SUPPORTING REPORT C

Water Quality

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C WATER QUALITY

C.1 General

This Supporting Report C presents the conditions of the surface water quality in the whole country as well as those in EABD and WABD areas. For EABD and WABD areas, the pollution loads and pollution mechanism are analyzed and presented. Based on these analyses, programme of measures for managing and improving the surface water quality for EABD and WABD areas are proposed.

In addition to the above, in relation to the GIS-DB development works for the pilot river basins in DRBD (Yantra River Basin) and BSBD (Kamchia River Basin), present pollution loads in these two river basins are also analyzed, and the GIS maps for the pollution loads distribution are prepared. This result is shown in *Annex A.3*.

C.2 Current Conditions of Water Quality

Current conditions of water quality in the rivers were analyzed based on the available data of EEA from Year 2000 to 2005, which is based on the existing monitoring networks. Data of physico-chemical parameters and hydro-biological parameters were collected and analyzed.

In March 2007, MoEW together with EEA and the four Basin Directorates formulated the New Monitoring Program for surface water and groundwater, and submitted it to EU. It was expected to start the New Monitoring Program from latter half of 2007. However the schedule is a little delayed, and it is expected to start from the beginning of 2008. This new monitoring program will be briefly described later. Following analyses are based on the data of the existing monitoring networks in the current stage.

C.2.1 Existing Water Quality Monitoring Networks

(1) Physico-chemical Monitoring Network

For the monitoring networks for surface water, EEA and NIMH have different monitoring networks in the country. Analysis of this Study is based on the monitoring network of EEA. Figure C.2.1 shows the EEA's current physico-chemical monitoring network. This network has been updated in May 2005. The current physico-chemical monitoring network is composed of 509 sampling sites and some additional ones. 24 to 43 parameters are measured with frequency of 4, 6 or 12 times per year.

Number of Current Physico-chemical Monitoring Points of EEA

DRBD	BSBD	EABD	WABD	Total
201	107	151	50	509

Measured Physico-chemical Parameters

No.	Group I	No.	Group II	No.	Group III
1	pH	14	Ferric (Fe) - iron	26	Copper (Cu)
2	Suspended Solids	15	Manganese (Mn)	27	Zinc (Zn)
3	Temperature	16	Sulphate (SO4)	28	Arsenic (As)
4	Electric Conductivity	17	Chloride (Cl)	29	Cadmium (Cd)
5	NO2 nitrite - N	18	Total Phosphorous as PO4	30	Chromium (CR-III-VI)
6	NO3 nitrate - N	19	Total Nitrogen	31	Lead (Pb)
7	NH4 ammonium - N	20	Chlorophyll A (for Reservoir), transparency	32	Nickel (Ni)
8	Orthophosphate PO4	21	Kjeldahl Nitrogen in Potassium permanganate oxidation > 5	33	Mercury
9	Dissolved Oxygen O_2	22	Colititre	34	Hardness
10	Oxygen saturation O_2	23	Total number of microorganism	35	Calcium (Ca)
11	BOD5	24	Escherichia Colititre	36	Magnesium (Mg)
12	COD - Mn	25	Pathogenic Microorganisms	37	Cyanide
13	COD as Potassium permanganate oxidation > 5			38	Surfactant
				39	Phenol
				40	Dissolves and emultionizes Hydrocarbons
				41	Polycyclic aromatic hydrocarbons
				42	Total Pesticides
				43	Total Extractable substance

Note:
1) Measurement of Group I is more frequent (up to 12 times a year) than Group II and III in general.

(2) Hydro-biological Monitoring Network

EEA has the hydro-biological monitoring network covering the whole country. Number of sampling points of the network is about 2000. However, many points have only descriptive location without exact coordinates. Figure C.2.2 shows the locations of the monitoring points where exact locations are known including coordinates. Up to now, benthic macroinvertabrates fauna is observed. Based on the observation, ecological status of the rivers are assessed and classified by Biotic Index (BI), which is calculated by Irish Method.

Biotic Index (BI) and the Classification of Ecological Status

Biotic Index (BI)	National Classification	Ecological Status
5; 4-5	Class I	High
4; 3-4	Class II	Good
3	Class III	Moderate
2-3; 2	Class IV	Poor
1-2; 1	Class V	Bad

C.2.2 Water Quality Conditions

(1) Water Quality Conditions of Common Physico-chemical Parameters

(a) Water Quality Classification by Physico-chemical Parameters

MoEW has proposed a new classification of water quality of physico-chemical parameters since 2005, which is also referred to the EU-WFD and ICPDR's water quality classification. This new proposal has not been officially approved yet, but it is appropriate for classifying the water quality conditions in general, which is also similar to the Japanese "Water Quality Standard for Rivers and Conservation of Living Environment" in terms of BOD5 and DO.

Proposed New Surface Water Quality Classification by MoEW in 2005

Class limit values		**Reference class - High**	**TV-good**	**2 x TV**	**5 x TV**	**> 5 x TV**
	Unit	**I**	**II**	**III**	**IV**	**V**
Oxygen/nutrient regime						
Temperature	°C					
Dissolved oxygen	mg/l	7	6	5	4	3
BOD5	mg/l	<2	<3.5	<7	<18	>18
pH (acid)	-		>6.5	>6.0		
pH (alkali)	-		<8.5	<9.0		
NH4 ammonium-N	mg/l	0.05	0.3	0.6	1.5	>1.5
NO2 nitrite-N	mg/l	0.01	0.06	0.12	0.3	>0.3
NO3 nitrate-N	mg/l	0.8	2	4	10	>10
PO4 ortho-P	mg/l	0.05	0.1	0.2	0.5	>0.5
Total-P	mg/l	0.1	0.2	0.4	1	>1
Chlorophyl-a	µg/l	25	50	100	250	>250
Ions						
Sulphate (SO4)	mg/l	80	150	250	300	>300
Chloride (Cl)	mg/l					
Metals (Dissolved)						
Zinc (Zn)	µg/l	bg	100	200	500	>500
Copper (Cu)	µg/l	bg	20	40	100	>100
Chromium (Cr-III + VI)	µg/l	bg	50	100	250	>250
Lead (Pb)	µg/l	bg	5	10	25	>25
Cadmium (Cd)	µg/l	bg	1	2	5	>5
Mercury (Hg)	µg/l	bg	0.1	0.2	0.5	>0.5
Nickel (Ni)	µg/l	bg	50	100	250	>250
Arsenic (As)	µg/l	bg	5	10	25	>25
Aluminum (Al)	µg/l	bg	5	10	25	>25
Biology						
Biotic index		≥4	>3	3	2 - 3	<2

Note: 1) TV: Threshold value:
2) There is no proposed water classification for COD up to now.
Data Source: MoEW; "National Report on Water Management at River Basin Level in the Republic of Bulgaria", 2005.

