinity of a substance on a 0 to 14 scale with neutral point at 7.0. Values lower than 7.0 indicate the presence of acids and greater than 7.0 the presence of alkalis

**Primary treatment of sewage** - treatment in which large solids like old shoes and plastics are screened out and sewage is allowed to settle in a large tank for a few minutes.

**Runoff** - lateral movement of nutrients and soil to surface waters.

**Sanitary Landfill** - dumping process whereby garbage or other refuse is covered with soil, thus controlling smells, rodent activity etc. and speeding the decay of organic substances.

**Secondary Treatment** - secondary step in most waste treatment systems in which bacteria consume the organic parts of the wastes.

**Septic Tank** - underground tank that receives waste water directly from the house. The bacteria in the sewage decompose the organic wastes and the sludge settles to the bottom of the tank. The effluent flows out of the tank into drains or percolation field.

Turbidity - in water quality, the expression of the optical property that causes light to be scattered and absorbed (expressed in turbidity units). The turbidity in water is caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter and microscopic organisms.

Watershed - land area from which water drains toward a common water course in a natural basin.



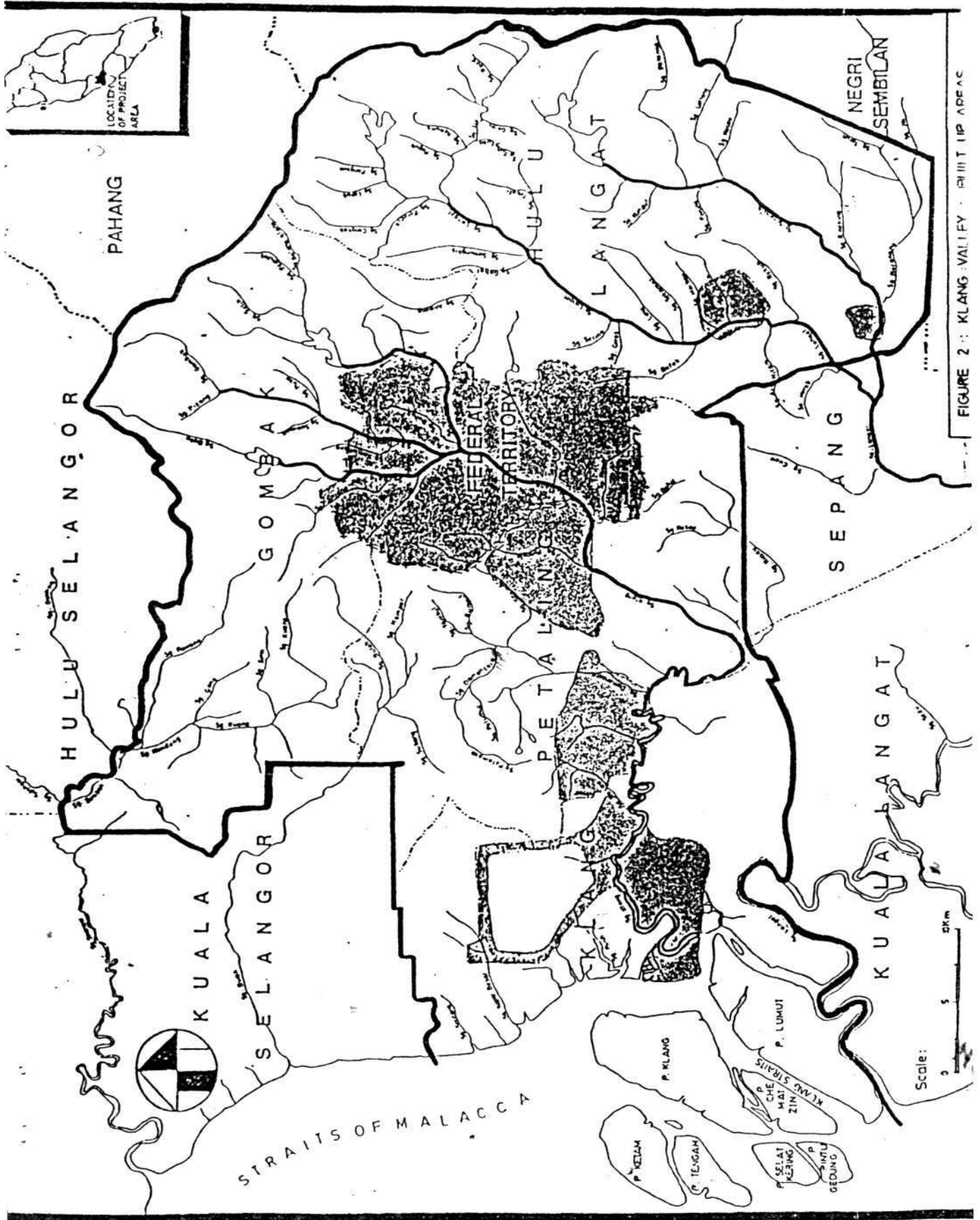
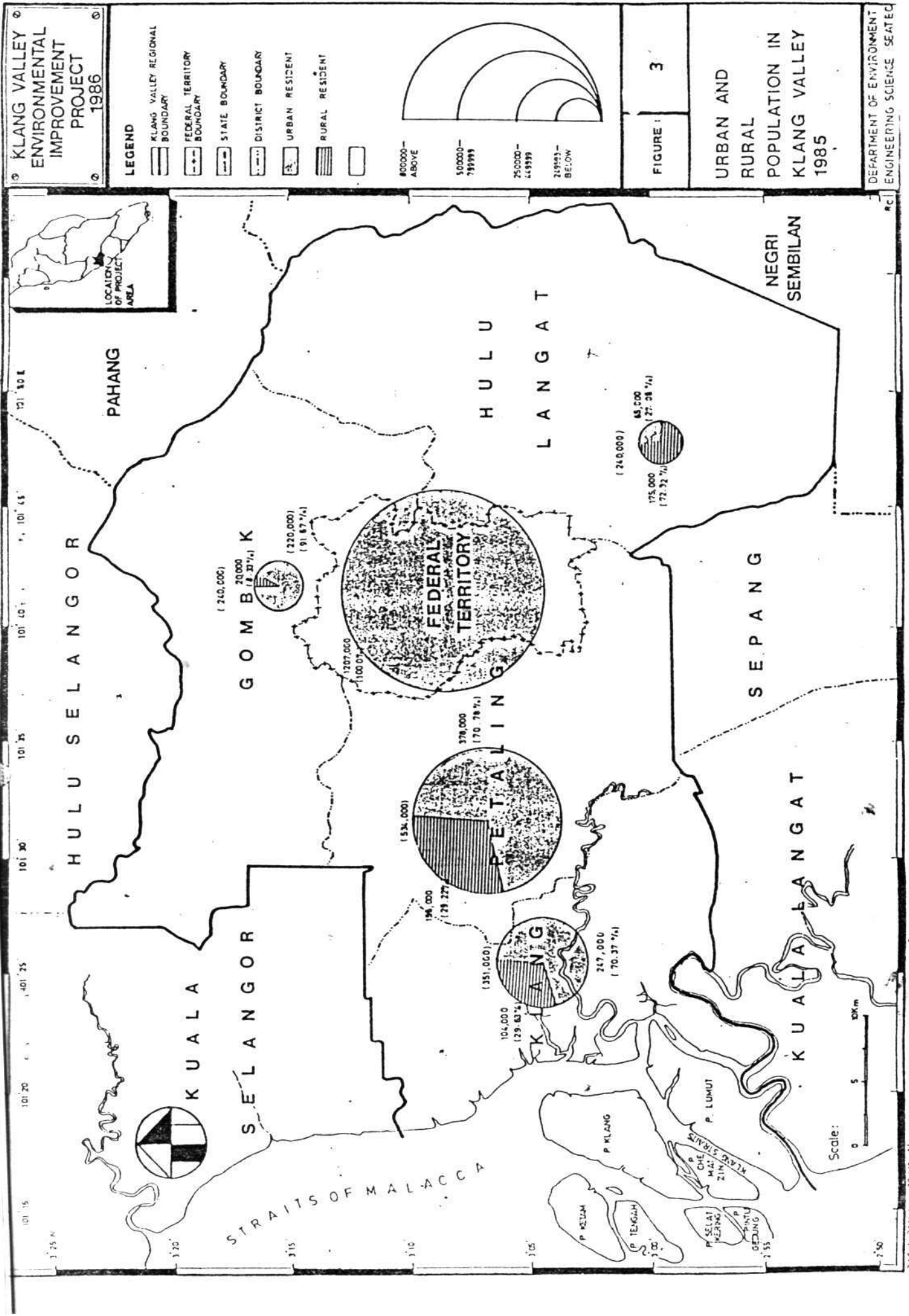
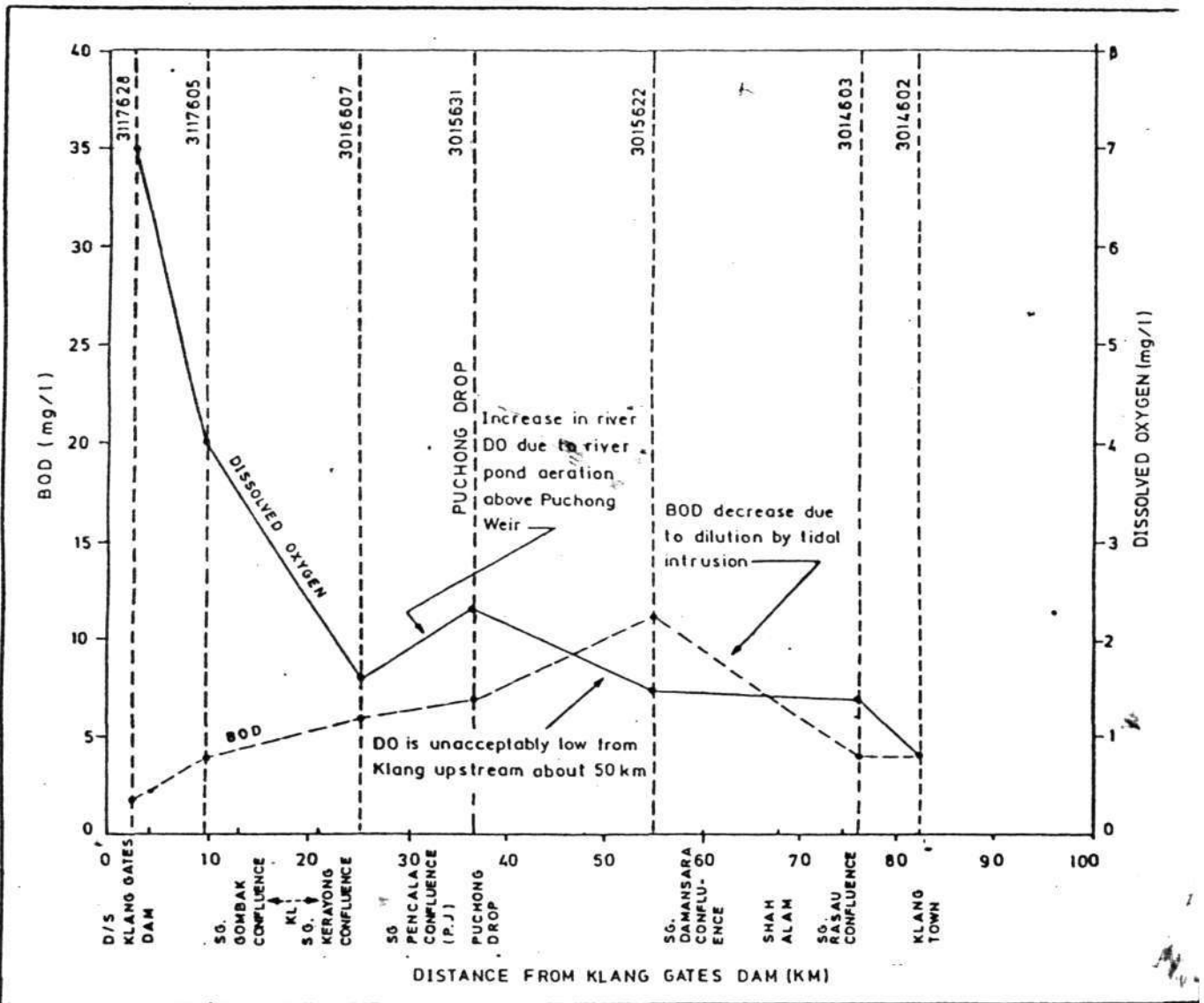