(b) Water Quality Condition of Common Physico-chemical Parameters in the Whole Country

Figures C.2.3 - C.2.6 show the conditions of normal maximum values of BOD5, COD_{Mn}, NH4-N and NO3-N, which are the normal range of the high values in a year especially during summer season, when water quantity in the river is relatively small. The normal maximum values are calculated based on the trend (time series) analysis of the data during 2000 to 2005. Based on these figures, it can be said that the water quality in the country is moderate (Class III) to bad (Class V) conditions in general with many stretches of poor (Class IV) to bad conditions. Water quality of poor to bad conditions can be seen in Iskar, Vit, Osum, Yantra and Rusenski Lom Rivers in DRBD, Kamchia River in BSBD, Maritsa and middle to downstream part of the Tundza River in EABD, and the Struma River in WABD. Organic pollution especially pollution by untreated domestic wastewater, industrial wastewater and wastewater from animal breeding farms are the reasons for these wide spread pollution in the country.

(c) Water Quality Condition of Common Pysico-chemical Parameters in the EABD and WABD

Figures C.2.7 - C.2.8 show values of water quality of annual average and that of the normal maximum values during a year in terms of BOD5, COD_{Mn}, NH4-N and NO3-N in EABD and WABD.

Figures C.2.9 - C.2.12 show some examples of the trend analysis of these parameters. As a general tendency, these parameters fluctuate within certain limited range. However, sometimes, much higher values than the normal maximum range are recorded. The reason of the occurrence of such higher values is unknown. However, there are some possibilities of happening unreliable measurement or occurrence of accidental pollution.

Furthermore, it can be noticed that the values of BOD5 has been drastically decreased after middle of 2002 at the monitoring stations in EABD. Such drastic decrease cannot be seen for the BOD5 data of DRBD, BSBD and WABD. As the situation of pollution loads and wastewater treatment has not been changed so much since 10 years ago in EABD area, this drastic decrease of BOD5 in EABD is very strange. Therefore, it is important to strengthen quality control for the measurement including sampling and laboratory test together with other physico-chemical parameters.

(2) Hydro-biological Water Quality

Mainly based on the EEA's data of 2004 as well as referring to the data from 2000 to 2005, hydro-biological water quality map for the whole country was prepared in this Study as shown in Figure C.2.13. Based on this map, it can also be said that hydro-biological water quality in many of the rivers in the country is moderate to bad conditions. Among the major rivers, poor to bad hydro-biological water quality conditions can be seen in the upper and the most downstream part of the Ogosta River, Iskar, middle part of the Yantra and upper part of Rusenski Lom Rivers in DRBD, upper to middle part of the Kamchia River in BSBD, Maritsa and Tundzha Rivers in EABD, and

some stretches in upper, middle and downstream parts of the Struma River in WABD. The poor to bad hydro-biological water quality are the results of the wastewater discharge (domestic, industrial and animal breeding farms) with insufficient treatment as well as inflow of nutrients (nitrogen and phosphorous) into the rivers.

(3) Supplemental Water Quality Survey

In this study, in order to know the current water quality conditions in the rivers in EABD and WABD, Supplemental Water Quality Survey was conducted from the beginning of September to middle of November 2006, which includes field sampling (one time per each site) from beginning of September to middle of October 2006. Figure C.2.14 shows the locations of the survey, and Tables C.2.1 and C.2.2 show the results. Based on the results, it can be said that many locations have problem of organic pollution with water quality class more than Class III. Furthermore, in many places, nutrients indicated by total nitrogen (TN) and total phosphorous (TP) are rather high, which might be caused from agriculture as well as wastewater from settlements, industry and animal breeding farms.

(4) Water Quality of Specific Parameters (Heavy Metals)

Water quality conditions in the whole country in terms of specific parameters (heavy metals) of arsenic (As), lead (Pb), zinc (Zn), cadmium (Cd) and copper (Cu) were analyzed based on the EEA's data from 2000 to 2005. Figures C.2.15 - C.2.20 show the water quality class of the maximum values of these heavy metals for each year. The major rivers, where high values of these heavy metals are recorded during these 6 years, are the Ogosta River (As and Pb), Iskar River (Pb, Cd and Cu), Osam River (Cd), Yantra River (As, Zn and Cu), Rusenski Lom River (As, Pb, Zn, Cd and Cu), Kamchia River (Pb, Cd and Cu), Maritsa River (As, Pb, Zn, Cd and Cu), Tundzha River (Pb, Zn, Cd and Cu), Arda River (Pb, Zn, Cd and Cu), Struma River (Cd and Cu) and Mesta River (Cd and Cu). Although, there is also a question about the accuracy of the data, it is difficult to deny the possibility of occurrence of such heavy metal pollution.

Furthermore, as the previous JICA Maritsa Study Report mentioned, there is a possibility of problems of pollution of soil by heavy metal, which has been caused by the intake of irrigation water from the river and distribution the water to the agricultural area such as part of the area along the Topolnitsa River.

The heavy metal pollution might be related to the wastewater discharge from mines under operation and closed ones as well as wastewater and emission to the air from the ferrous and non-ferrous metal industry etc. Figure C.2.21 shows the metal and non-metal mines of under operation and closed ones. There are clear relation between the locations of the mines and heavy metal pollution in the Topolnitsa River (left tributary of the Maritsa River), Arda River, and middle part of the Tundzha River. However, in general, the relation is not so clear. As the pollution by heavy metal is not only problem to the water quality in the river, but also have a risk of causing problem to the soil around irrigation channel and health to the people, following actions are recommendable to be taken.

<u>Recommendation for the Actions against Heavy Metal Pollution:</u>

1) The possibility of heavy metal pollution problem firstly has to be proved by MoEW

before reporting to the Government. In order to make clear the problems and to formulate necessary programme of measures, not only the effort of MoEW, but also cooperation from various ministries will be necessary, because the problem might not only in the water, but also in the soils and crops in the affected area, health of people, and pollution sources such as mining. Therefore, after the above investigation by MoEW, it will be necessary to report to the Government about the possible problems of heavy metal pollution, and form inter-ministerial committee and working groups composed of the relating ministries such as MoEW, MoAF, MoH, MoRDPW and MoEE for the recommended actions below.

2) In order to overview the condition and mechanism as well as problem of the heavy metal pollution, to conduct a Preliminary Investigation of the river water, river bed materials, outlet of the mining wastewater etc., and soils and crops including sampling and analysis by different laboratories including the reliable laboratories in other Europe countries to check the accuracy of test results, and to prepare for the full-scale investigation / study mentioned below.

3) To conduct an Integrated Heavy Metal Pollution Study, under the assigned responsible Ministry or Joint Ministries appointed by the Council of Ministers;
   - Investigation of pollution by heavy metals in the surface water, river bed materials, water in the irrigation channels, soil in the irrigation areas, groundwater, crops in the possible contaminated areas, health problems of the local people and wastewater from the pollution sources such as mines. It is also recommendable to conduct laboratory test not only in Bulgaria but also in some other reliable international laboratories in the Europe countries etc. to get more reliable results.
   - To study the mechanism of heavy metal pollution, and direction of controlling the pollution sources and improvement of the contaminated areas.
   - To set operational monitoring stations for water and river bed, wastewater from mines etc. and soil and conduct periodical observation.
   - To formulate concrete programme of measures to improve the situation from the short-term, mid-term and long-term point of views.
   - To take actions for implementing the proposed program of measures one by one.

C.3 Current Conditions of Water Quality

C.3.1 Existing Urban and Municipal wastewater Treatment Plants

There are 66 numbers of the existing urban or municipal wastewater treatment plants (WWTPs) in the country (see Table C.3.1). Among them, 60 WWTPs are under operation, and 6 WWTPs have not received permission for operation yet. Table C.3.2 shows the new WWTPs under construction or committed for construction (under tendering or just contracted for construction based on international funding) in the country. Figure C.3.1 shows the existing WWTPs, under constructed WWTPs and committed WWTPs for construction.

In order to know the current conditions and problems of the existing WWTPs, JICA Study Team has visited Plovdiv, Hissaria, Ihitiman, Nova Zagora, Radnevo, Kazanlak, Pavel banya and Sliven WWTPs in EABD and Pernik, Radomir, Zemen, Kyustendil and Dupnitsa WWTPs in WABD. In general, there are several problems as follows;

- Many of the WWTPs were constructed in 1970s and 1980s. However, many of them have not yet fully replaced the mechanical and electrical equipments (except Zemen built in 1996 and Hissaria with only primary treatment with concrete structure). Therefore, these equipments have become very old, and sometimes do not work. Renovation was done for Plovdiv WWTPs and Kazanlak WWTP in 2000. Furthermore, it can be often seen the deterioration of some of the concrete facilities.
- Inflow concentration of BOD5 to the existing WWTPs is generally very low with about 40 to 60 mg/l. This means that the sewage goes out from the sewer pipe to the ground and inflow of surrounding water into the sewer pipes.
- Several WWTPs have problems of inflow of petrol or heavy metal from the industries, which cannot be treated by the urban or municipal WWTPs. Furthermore, this causes problem to the sludge (Plovdiv, Kazanlak, Pernik and Dupnitsa WWTPs), which includes heavy metal or oil.
- Even in the case of no harmful substances in the sludge, sludge has not been utilized for agriculture etc.

C.3.2 National Program for Constructing WWTPs

Considering the requirement of EU-WFD, Bulgaria has a national program for constructing new WWTPs. The name of the program is “Implementation Program for Directive 91/271/EC concerning Urban Wastewater Treatment” in 2003, which aims to construct new WWTPs for the towns and settlements with population equivalent (PE) above 2000 by Year 2015. Total number of the town and settlements above PE 2000, which should have WWTPs by 2015 are 430. Therefore, based on this program, 364 towns or settlements should have new WWTPs by 2015.

There is another program called “National Program for Priority Construction of Urban Waste Water Treatments Plants for Populated Areas with Over 10,000 Equivalent Inhabitants in the Republic of Bulgaria” in 1999. It proposed to construct 36 new WWTPs for the towns with more than PE 10,000. About 15 WWTPs have been constructed until 2007 among them.

C.4 Water Quality Management Plan

C.4.1 Objectives of the Water Quality Management Plan

- To attain good status of water in terms of ecology and common physico-chemical parameters by reducing organic pollutants and nutrients inflow to water bodies.
- To prevent direct discharge of wastewater without treatment (domestic, industrial, livestock wastewaters) into the surface water bodies and relating groundwater bodies.
- To recommend reduction of pollution loads from industries, livestock and agriculture mainly by strengthening of regulation.
- To propose programme of structural measures with rough cost estimation.
- To propose implementation plan for the programme of structural measures.
- To propose non-structural measures such as monitoring and improvement of regulation etc.

C.4.2 Study Approach

Figure C.4.1 shows the approach of the study for formulating the programme of measures (mainly structural measures) for water quality improvement and management. Followings are the descriptions of the approach.

(1) Study on the Pollution Mechanism in the Present Condition

- Estimation of the pollution loads with their spatial distribution for the present condition. For this estimation BOD load is focused as a key parameter.
- Comparison with the physico-chemical and hydro-biological water quality condition as well as the risk assessment results with the above pollution loads distribution.
- Study on the pollution mechanism of the surface water bodies in the present condition.
- Development of the Water Quality Simulation Models composed of the MIKE 11 Model and Simple Model.

(2) Study on the Pollution Conditions in the Near Future Condition

- Estimation of the pollution loads with their distribution in the near future condition with completion of the constructions for the new urban or municipal wastewater treatment plants (WWTPs), which are under-construction or already in the tendering or contact stage in 2007.
- Estimation of the river water quality and the pollution mechanism in the near future conditions by using MIKE 11 Model and the Simple Model.
- Identification of the Problematic Areas and priority zones for pollution reduction.

(3) Study on the Future Condition

- Study on the Future Condition with the Programme of Measures such as new or renovation of the WWTPs and improvement and new construction of the sewer

networks as well as relating non-structural measures such as improvement of regulation and monitoring system.

- Estimation of rough cost for the proposed Programme of Measures (manly structural measures).
- Study on the Implementation Program for the proposed Programme of Measures.

C.4.3 Methods of Estimating the Pollution Loads

(1) Items of the Pollution Loads Estimation in the River Basins

- Domestic pollution loads plus industrial pollution loads, which are discharged into the sewerage systems (for BOD5, TN and TP loads).
- Industrial pollution loads, which are discharged directly into the rivers or water bodies (for BOD, TN and TP loads).
- Livestock pollution loads, which are composed of the pollution loads from major livestock firms as the point sources and other small size livestock firms or livestock owned by farmers as non-point sources (BOD, TN and TP loads).
- Fertilizer non-point pollution loads (TN and TP loads)

(2) Domestic Pollution Loads plus Industrial Pollution Loads discharged into the Sewerage Systems

- Domestic pollution loads are generated and discharged from people. Therefore, population in each settlement and town is the basis for calculation.
- The existing Water Supply and Sewerage Companies (WSS Co.) have contracts with industries, which discharge their wastewater into the sewerage networks. The WSS Companies have obligation to send copies of the above contracts to the Basin Directorates, but this rule is not followed in many cases.
- Basin Directorates either REIW have almost no information and data about such industries (list, contracted amount of water supply, and discharge quantity and quality of wastewater), which discharge into the sewerage system.
- Basin Directorates and REIW have the information of discharge quantity and quality of wastewater (although not covering all) at the outlet of sewer pipes or outlet of the existing urban or municipal WWTPs.
- Considering above situation, the industrial loads, which are discharged into the sewerage systems, have to be estimated together with the domestic loads based on the population equivalent (PE).
- In order to overview and manage the total industrial loads in the river basins, it is very necessary to know the industrial loads which discharge into the sewerage systems too.