FIGURE 2 : KLANG VALLEY - PHINTIP AREA





KLANG VALLEY ENVIRONMENTAL IMPROVEMENT PROJECT

BOD AND DO VARIATION ALONG KLANG RIVER FOR LOW FLOW CONDITIONS, 1981-1984.

FIGURE : 4

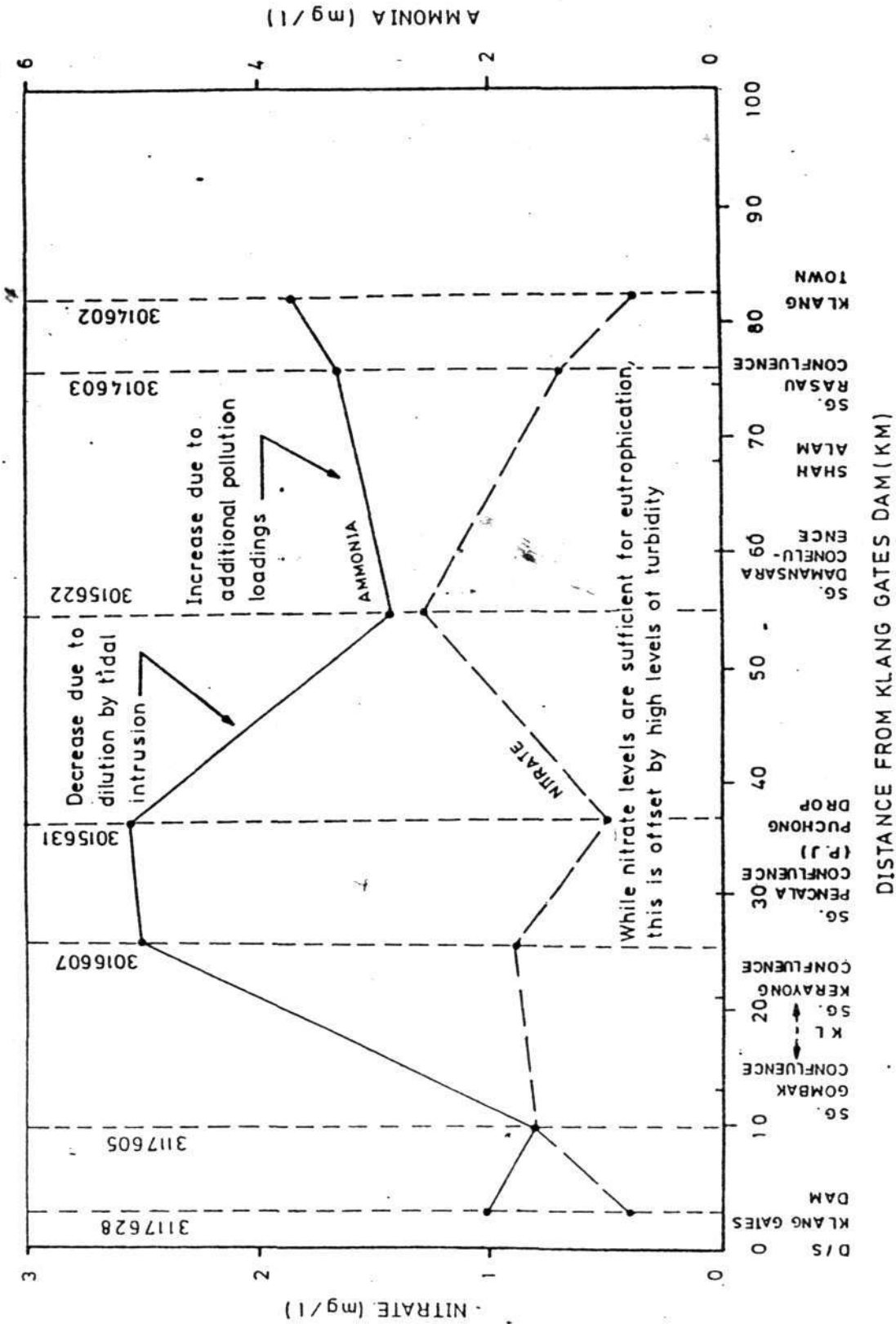


FIGURE : 5

AMMONIA AND NITRATE VARIATION ALONG  
KLANG RIVER FOR LOW FLOW CONDITIONS,  
1981 - 1984

KLANG VALLEY  
ENVIRONMENTAL  
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KLANG VALLEY ENVIRONMENTAL IMPROVEMENT PROJECT

COD AND PHOSPHATE VARIATION ALONG KLANG RIVER FOR LOW FLOW CONDITIONS, 1981-1984.

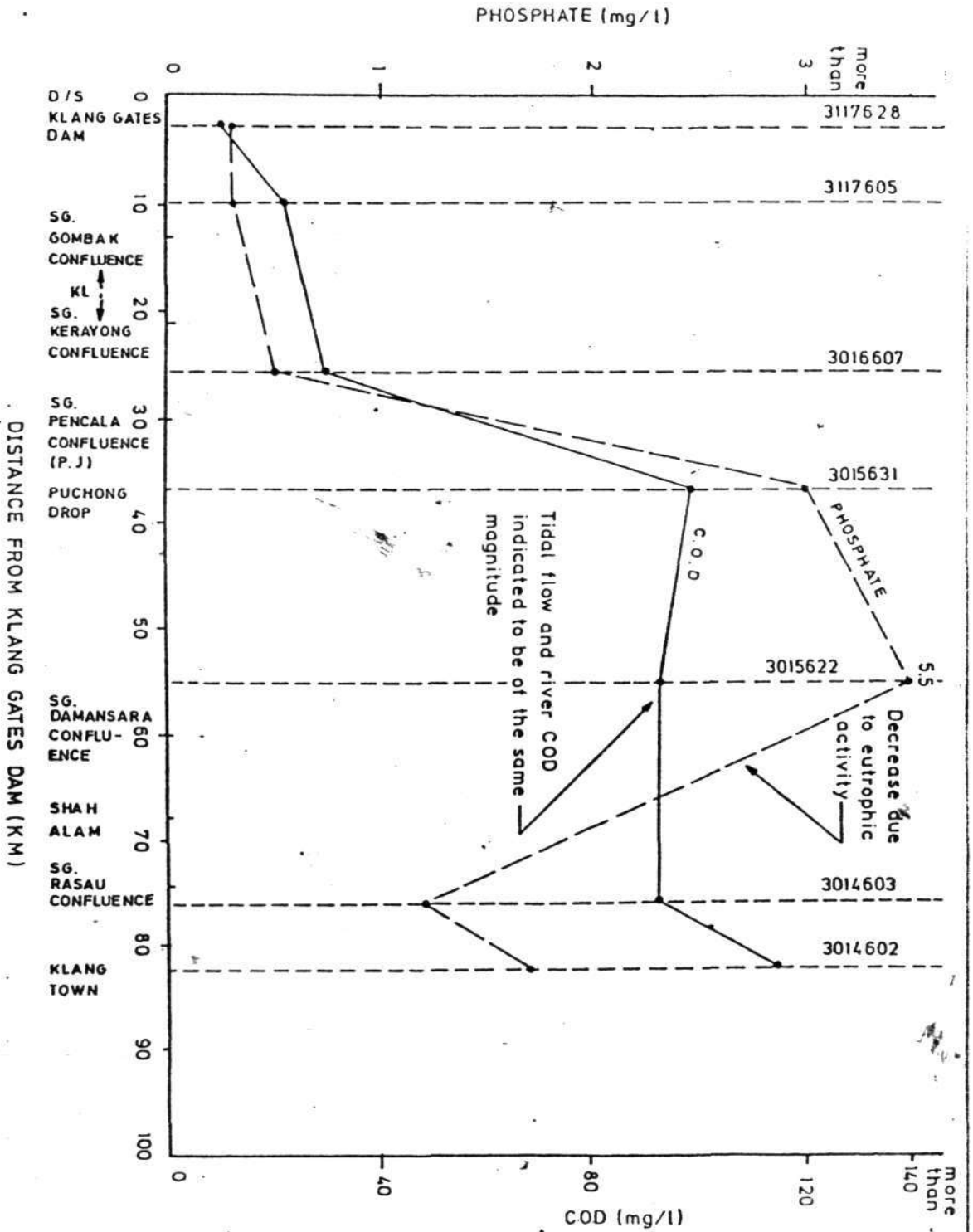


FIGURE : 6

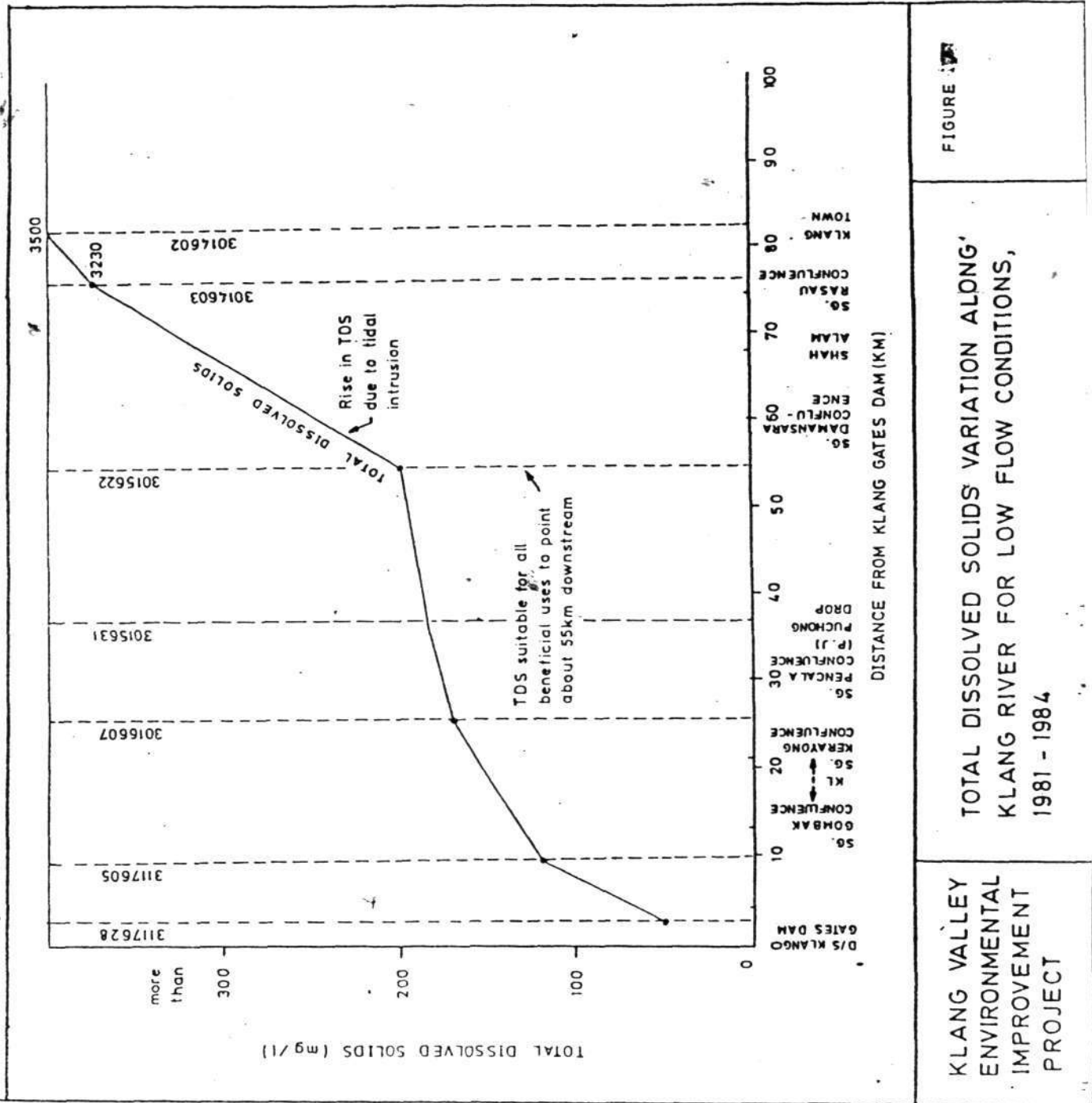
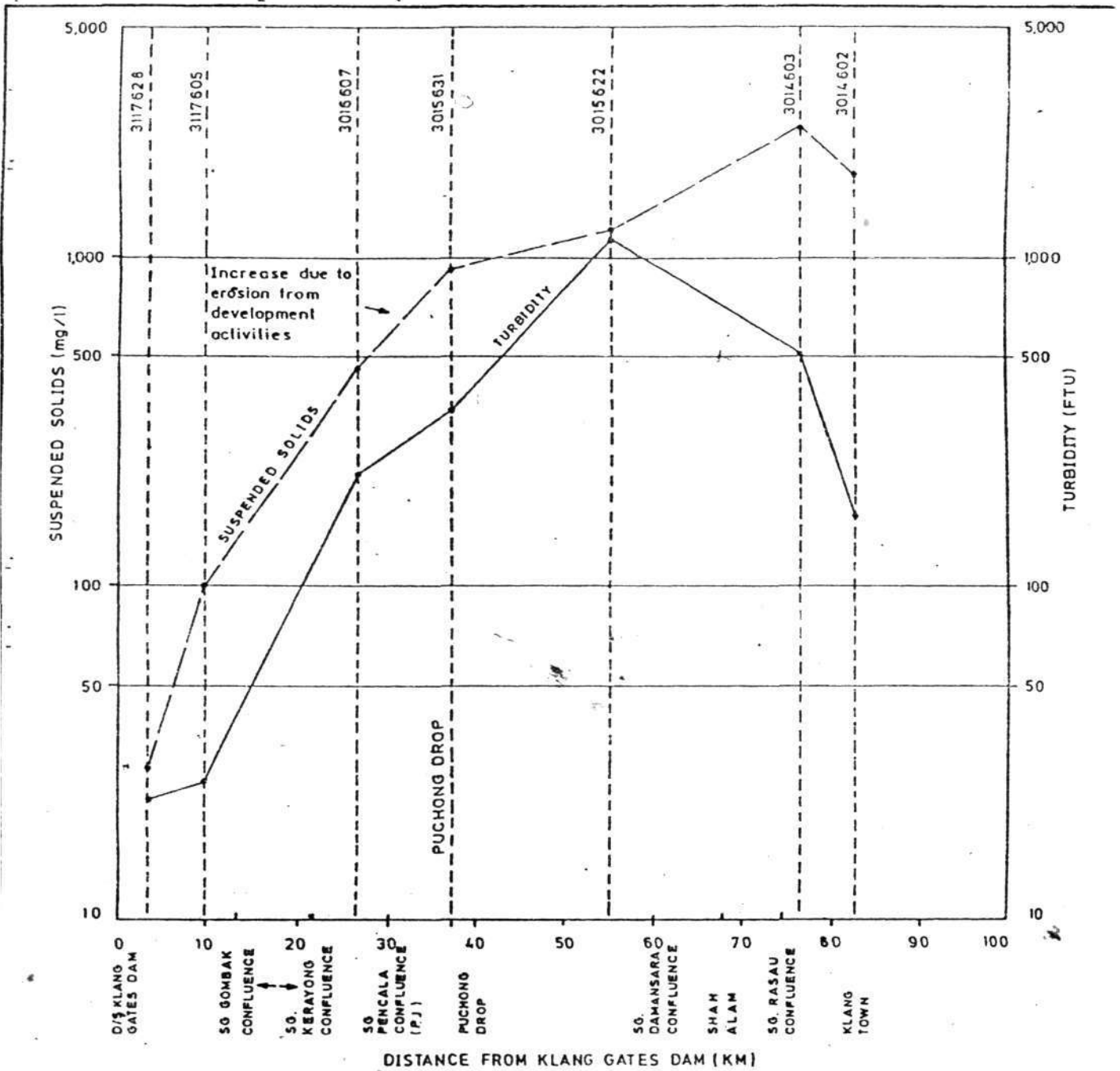


FIGURE 1.1

TOTAL DISSOLVED SOLIDS VARIATION ALONG KLANG RIVER FOR LOW FLOW CONDITIONS, 1981 - 1984

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KLANG VALLEY ENVIRONMENTAL IMPROVEMENT PROJECT

SUSPENDED SOLIDS AND TURBIDITY VARIATION ALONG KLANG RIVER FOR LOW FLOW CONDITIONS, 1981.- 1984.