Applied Ratio of PE / Population

PE size of Town / Settlement	Ratio of PE / Population
PE ≥ 10,000	• 1.5 in principle, or • Ratio in Document A.
2,000 ≤ PE < 10,000	• 1.2 in principle, or • Ratio in Document A.
500 ≤ PE < 2,000	• 1.2 in principle
PE < 500	• 1.0
Document A: "Implementation Program for Directive 91/271/EC concerning Urban Wastewater Treatment" (National Program for WWTP).	

- Following table shows the applied unit loads for estimating the domestic loads and industrial loads, which are discharged into sewerage systems.

Unit Loads for Domestic and Industrial Load discharged into Sewerage Systems

Item	BOD (g/day/PE)	TN (g/day/PE)	TP (g/day/PE)
1) Raw: 1pe	60	11	1.8
2) Sewered without treatment	60	11	1.8
3) With primary treatment by the existing WWTP	35	11	1.8
4) With secondary treatment by the existing WWTP	10	4	1
5) Without sewerage system	15	3	1
6) With new WWTP including TN and TP treatment	6	2.5	0.9

(3) Loss of the Existing Sewer Networks

- Based on the analysis of the self monitoring data of some of the existing WWTPs in EABD and WABD, it can be known that the pollution loads, which flow through the sewer pipes, are lost, and significant dilution is occurred by infiltration of water from surrounding ground at the same time.
- Percentages of above loss in terms of BOD5 are estimated at least about 40 % for the sewer networks in the Maritsa and Tundzha River Basin, 50 % in the Arda River Basin and 60 % in the Struma, Mesta and Dospat River Basin in general.
- The existing monitoring data of REIWs at the outlet of the existing sewer pipes also show low concentration of BOD5 in general. This fact supports the above estimation of the significant pollution loss from the sewer networks.
- The lost pollutants contaminate surrounding groundwater. There is fact that many groundwater wells have problem of nitrate (NO3) contamination, and this might also caused not only by fertilizers containing nitrogen, but also by the loss from the sewer networks.

Estimated Loss of Pollution Loads at the Inlet of the Existing WWTPs

WWTP	Inflow		Outflow	PE in 2005 (NSI data)		Inflow BOD Load to WWTP (kg/day)	Generated BOD Load By PE (kg/day)	Loss of BOD Load (%) =1-F/G
	Discharge (l/s)	BOD5 (mg/l)	BOD5 (mg/l)	Total PE	Treated PE			
	A	B	C	D	E	F	G	H
Kyustendil WWTP	210	81.3	6.1	70,688	65,638	1,477	3,938	62
Pernik WWTP	483	51.4	19.6	121,350	120,168	2,148	7,210	70
Radomir WWTP	51	53.3	2.5	21,621	19,367	236	1,162	80
Sliven WWTP	168	445.5	87.2	100,294	100,294	6,483	6,134	-
Plovdiv WWTP	1,667	125.0	-	666,652	599,987	18,005	35,999	50
Nova Zagora WWTP	162	301.4	21.2	58,463	32,388	4,318	1,943	-
Data sources: 1) Self monitoring data of the above WWTPs.								

Estimated Loss of BOD5 at the Outlet of the Existing Sewer Pipes

River Basin	Average BOD5 at outlets of sewer pipes (mg/l)	% of BOD5 against normal low value of sewage (150 mg/l)	% of BOD5 against normal value of sewage (200 mg/l)
Maritsa River Basin	87	58 % (loss 42%)	44 % (loss 56%)
Tundzha River Basin	114	76 % (loss 24%)	57 % (loss 43%)
Arda River Basin	100	67 % (loss 33%)	50 % (loss 50%)
Struma River Basin	64	43 % (loss 57%)	32 % (loss 68%)
Mesta River Basin	70	47 % (loss 53%)	35 % (loss 65%)
Data sources: 1) Data of EABD and WABD based on the monitoring data of REIWs.			

(4) Industrial Pollution Loads discharged directly into the River or Water Bodies

- Industrial pollution loads, which are directly discharged into the rivers or water bodies are estimated based on the self monitoring data from such industries, monitoring data of REIWs for the emission of the industrial wastewater, and permission data for the wastewater discharge by the Basin Directorates to the industries.
- For estimating the TN and TP Loads from the industries, "Regulation No. 6 of 9 November 2000 on the Limit Values for Admissible Contents of Dangerous and Harmful Substances in the Waste Water Discharged in the Water Bodies" is also referred.

- Tables C.4.1 and Table C.4.2 show the major industries in EABD and WABD, which discharge their wastewater directly into the rivers or water bodies.

(5) Livestock Pollution Loads

- Livestock pollution loads are composed of the pollution loads from major livestock farms as point sources, and pollution loads from small and medium livestock farms including small numbers of livestock owned by farmers as non-point livestock farms.
- The data of the major livestock farms are based on the information from National Veterinary Medical Service. Tables C.4.3 and Table C.4.4 show the major livestock farms in EABD and WABD.
- Numbers of heads of livestock are based on the Agro-statistics of MoAF in 2003, which was used for estimating the non-point livestock loads. Run-off rate of the non-point livestock load is set at 5 %.
- Following table shows the applied unit loads for estimating the livestock loads.

Unit Loads for Livestock

Livestock	BOD (g/year/head)	TN (g/year/head)	TP (g/year/head)
1) Cattle	230	79	1.4
2) Pig	7.98	4.0	0.75
3) Hens for egg production	0.7	0.4	0.12
4) Slaughter chicken	0.05	0.03	0.002
5) Duck	0.2	0.1	0.006

(6) Fertilizer Non-point Pollution Loads

As the pollution loads from agriculture, fertilizer non-point pollution loads are estimated based on the data of the fertilizer amount by district in Bulgaria, which were collected from the “National Plant Protection Service”. Run-off coefficient of 10% is applied for the estimation. Unit load of fertilizer is as shown below.