FIGURE : 8

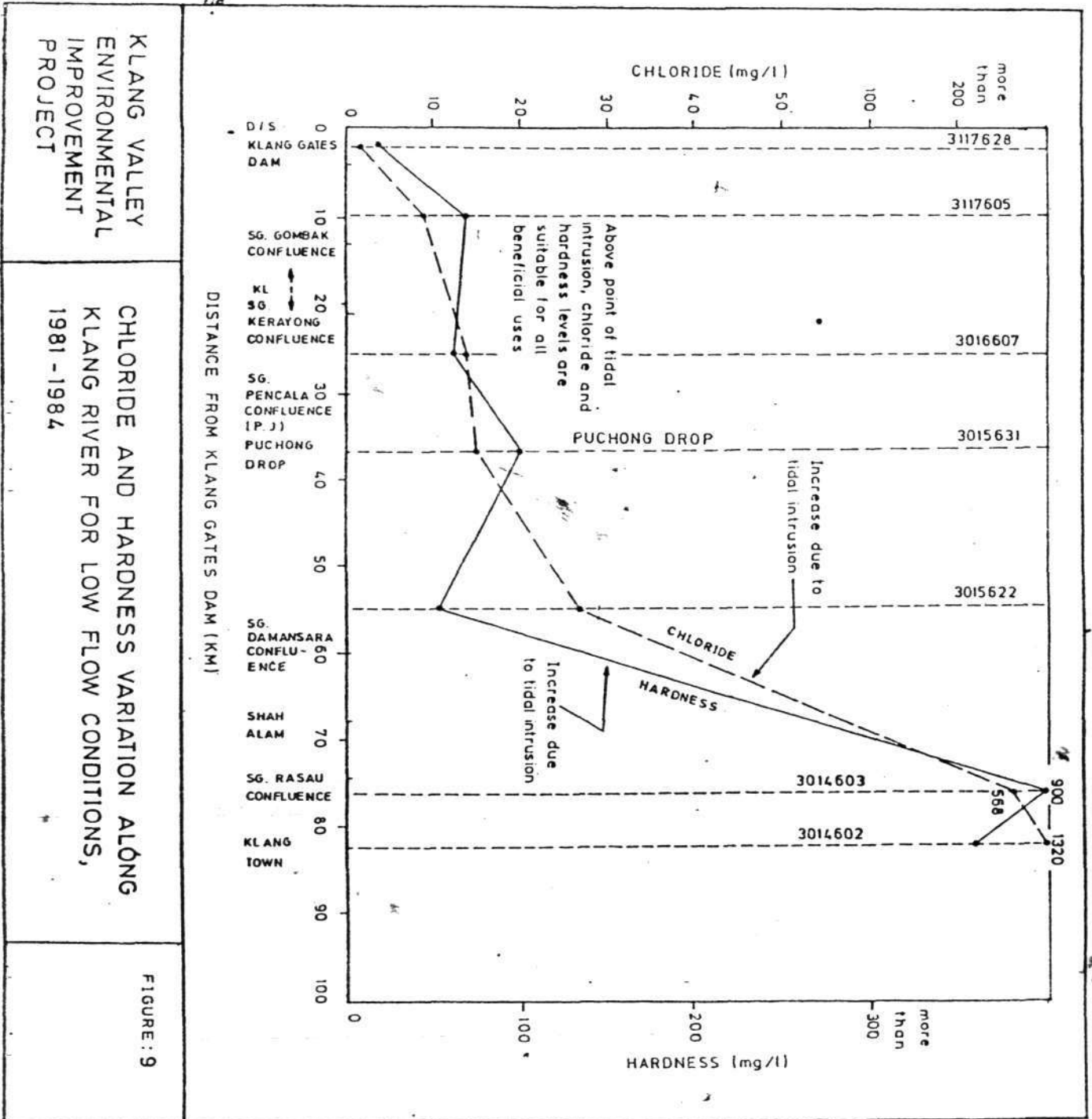


FIGURE: 9

KLANG VALLEY ENVIRONMENTAL IMPROVEMENT PROJECT

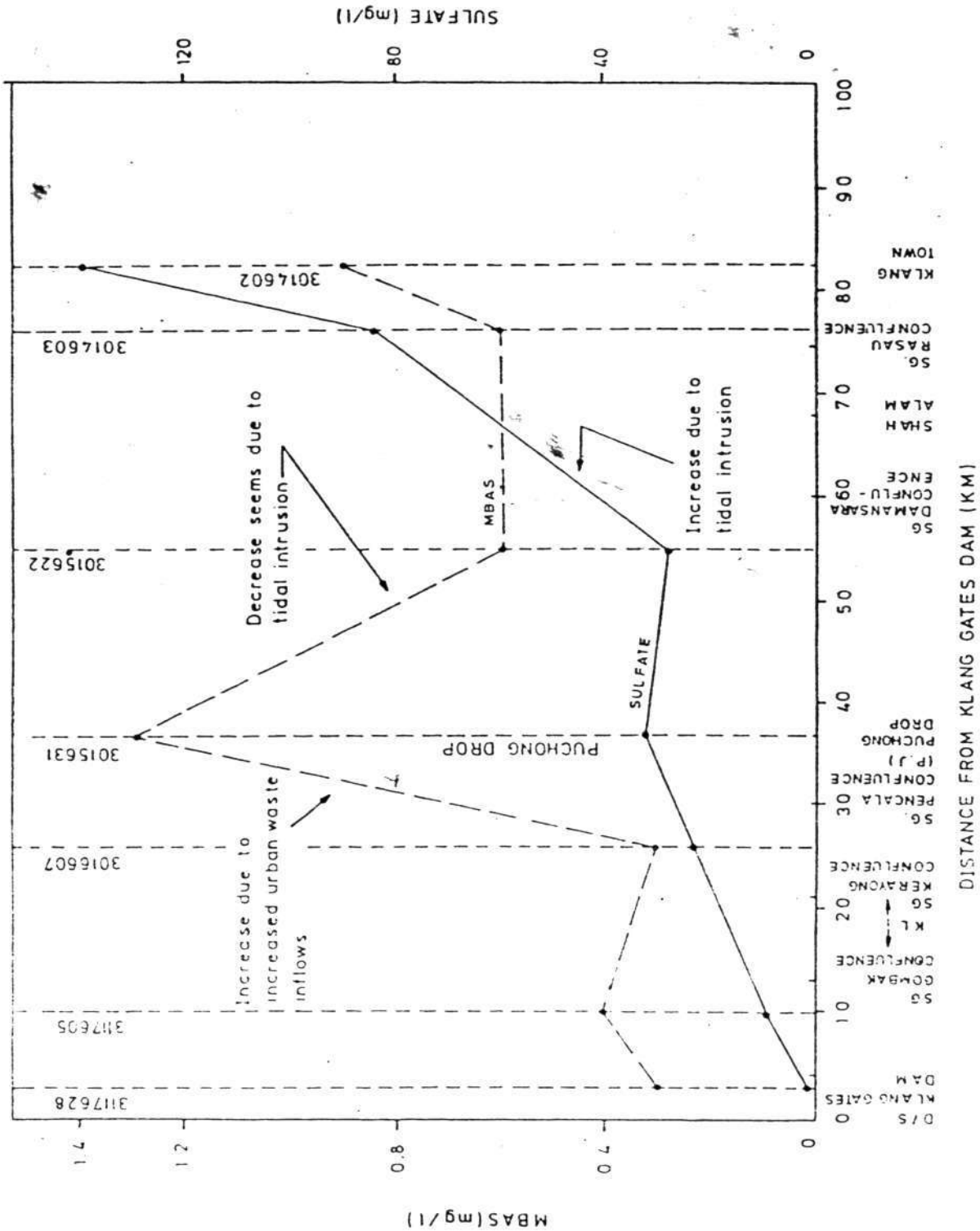
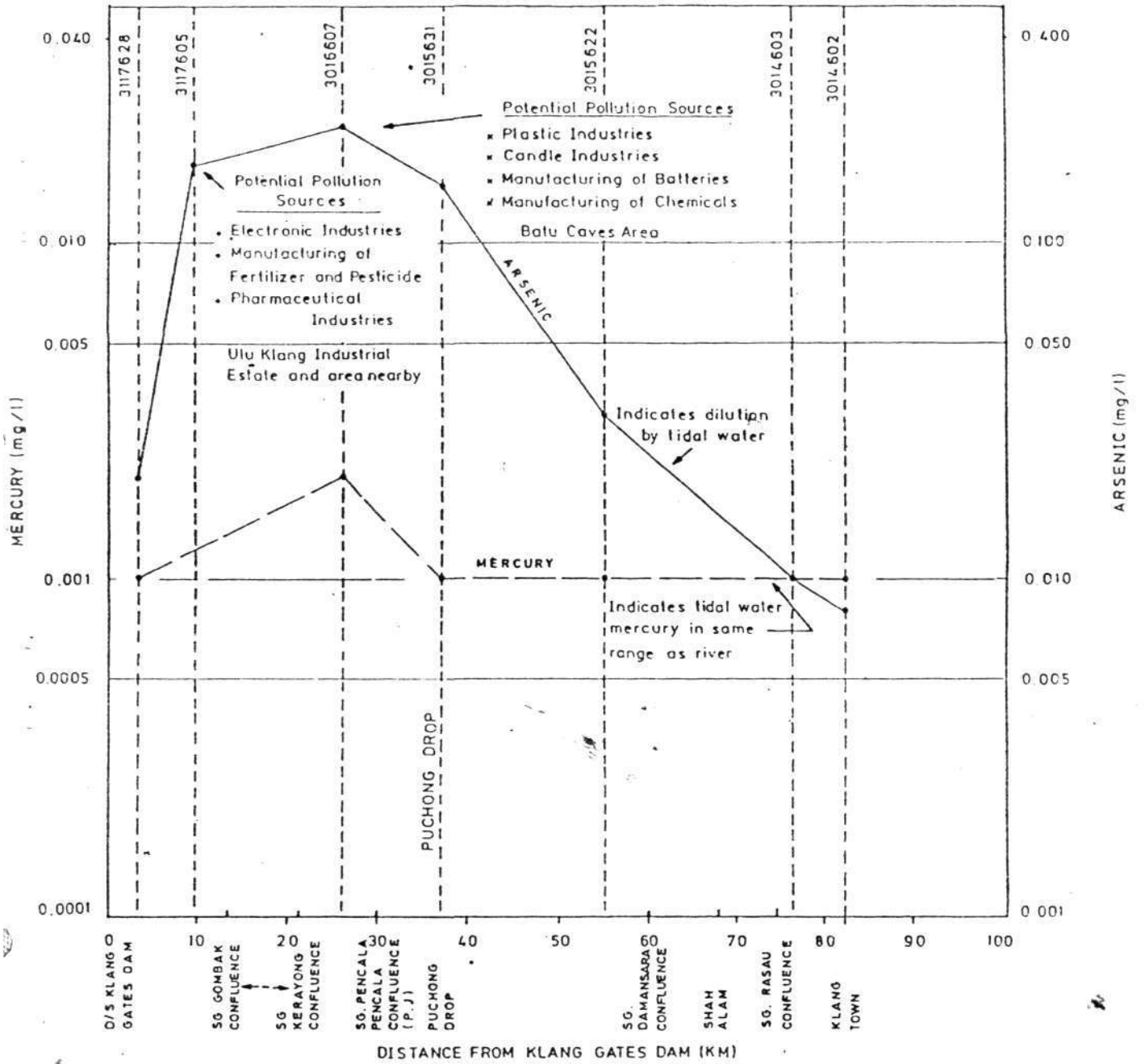