Average Amount of Fertilizer by District and Unit Load

	Area	Average Fertilizer Amount (Year 1999 to 2005)		Unit Load of Fertilizer	
	(km2)	(kgN/year)	(kgP/year)	(kgN/y/m2)	(kgP/y/m^2)
Plovdiv	5,961	7,366,998	234,339	0.00124	0.000039
Burgas	7,741	8,189,752	81,045	0.00106	0.000010
Blagoevgrad	6,458	1,743,346	103,836	0.00027	0.000016
Pazardzhik	4,459	2,350,964	164,106	0.00053	0.000037
Kardzhali	3,210	633,216	1,366	0.00020	0.000000
Kyustendil	3,060	760,438	20,776	0.00025	0.000007
Sofia	7,071	2,093,932	94,665	0.00030	0.000013
Stara Zagora	5,148	7,857,141	141,730	0.00153	0.000028
Haskovo	5,528	4,740,222	75,958	0.00086	0.000014
Smolyan	3,204	1,648,178	209,222	0.00051	0.000065
Sliven	3,542	4,183,851	28,153	0.00118	0.000008
Yambol	3,353	6,222,461	86,337	0.00186	0.000026
Pernik	2,397	710,138	3,531	0.00030	0.000001
Gabrovo	2,022	903,478	17,075	0.00045	0.000008
Veliko Tarnovo	5,961	7,366,998	234,339	0.00124	0.000039
Plovdiv	7,741	8,189,752	81,045	0.00106	0.000010

C.4.4 Present Pollution Loads with Pollution Mechanism and Near Future Pollution Loads

(1) Pollution Loads and Pollution Mechanism in EABD

(a) Present Pollution Loads and Pollution Mechanism in EABD

Present BOD loads by NAM catchment in EABD are estimated as shown in Figure C.4.2 and Table C.4.5. Figure C.4.3 shows the BOD loads from unit area (= total BOD load of NAM catchment / area of NAM catchment). From these figures, it is clear that the area around Pazardjik, Plovdiv and Stara Zagora are the highest producers of BOD loads, which followed by the Dimitrovgrad and Haskovo Areas. In the Tundzha River Basin, Yambol to Elhovo areas is the highest producer of BOD loads. Sliven and Kazanlak Areas also produce high BOD loads from small areas. For the Arda River Basin, Kardzhali and Smolyan Areas are the highest producers of BOD loads.

These tendencies of the BOD load distributions coincide with the current pollution conditions along the Maritsa and Tundzha Rivers, where water quality is generally poor to moderate conditions from the upstream to the downstream. For the Arda River, the BOD load distribution also coincides with the tendency of river water quality, where the tributary along Smolyan Town and the river reach around Kardzhali town is in poor condition.

These tendencies of BOD load distribution also coincide with the results of the Risk Analysis for the Surface Water Bodies made by the EABD Directorate.

In addition to the BOD Loads, Figures C.4.6 and C.4.8 show the Present TN and TP loads in EABD.

(b) Near Future BOD Loads in EABD

There are nine (9) numbers of new WWTPs, which are under-construction. They are Pazaedjik, Dimitrovgrad, Stara Zagora, Haskovo, Karlovo and Koprivshtitsa WWTPs in the Maritsa River Basin, and Madan, Rudozem and Zlatograd WWTPs in the Arda River Basin. All of the new WWTPs can treat up to secondary treatment for BOD. Stara Zagora and Dimitrovgrad WWTPs have facilities of higher treatment for treating nitrogen and phosphorous. In Karlovo, construction of the new WWTP has been started only a part. However, it looks that the budget for the Karlovo WWTP construction is insufficient, because the construction work seems to be very slow and is stopped in November 2007, when JICA Study Team visited the site.

In addition to the above 9 new WWTPs, renovation of the existing Sliven WWTP including some improvement of sewer networks has been committed by ISPA, and it is under-tendering. New Smolyan WWTP including some improvements of sewer networks has also been committed by ISPA, and it has been already contracted with the contractor in 2007.

Figure C.4.4 shows the BOD loads in the Near Future Conditions in EABD and Figure C.4.5 shows the BOD loads from unit area. By the above under-constructed and soon constructed WWTPs, BOD loads will be reduced around Pazardjik, Stara Zagora, Dimitrovgrad, Haskovo, and Smolyan areas. Figures C.4.7 and C.4.9 show the TN and TP loads in EABD in the Near Future Condition.

(2) Pollution Loads and Pollution Mechanism in WABD

(a) Present Pollution Loads and Pollution Mechanism in WABD

Present BOD loads by NAM catchment in WABD are estimated as shown in Figure C.4.10 and Table C.4.2. Figure C.4.11 shows the BOD loads from unit area. In terms of BOD load in NAM catchment, Blagoevgrad area is the highest producer followed by Pernik, Dupnitsa, Sandanski and Petrich areas. In terms of BOD load from unit area, Blagoevgrad, Sandanski, Gotse Delchev areas are the highest density of BOD load, followed by Pernik, Dupnitsa, Bansko and Razlog areas.

These tendencies of the BOD load distributions coincide with the current pollution conditions along the Struma and Mesta Rivers, and the results of the Risk Analysis for the Surface Water Bodies made by the WABD office.

Figure C.4.14 and C.4.16 show the Present TN and TP loads in WABD.

(b) Near Future Pollution Loads in WABD

There are two (2) numbers of new WWTPs, which are under-construction. They are Blagoevgrad WWTP in the Struma River Basin and Razlog WWTP in the Mesta

River Basin. These two new WWTPs can treat BOD up to secondary level. Razlog WWTP, which has almost completed construction by September 2007, has a partial function of nitrogen reduction.

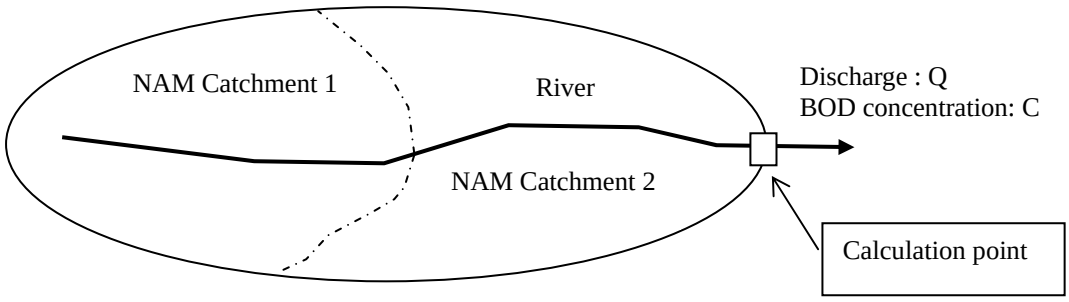
In addition to the above 2 new WWTPs, renovation of the existing Kyustendil WWTP including some improvements of sewer networks has been committed by ISPA, and it is under-tendering.