FIGURE : 10

MBAS AND SULFATE VARIATION ALONG  
 KLANG RIVER FOR LOW FLOW CONDITIONS,  
 1981 - 1984

KLANG VALLEY  
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KLANG VALLEY ENVIRONMENTAL IMPROVEMENT PROJECT

ARSENIC AND MERCURY VARIATION ALONG KLANG RIVER FOR LOW FLOW CONDITIONS, 1981 - 1984

FIGURE: 11

TABLE : 1

SOLID WASTE BOD LOADS FOR KLANG VALLEY, 1985

<u>District</u>	<u>Population</u>	<u>BOD, Kg/day</u>
Federal Territory.	1,207,000	1,175
Petaling	454,000	442
Klang	324,000	315
Gombak	240,000	234
Ulu Langat	240,000	234
<hr/>		
Klang Valley	2,465,000	2,400
<hr/>		

Note: Assumed 1 ton of putrescibles generates @ 80 kg of BOD.  
Therefore 30 tons of putrescibles generates 2,400 kg of BOD.

TABLE: 2

## MAJOR POLLUTING INDUSTRIES IN KLANG VALLEY

CATEGORY	Industry REF NO	FLOW (cu m/day)	LOAD (Kg/Day)		
			BOD	SS	AN
Breweries.	2	2315	6250	4630	14
	6	70	57	6	-
	3	32	3	35	-
Soft Drink Industries	1	21	21	36	-
	8	341	708	271	-
	25	437	256	15	-
Food Proce- ssing Indus- tries	7	480	384	-	-
	2F	409	491	118	-
	3F	780	281	246	-
	135	42	42	51	-
	161	48	71	1000	-
Chemical Ma- nufacturing Industries	1C	341	511	682	-
	8C	75	45	22	-
	16C	90	11	-	1
Semi-Conduc- tor and Ele- ctrical In- dustries	30	3000	150	300	200
Rubber Pro- cessing In- dustries	245	136	106	-	-
	259	230	90	54	89
	3	99	599	80	62
	12	269	26	31	89
	102	1067	28	43	9
	135	171	9	19	9
	164	2617	341	532	21
	210	1170	119	234	11
	112	1000	64	60	25
	132	132	6	10	0.2
	330	288	66	29	6
Palm Oil Processing Industries	55	264	85	973	83
	67	9	0.6	4	0.01
	165	299	40	442	36
	168	125	18	18	14

Source: Department of Environment

TABLE : 3

## INDUSTRIAL WASTEWATER LOADS FROM KLANG VALLEY ZONES

Location	KV Zone	1985		1995		2005	
		BOD	Flow	BOD	Flow	BOD	Flow
Setapak	47	0.3	950	0.7	2,200	1.6	5,000
Ulu Klang	10	0.70	2,300	0.7	2,300	0.7	2,300
Batu Caves/ Kepong	14	0.40	1,200	0.5	1,500	0.6	2,000
Jinjang	41	0.5	1,500	0.9	2,700	1.4	4,400
Kepong	45	0.95	2,800	0.95	3,000	1.0	3,000
Gombak	46	0.50	1,450	0.8	2,400	0.9	2,700
Segambut	42	1.10	3,600	1.2	3,600	1.2	3,600
K.L.	40	0.30	800	0.5	1,450	0.8	2,500
Sg. Besi	35	1.20	3,800	1.2	3,800	1.2	3,800
Cheras	11	0.15	500	0.2	500	0.2	500
K.L.	30	1.1	3,500	1.8	5,500	2.9	9,000
K.L.	32	1.40	4,300	1.4	4,300	1.4	4,300
Petaling Jaya	27	5.9	18,400	7.0	24,000	9.0	29,000
Batu Tiga/ Puchong	49	3.60	11,400	4.7	14,000	5.9	18,300
Shah Alam	24	6.10	19,000	8.0	27,000	9.0	31,000
Bkt Rajah	19	0.20	700	0.3	850	0.4	1,100
Klang	21	1.50	4,800	4.4	13,600	7.9	25,000
North Klang	25	2.0	5,000	3.0	8,000	4.0	9,500
Bangi/ Kajang	54	0.4	2,000	0.5	2,500	0.7	3,500

Units: BOD, tons/day  
Flow, cu m/day

**TABLE : 4**

**PROPOSED INTERIM NATIONAL WATER QUALITY STANDARDS  
FOR MALAYSIA**

PARAMETERS	(units)	CLASSES					
		I	IIA	IIB	III	IV	V
Ammoniacal Nitrogen	mg/L	0.1	0.3	0.3	0.9	2.7	>2.7
BOD	mg/L	1	3	3	6	12	>12
COD	mg/L	10	25	25	50	100	>100
DO	mg/L	7	5-7	5-7	3-5	<3	<1
pH		6.5-8.5	6-9	6-9	5-9	5-9	-
Colour	TCU	15	150	150	-	-	-
Elect. Cond.*	µmhos/cm	1000	1000	-	-	6000	-
Floatables		N	N	N	-	-	-
Odour		N	N	N	-	-	-
Salinity*	‰	0.5	1	-	-	2	-
Taste		N	N	N	-	-	-
Total Diss. Solid*	mg/L	500	1000	-	-	4000	-
Total Susp. Solids	mg/L	25	50	50	150	300	>300
Temperature	°C	-	Normal +2	-	Normal +2	-	-
Turbidity	NTU	5	50	50	-	-	-
F. Colif.**	counts/ 100mL	10	100	400	5000 (20000) <sup>a</sup>	5000 (20000) <sup>a</sup>	-
Tot. Colif.	counts/ 100mL	100	5000	5000	50000	50000	>50000

N = No visible floatable materials/debris,  
or No objectionable odour,  
or No objectionable taste.