Figure C.4.12 shows the BOD loads in the Near Future Conditions in WABD and Figure C.4.13 shows the BOD loads from unit area. By the above under-constructed and soon renovated WWTPs, BOD loads will be reduced around Blagoevgrad, Razlog areas. Figures C.4.15 and C.4.17 show the TN and TP loads in WABD in the Near Future Condition.

(3) Co-relation between Catchment BOD Load and River BOD Load

Co-relation between the accumulated catchment BOD load, which accumulate BOD load of NAM catchments locating upstream from certain calculation point in the river, and the river BOD Load in dry season (July to September) is calculated.

- Accumulated catchment BOD load = ∑ (BOD load of NAM catchment i)
- River BOD load = (BOD concentration in the river: C) x (Average discharge of river in dry season: Q)



Figures C.4.18 and C.4.19 show co-relation between the "Accumulated catchment BOD load" and "River BOD load". Discharge of the river is based on the MIKE 11 Water Quantity Simulation results. BOD concentration (normal maximum values in dry season) in the river is based on the monitoring data of EEA. Followings are the findings of this analysis.

- There are very high co-relation between the "Accumulated catchment BOD load" and "River BOD load" for the Maritsa, Tundzha, Arda, Stuma and Mesta Rivers in general.
- The above high co-relations mean that the BOD concentration at certain location along the river is reflected by the BOD loads in the upper catchment areas. Furthermore, another analysis shows that there is no clear co-relation between BOD load in the river and nearby Catchment BOD load (example: NAM catchment 2 only).

- Considering the above fact, in order to improve water quality at certain location in the river, it is necessary to reduce the accumulated catchment load upstream from that location.

C.4.5 Structural Measures of the Programme of Measures

(1) Planning Principle

Based on the analysis of the pollution loads in the present and near future conditions as well as the water quality conditions in the rivers, followings are the procedure of planning the programme of measures, which is mainly applied for planning the structural measures for water quality management and improvement.

- BOD load is focused as a key parameter for the reduction of catchment pollution loads.
- The current water quality (BOD etc.) in the rivers is reflected by the significant loss from sewer networks (at least 40 % in Maritsa and Tundzha River Basin, 50 % in Arda River Basin, and 60 % in Struma and Mesta River Basins). However, the loss should be reduced from now on, which is hopefully up to 10 % in the long time future. This reduction of loss is necessary to stop the pollution of groundwater by the loss from the sewer networks.
- In case the loss of the sewer networks will be reduced up to 10 % and the treatment conditions of towns and settlements in EABD and WABD areas will be the same as the Near Future Conditions, the water quality in the river will be much worse than the present. This assumption is the basis for planning for reducing the catchment pollution loads as well as for improving future water quality conditions in the rivers.
- Based on the rough estimation of the required BOD loads in the river basins for attaining the good status of water in terms of BOD (Class II: target of BOD 3.0 mg/l), the accumulated catchment BOD loads are necessary to be reduced about 50 % for Maritsa, Tundzha, Stuma and mid to downstream of Mesta River Basins. For the Arda River Basin, reduction of BOD load around Kardzhali town is required.
- Based on polluter pay principle, reduction of catchment loads shall be shouldered by domestic, industry, livestock and other sectors.
- For reducing domestic loads plus industrial loads into sewerage system, new WWTPs and renovation of the existing WWTPs are planned as the structural measures.
- For reducing the industrial loads and the major livestock loads, strengthening of regulations are to be considered as the non-structural measures.
- Based on the distribution of the catchment BOD loads and its loads from unit areas (load density), high priority zones are identified for reference.
- The towns and settlements to be treated are selected based on the contribution for reducing the catchment BOD loads and the above zoning in principle. The target reduction of BOD loads by the high priority towns are set about 30 %. Expert judgments are also introduced to select some additional high priority towns and settlements.

- For the proposed new and to be renovated WWTPs, higher level of treatment for reducing nitrogen and phosphorous are included.
- For the proposed high priority towns and settlements, improvement as well as expansion of the sewer networks is also proposed.
- It is recommendable to consider how to reduce pollution loads from smaller settlements such as improvement of septic tanks to be sealed septic tank or individual treatment of houses or some small size WWTP etc. from the settlements which locate in the high priority zones. In case of improvement of septic tanks or individual treatment, their sludge should be taken out periodically and to be treated in the nearby WWTPs or bring to sanitary landfill sites for temporary solution. Financial support systems are necessary to be considered for the improvement of septic tanks and installing individual treatment facilities to the houses.

(2) High Priority Towns to be Treated in EABD

Supposing that all of the towns and settlements in EABD will be treated, reduction percentage of each towns and settlements against the Near Future Catchment BOD Loads are analyzed as shown in Table C.4.6.

Figure C.4.20 shows the selected high priority towns to be treated as well as the reference high priority zones. The selected high priority towns are shown in the table below. The sewer networks of these towns are also to be improved including renovation and expansion.

High Priority Towns (22 Towns) for Treatment in EABD Areas

Priority	Town	River Basin	PE in 2015	WWTP	Sewerage	Remarks
I.	**New WWTPs in the Maritsa River Basin**					
I-1	Asenovgrad	Maritsa	78,054	New	Improvement	
I-2	Plovdiv	Maritsa	681,985	Existing	Improvement	Only SW improve.
I-3	Karlovo	Maritsa	37,181	New	Improvement	Under construction (only a part). Increase the budget is required.
I-4	Velingrad	Maritsa	28,752	New	Improvement	
I-5	Peshtera	Maritsa	28,691	New	Improvement	
I-6	Harmanli	Maritsa	28,538	New	Improvement	
I-7	Svilengrad	Maritsa	28,050	New	Improvement	
I-8	Chirpan	Maritsa	25,413	New	Improvement	
I-9	Rakovski	Maritsa	23,453	New	New	
I-10	Panagyurishte	Maritsa	23,029	New	Improvement	
I-11	Parvomay	Maritsa	22,200	New	Improvement	
I-12	Stamboliyski	Maritsa	18,068	New	Improvement	
I-13	Kostenets	Maritsa	11,048	New	Improvement	Most upstream town.
II.	**New WWTPs in the Tundzha River Basin**					
II-1	Yambol	Tundzha	118,971	New	Improvement	
II-2	Karnobat	Tundzha	28,916	New	Improvement	
II-3	Elhovo	Tundzha	16,808	New	Improvement	
II-4	Kalofer	Tundzha	4,229	New	Improvement	Most upstream town.
III.	**New WWTPs in the Arda River Basin**					
III-1	Kardzhali	Arda	67,346	New	Improvement	
IV.	**Renovation of the Existing WWTPs**					
IV-1	Nova Zagora	Maritsa	36,185	Renovation	Improvement	
IV-2	Radnevo	Maritsa	20,691	Renovation	Improvement	
IV-3	Ihtiman	Maritsa	20,234	Renovation	Improvement	
IV-4	Pavel banya	Tundhza	4,407	Renovation	Improvement	

(3) High Priority Towns to be Treated in WABD

Supposing that all of the towns and settlements in WABD will be treated, reduction percentage of each towns and settlements against the Near Future Catchment BOD Loads are analyzed as shown in Table C.4.7.

Figure C.4.21 shows the selected high priority towns to be treated as well as the high priority zones for reference. The selected high priority towns are shown in the table below. The sewer networks of these towns are also to be improved including renovation and expansion.

High Priority Towns (9 Towns) for Treatment in WABD Areas

Priority	Town	River Basin	PE in 2015	WWTP	Sewerage	Remarks
I.	**New WWTPs in the Struma River Basin**					
I-1	Petrich	Struma	45,020	New	Improvement	
I-2	Sandanski	Struma	40,358	New	Improvement	
I-3	Simitli	Struma	8,242	New	Improvement	
II.	**New WWTPs in the Mesta River Basin**					
II-1	Gotse Delchev	Mesta	30,185	New	Improvement	
II-2	Bansko	Mesta	11,493	New	Improvement	
III.	**New WWTPs in the Dospat River Basin**					
III-1	Dospat	Dospat	3,218	New	Improvement	Currently, only sewage from the town flow in the river.
IV.	**Renovation of the Existing WWTPs**					
IV-1	Pernik	Struma	121,350	Renovation	Improvement	
IV-2	Dupnitsa	Struma	55,224	Renovation	Improvement	
IV-3	Radomir	Struma	21,621	Renovation	Improvement	

(4) High and Medium Priority Towns for EABD and WABD

In order to reduce pollution loads more than 30 % up to around 40 %, high and medium priority towns are also studied. Figures C.4.22 and C.4.23 show the high and medium priority towns, where new WWTPs or renovation of the existing WWTPs as well as improvement or expansion or new sewer networks are to be constructed. As the numbers of the towns / settlements are total 56 towns / settlements in EABD, and 20 towns / settlements in WABD. Therefore, considering the realistic program for constructing the proposed WWTPs, these numbers of the WWTPs may be too heavy for implementation by 2015 or by 2021. Therefore, these plans can be considered as reference for the future plans.

(5) Estimated Amount of Reduction of Loss by Improvement of Sewer Networks

By improvement of the existing sewer networks, loss of pollutants from the sewer pipes to the ground will be reduced. This will improve the condition of pollution in the surrounding groundwater by the loss from the sewer pipes.

It is difficult to estimate the amount of groundwater, which is contaminated by the loss from the sewer pipes. However, supposing that the NH_4 in sewer pipes (about 20 to 25 mg/l) is leaked out to the ground and contaminate the groundwater, about 20 times dilution is required to reach 0.5 mg/l of standard permissible level.

Setting the target of loss from the sewer networks to be 10 % in the future, Table C.4.8 shows the estimated amount of reduction of groundwater contamination by the loss from sewer networks in the high priority towns. In this calculation, dilution is set at 10 times for conservative calculation. This table also shows the amount of newly treated sewage by the proposed plans for the high priority towns.

Estimated Amount of Reduction of Polluted Groundawater by Improvement of Sewer Networks

Basin District	Amount of Sewage Loss (m3/year)	Amount of polluted groundwater by the sewage loss (m3/year)	Reduction amount of polluted groundwater by improvement of sewer pipes (m3/year)
EABD	32,282,000	322,820,000	290,538,000
WABD	13,833,000	138,331,000	124,498,000
Total	46,115,000	461,151,000	415,036,000

(6) Cost Estimation for the Proposed Structural Measures

(a) Construction Cost for WWTPs and Sewer Networks

Data on the construction costs of recently completed WWTPs and under-constructed WWTPs are collected and analyzed. For the analysis, all the construction costs are converted to the current price level in the middle of 2007. Based on the analysis, Unit construction cost of WWTP by PE is estimated. The cost includes the normal secondary treatment for BOD as well as higher treatments for TN and TP reduction facilities.

Required length and cost of sewer pipes by PE is estimated.

Table C.4.9 shows the estimated rough construction costs (without VAT) for the new or renovation of WWTPs and related improvements of sewer networks for the proposed high priority towns in EABD and WABD areas. Summary of the estimated costs is shown below:

Estimated Rough Construction Cost for the New and Renovation of WWTPs and Improvement of Sewer Networks in EABD and WABD Areas

Basin District	WWTPs (EUR 1000)	Sewer Networks (EUR 1000)	Total (EUR 1000)
EABD	206,050	1,628,082	1,834,133
WABD	72,074	536,553	608,627
Total	278,124	2,164,635	2,442,760

(b) Operation and Maintenance Costs for WWTPs and Sewer Networks

- Operation and maintenance cost for WWTPs are estimated based on the annual rate of 7.5 % to the direct construction cost in principle.
- Operation and maintenance costs for sewer networks are estimated based on the annual rate of 1.5 % to the direct construction cost in principle.
- Table C.4.10 shows the estimated operation and maintenance costs (without VAT) for the proposed WWTPs and sewer improvements for the high priority towns.

(7) Implementation Plan of the Structural Measures

For implementing the proposed WWTPs and improvement of sewer networks, following two scenarios are considered.

1) Optimistic Scenario: all will be implemented from 2012 to the end of to 2014
2) Practical Scenario: divided into first group and second group.

   The first group will be implemented from 2012 to the end of 2014.

   The second group will be implemented from 2018 to the end of 2020.

   Figure C.4.24 shows the tentative practical scenario. It can be modified based on updated information.

C.4.6 Non-Structural Measures of the Programme of Measures

(1) Cooperation with Municipality for Water Quality Management

Although the coverage area of each Basin Directorate is very wide, number of staff of each Basin Directorate is very limited between 50 to 60 people. Even with the REIW, number of the staff for monitoring and managing the water in the Basin District Area is very limited. Therefore, physically, it is rather difficult to monitor what is happening in the whole area of the Basin District in every moment. This will delay the actions for improving the situation.

- In order to conduct river basin management for the River Basins more properly and timely, it is highly recommendable to conduct monitoring for the important or problematic places such as the key monitoring stations in the river basins under cooperation from the municipality offices.
- Daily patrol with ocular observation is the basic way. Furthermore, it is better to conduct simple on-site measurement of water such as temperature, pH, turbidity, DO, EC and others.
- If any strange facts such as strange color, floating of many fish, abnormally values of pH, DO and others can be found by the daily patrol and simple measurement, it should be reported to the Basin Directorates for immediate actions including more detailed investigation, regulation to the polluters etc. as well as warning to the people.
- Legislative arrangement is necessary to be made for realizing the cooperation with municipality offices for water management.