\* = Related parameters, only one recommended for use

\*\* = Geometric mean

a = Maximum not to be exceeded

CONTINUED ..... TABLE : 4

PARAMETERS	(units)	CLASSES				
		I	IIA/IIB	III#	IV	V
CCE	µg/L	↑	500	-	-	-
MBAS/BAS	µg/L	N	500	5000 (200)	-	-
O&G (mineral)	µg/L	A	40;N	N	-	-
O&G(emulsified edible)	µg/L	T	7000;N	N	-	-
PCB	µg/L	L	0.1	6 (0.05)	-	-
Phenol	µg/L	E	10	-	-	-
		V				
Aldrin/ Dieldrin	µg/L	E	0.02	0.2 (0.01)	-	-
		L				
BHC	µg/L	S	2	9 (0.1)	-	-
Chlordane	µg/L		0.08	2 (0.02)	-	-
t-DDT	µg/L	O	0.1	1 (0.01)	-	-
Endosulfan	µg/L	R	10	-	-	-
Heptachlor/ Epoxide	µg/L		0.05	0.9 (0.06)	-	-
		A				
Lindane	µg/L	B	2	3 (0.4)	-	-
		S				
2,4-D	µg/L	E	70	450	-	-
2,4,5-T	µg/L	N	10	160	-	-
2,4,5-TP	µg/L	T	4	850	-	-
Paraquat	µg/L	↓	10	1800	-	-

N = Free from visible film, sheen, discoloration and deposits  
 # = Maximum (unbracketed) and 24-hr average (bracketed) concentration

**IV.2 WATER QUALITY CLASSIFICATION**

The system of use classification proposed is defined as follows:

<u>CLASS</u>	<u>USES</u>
I	Conservation of natural environment Water supply I --practically no treatment necessary (except by disinfection or boiling only) Fishery I - very sensitive aquatic species
IIA	Water supply II - conventional treatment required Fishery II - sensitive aquatic species
IIB	Recreational use with body contact
III	Water supply III - extensive treatment required Fishery III - common, of economic value, and tolerant species Livestock drinking
IV	Irrigation
V	None of the above

CONTINUED ..... TABLE : 4

PARAMETERS	(units)	CLASSES							
		I	IIA/IIB	III#	IV	V			
Al	mg/L	↑	-	-	(0.06)	0.5	↑		
As	mg/L		0.05	0.4	(0.05)	0.1			
Ba	mg/L		1	-	-	-			
Cd	mg/L		0.01	0.01*	(0.001)	0.01			
Cr(VI)	mg/L		0.05	1.4	(0.05)	0.1			
Cr(III)	mg/L		-	2.5	-	-			
Cu	mg/L		1	-	-	0.2			
Hardness	mg/L		250	-	-	-			
Ca	mg/L		-	-	-	-			
Mg	mg/L		-	-	-	-			
Na	mg/L		-	-	-	3 SAR			
K	mg/L		-	-	-	-			
Fe	mg/L		0.3	1	-	1 (leaf) 5 (others)			
Pb	mg/L		N	0.05	0.02*	(0.01)		5	L
Mn	mg/L		A	0.1	0.1	-		0.2	E
Hg	mg/L	T	0.001	0.004	(0.0001)	0.002	V		
Ni	mg/L	U	0.05	0.9*	-	0.2	E		
Se	mg/L	R	0.01	0.25	(0.04)	0.02	L		
Ag	mg/L	A	0.05	0.0002	-	-	S		
Sn	mg/L	L	-	0.004	-	-	A		
U	mg/L	L	-	-	-	-	B		
Zn	mg/L	E	5	0.4*	-	2	O		
B	mg/L	V	1	-	(3.4)	0.8	V		
Cl	mg/L	E	200	-	-	80	E		
Cl <sub>2</sub>	mg/L	L	-	-	(0.02)	-	IV		
CN <sup>-</sup>	mg/L	S	0.02	0.06	(0.02)	-	↓		
F	mg/L	↓	1.5	10	-	1	↓		
NO <sub>2</sub>	mg/L	↓	0.4	0.4	(0.03)	-	↓		
NO <sub>3</sub>	mg/L	↓	7	-	-	5	↓		
P	mg/L	↓	0.2	0.1	-	-	↓		
Si	mg/L	↓	50	-	-	-	↓		
SO <sub>4</sub>	mg/L	↓	250	-	-	-	↓		
S <sub>2</sub>	mg/L	↓	0.05	-	(0.001)	-	↓		
CO <sub>2</sub>	mg/L	↓	-	-	-	-	↓		
Gross-α	Bq/L	↓	0.1	-	-	-	↓		
Gross-β	Bq/L	↓	1	-	-	-	↓		
Ra-226	Bq/L	↓	<0.1	-	-	-	↓		
Sr-90	Bq/L	↓	<1	-	-	-	↓		

\* = At hardness 50 mg/L CaCO<sub>3</sub>

# = Maximum (unbracketed) and 24-hr average (bracketed) concentrations

## 1. Purpose

1.1 The purpose of this paper is to present an overview of the environmental problems faced by the Klang River, a major urban river of this country.

1.2 The participants of this workshop thus will be exposed to the basic knowledge of water quality management and water pollution. It is not the intention of the writer to impart highly technical or academic mumbo jumbo.

1.3 A major part of the information presented in this paper is drawn from the recent Klang Valley Environmental Improvement study conducted by Engineering Science Incorporated of the United States and SEATEC International in conjunction with the Department of Environment, Malaysia.

## 2. Klang River System

2.1 The Klang River drains an area of about 1200 sq. Km extending from the headwaters in the steep mountain forests of the Main Range of Peninsular Malaysia to the river mouth for a total length of 120 Km. The main tributaries of Sungai Klang are Sungai Batu, Sungai Gombak, Sungai Ampang, Sungai Kerayong, Sungai Damansara, Sungai Keroh, Sungai Jinjang, Sungai Penchala and Sungai Kuyoh. The river system drains all the major urban centers in Klang Valley, viz. Kuala

Lumpur, Petaling Jaya, Subang Jaya, Shah Alam, Klang and Fort Klang (Figure 1 and 2).

2.2 The effective watershed basins of the Sungai Klang, Sungai Batu and Sungai Gombak are relatively small. As a result of the mountainous nature of these upper reaches and rapid development ongoing within these catchment areas, extreme high flows are experienced during the rainy season and periods of sudden thunderstorms. Construction of the Klang Gates Dam has significantly reduced natural flow in Sungai Klang.

2.3 The Batu Dam will be fully operational by 1988 and this will further reduce the natural flow of Sungai Batu and Sungai Klang (downstream of Sungai Gombak\_Sungai Klang confluence near the Jamek Mosque).

### 3. Pollution Sources

#### 3.1 Community (Domestic) Wastewater

There are four different wastewater disposal systems used within the Klang River Basin, namely municipal sewerage, individual community sewerage, building systems and non-sewered system.

The populations in Kuala Lumpur serviced by existing facilities as of 1984 are listed below :

Facilities	Population (thousand)
<u>Sewerage</u>	
Septic tank	336
Imhoff tank	157
Treatment (city sewerage and individual community sewerage)	425
<u>Non-sewered system</u>	
Bucket nightsoil	30
Pour-flush latrine	105
Pit privies	106
Latrines over watersource (hanging latrines)	12
Others	12
<b>Total</b>	<b>1213</b>

Individual building systems in the Klang River Basin are generally served by septic tank without any accompanying soakaway or leaching pit. Almost without exception, septic tank effluent is discharged direct to the surface water drain, along with sullage which invariably by-passes the septic tank. The degree of treatment afforded by most septic tanks is negligible because most of them are never desludged. Individual

community systems are normally built by the developer of a particular community/housing area and usually comprise Imhoff tanks with effluent filters, oxidation ponds or aerated lagoons. The maintenance of Imhoff tanks and filters is usually neglected and the resulting treatment efficiency of the system is quite low (about 10%).

### 3.2 Industrial wastewater

The distribution of the major industrial and agro-industrial sources of water pollution in the Klang River Basin are shown in Figure 1. However the Department of Environment (DOE) records are incomplete for smaller industries and the usually illegal "backyard" industries. The wastewater data compiled by the DOE are based on information submitted by the industries and represent the effluent flow and load characteristics after in-plant treatment, if any.

### 3.3 Solid wastes

A significant portion of the total solid wastes not collected within the Klang River basin, not burned nor buried, finds its way into the waterways. It is estimated that the total non-collected refuse in Klang Valley amounted to some 403 tons/day and of this it is

is estimated that some 120 tons/day are buried, 200 tons/day burned and 65 tons/day reach the rivers.

#### 3.4 Farm waste and agricultural runoff

Major agricultural activities in the region include rubber, oil palm and coconut cultivation. Animal husbandry activities include pig and poultry farming. Plantation activities are fairly well managed and agricultural chemicals (fertilizer, chemicals, etc) are well controlled but the surface runoff from these plantations could increase nitrate and phosphate nutrient levels and possibly increase levels of eutrophication.

Pig farms are concentrated near new village settlements like Subang. Most large farms (over 3000 pigs) use single stage anaerobic ponds which provide varying degrees of treatment but many do not perform satisfactorily due to design deficiencies and to poor operation and maintenance. There are many smaller farms without any treatment whatsoever which discharge waste direct into waterways.

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4.5 "In-situ" readings are also carried out namely for dissolved oxygen (DO), turbidity, pH, salinity, conductivity and temperature using specific electronic meters.

4.6 Data obtained ("in-situ" readings and results of chemical analyses) are stored in a computer but beforehand results are scanned for discrepancies such as sudden changes in certain parameters. These discrepancies are for the Enforcement Unit to act on by checking the possible polluting sources upstream of the monitoring station.

## 5. Water Quality

### 5.1 BOD and DO

As shown in Figure 4, for 1981-1984 conditions, the river water BOD increased markedly when the river flowed through the urban areas, and correspondingly the DO decreased. By the time the river met the sea, the DO level was very low from time to time, as low as or less than 1 mg/l. This means that the river was sometimes barely aerobic during the critical low flow period. The widening gap between BOD loading and river DO capacity will sooner or later cause the river to become septic over appreciable time periods over its lower reaches, unless suitable corrective measures are

undertaken. This transition to gross septic conditions is expected to take place within the next 5 to 10 years.

### 5.2 Other parameters

The patterns of change along the river for other pollutant parameters are shown in Figures 5 to 11. These patterns are similar to that of BOD which is, low near the river source but increasing as it passes through industrial and built-up urban areas.

### 5.3 Water Quality Index (WQI)

The Department of Environment uses the weighted average of several major parameters namely BOD, COD, suspended solids, pH and ammoniacal nitrogen to calculate Water Quality Indices of Malaysian rivers. Therefore, the trend of water quality from year to year can be observed. Anyway, there are scepticism as of the acceptability of such calculation relative to other statistical methods.

According to the WQI trends, the Klang River water quality is in a yo-yo pattern although there are some improvements.

## 6. Epilogue

6.1 The Water quality of most Malaysian rivers has changed for the better over the past 10 years as a result of

water pollution control actions brought about by appropriate legislative and institutional arrangements but sad to say, the statement is not generally true for the river that runs through the Malaysian capital. Actually, the quality of the Klang River might take a turn for the worse unless suitable corrective measures are undertaken.

6.2 Domestic wastewater should receive the same attention as organic industrial effluents and be required to meet the appropriate effluent quality requirements by centralised treatment facilities. This is especially true for the Klang River basin which carries the heavy burden of rapid industrialization, urbanization and population growth.

6.3 There is also a need for a reappraisal of the level of competency of many local authorities in implementing and enforcing various laws and rules for soil conservation, control of run-offs from construction sites, logging sites, tin mines, earthworks or other land development activities. This is because there is no general improvement of the suspended solids parameter in many Malaysian rivers and some rivers are getting worse (including Klang River). Nevertheless, a joint effort by all relevant agencies is greatly needed to overcome various aspects of problems related to environmental management.

ACKNOWLEDGMENT AND DISCLAIMER

The author is grateful to FPK Zamrudah Yeop and JT Ishak Raof for typing the paper and the DOE for permission to present it. The opinions expressed herein are those of the author and do not necessarily represent the decisions and the stated policies of the DOE.

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## APPENDIX 1

## KLANG RIVER WATER MONITORING STATIONS FOR WQR 18

STATION NUMBER	RIVER	DISTANCE (Km) FROM ESTUARY	REMARKS
3013601	KLANG	2.25	Bridge near the estuary
3014602	KLANG	18.19	Bridge at Klang Town
3117605	KLANG	90.80	At Kg. Datok Keramat. (near Multipurpose Hall)
3014603	KLANG	23.18	Kota Bridge, Klang
3117629	AMPANG	90.80	Near Ampang/Klang Confluence
3015637	DAMANSARA	52.49	Batu 3, Shah Alam
3116620	KEROH	91.00	Bridge near Datsun Service station, Segambut.
3016624	PENCHALA	65.04	8th. mile, Jln. Klang Lama
3216621	JINJANG	92.00	Near Batu Elementry School, Jalan Bernam
3016607	KLANG	74.06	Bridge at Kg. Petaling Bahagia
3217619	GOMBAK	96.28	At the corner to Batu Caves
3117610	KLANG	83.72	Bridge at Jln. Dang Wangi
3217627	BATU	97.08	Bridge at Batu Caves
3117626	GOMBAK	86.94	Jln. Tun Razak Bridge near Jln. Ipoh
3217603	KLANG	97.24	Bridge near National Zoo
3015622	KLANG	44.76	Bridge near Seman Estate
3015632	DAMANSARA	55.00	2 Km from Monfort Boys Home
3016623	KUYOH	72.45	7.5 mile Jln. Puchong

STATION NUMBER	RIVER	DISTANCE (Km) FROM ESTUARY	REMARKS
3117630	KLANG	84.36	Brickfields, junction to Jln. Lornie
3116604	BATU	90.16	Bridge near Maxwell School
3016631	KLANG	62.79	Puchong Weir
3016625	KERAYONG	79.53	14th. mile Jln. Klang Lama

APPENDIX 2

LIST OF PARAMETERS MEASURED FOR KLANG RIVER

Dissolved Oxygen (mg/l)	Oil and Grease (mg/l)
Temperature (C)	Phenol (mg/l)
Color (Hazen)	Detergents (MBAS) (mg/l)
Turbidity (FTU)	PCB (mg/l)
Conductivity ( /us)	Organochlorine (mg/l)
Salinity (o/oo)	Organophosphate (mg/l)
pH	Carbamate (mg/l)
BOD5 at 20 C	Pre. Coliform (MPN/100 ml.)
COD	E. Coli (MPN/100 ml.)
Ammoniacal-Nitrogen	As (mg/l)
Nitrate-Nitrogen	B (mg/l)
Total Nitrogen	Cd (mg/l)
Chloride (mg/l)	Cr (mg/l)
Fluoride (mg/l)	Cu (mg/l)
Cyanide (mg/l)	Fe (mg/l)
Sulphide (mg/l)	Pb (mg/l)
Sulphate (mg/l)	Mn (mg/l)
Phosphate (mg/l)	Ca (mg/l)
Hardness (mg/l)	Mg (mg/l)
Suspended Solids (mg/l)	Ni (mg/l)
Dissolved Solids (mg/l)	Zn (mg/l)
Total Solids (mg/l)	Hg (mg/l)