(2) Strengthening of Regulation for Wastewater Discharge

(a) Monitoring of industrial wastewater discharged into sewerage system

Wastewater discharge into the sewerage system from industries and other private sectors is controlled and managed by Water Supply and Sewerage Companies (WSS Companies), because WSS Companies have contracts with such industries etc under the current law. Furthermore, although the Basin Directorates issue permission for

wastewater discharge into the rivers or water bodies from sewerage systems including discharge from urban or municipal WWTPs, the Basin Directorates have almost no information about the wastewater from the industries etc., which discharge into the sewerage systems. Due to this reason, it is very difficult to grasp the total view of the pollution loads in the river basin, which are composed of not only the direct wastewater discharge into the rivers or water bodies, but also the wastewater discharge into the sewerage systems.

- As pollution loads distribution is one of the most important information for managing or improving water quality, it is very necessary to monitor the wastewater discharge from industries etc. into the sewerage systems.
- It is not recommendable to include industries into sewerage system, which discharge harmful substances or huge amount of wastewater.
- Therefore Water Act and related laws should be revised so that the Basin Directorates can collect information of the industrial wastewater, which is discharged into the sewerage systems.

(b) Treatment of wastewater by industries and animal breeding farms by themselves

Very often, industries discharge harmful substances such as petrol and heavy metals, which cannot be treated by urban or municipal WWTPs.

- In principle, industries should have their own industrial wastewater treatment plants to treat their wastewater. Big animal breeding farms also should treat their wastewater by themselves. Therefore, it is necessary to strengthen regulation, so that industries and big animal breeding farms shall treat their wastewater by themselves.
- Furthermore, it should not be allowed that industries or big animal breeding farms to pay many times the fines, which are imposed to them in case of discharge untreated wastewater. If industries or big animal breeding farms don't improve the condition of discharging untreated wastewater, and if they don't take actions for installing wastewater treatment plants for industrial discharge or discharge from big animal breeding farms, Basin Directorates should not issue discharge permit to those industries or animal breeding farms.

(3) Improvement of Monitoring System for Water Quality

(a) New Monitoring Program for Surface Water

Based on the risk assessment of surface water bodies and groundwater bodies, MoEW and the Basin Directorates formulated a New Monitoring Programs in March 2007, which is composed of new programs for surface water monitoring and groundwater monitoring. This sub-section proposes further improvement for the new program for surface water monitoring.

In compliance with the requirements of the EU-WFD, the new program for surface water monitoring includes surveillance monitoring (control monitoring) and operational monitoring. The surveillance monitoring will make overview the

condition of the basin, give idea for efficient monitoring program, and monitor long-term changes of the basin. The operational monitoring will monitor the status of the water bodies at risk, and assess the impact of the programme of measures. Figure C.4.25 shows the locations of the surveillance and operational monitoring points.

The surveillance monitoring and the operational monitoring will monitor surface water quality in terms of hydro-biological indicators and physico-chemical parameters. Hydro-biological indicators to be monitored are Phytoplankton, Macrophytes, Phytobenthos, Macrozo benthos / Bottom invertebrate, Fishes and others. Physico-chemical parameters to be monitored are 1st Group (common parameters such as pH, temperature, DO, BOD5, COD, NH4-N, NO2-N, NO3-N, and PO4-P etc.), 2nd Group (TN, TP, Ca, Mg, hardness etc.), the Group of Priority substances (33 parameters such as Alachlor, Anthracene, Benzene etc.), and the Group of Specific polluters (organic substances and heavy metals). Number of parameters to be monitored and frequency of monitoring differs for the monitoring stations. The number of the monitoring points is shown in the table below.

Number of the New Surveillance (Control) Monitoring Points for Surface Water			
Basin Directorate	River	Lake	Coastal Water
DRBD	92	41	-
BSBD	26	12	7
EABD	27	5	-
WABD	33	16	-
Sub-Total	178	74	7
Total		259	
Number of the New Operational Monitoring Points for Surface Water			
Basin Directorate	River	Lake	Coastal Water
DRBD	55	-	-
BSBD	32	16	6
EABD	58	4	-
WABD	80	12	-
Sub-Total	225	32	6
Total		263	

(b) Proposals for Improvement

(i) Setting Key Monitoring Stations to Ensure Stable Monitoring

Total number of the monitoring points of the New Surface Water Monitoring Program in the country is 522 points, which is slightly more than the number of the points of the existing surface water monitoring of EEA. However, the parameters to be monitored are very much increased and their frequency for monitoring is also rather high (ex. 12 times per year for the priority substances for surveillance monitoring for one year at least). Furthermore, Bulgaria has not so much experience for measuring many of the priority substances.

Considering this situation, it is recommendable to set Key Monitoring Stations as well as Important Monitoring Stations among the surveillance monitoring points to ensure stable monitoring and to overview the water quality conditions of the river basins. Furthermore, at these Key stations, it is necessary to measure the water quantity as well. In order to conduct this kind of permanent monitoring at the Key Monitoring Stations, the Basin Directorates are necessary to establish their own monitoring stations both for water quality and water quantity. Figure C.4.26 shows the proposed Key Monitoring Zones as well as Important Monitoring Zones in EABD and WABD by the Study, where the Key Monitoring Stations and Important Monitoring Stations are recommendable to be set within these zones.

Proposed Key Monitoring Zones and Important Monitoring Zones in EABD and WABD

Key/Important Monitoring Zones	EABD	WABD	Monitoring
Key Monitoring Zone	12 places	7 places	• Daily ocular observation and simple on-site measurement. • Monthly sampling and analysis.
Important Monitoring Zone	10 places	4 places	• Weekly ocular observation and simple on-site measurement. • Monthly sampling and analysis.
Total	22 places	11 places	

If Key Monitoring Zones and Important Monitoring Zones will be set in DRBD and BSBD area as well, order of the Key Monitoring Zones in the country will be around 50 places and Important Monitoring Zones will be around 25 places.

It is recommendable to start monitoring in the above Key and Important Monitoring Zones under cooperation from some of the municipalities as the pilot cases, and will be extended to all over the Basin District Areas.

Furthermore, the results of the monitoring at the Key Monitoring Zones and Important Monitoring Zones will be reported to EU instead of above 259 surveillance stations.

(ii) Capacity Building and Stage-wise Implementation of the New Monitoring Program

The new monitoring program for surface water includes several hydro-bilogical indicators. As the existing hydro-biological monitoring is mainly based on the macrozo benthos / bottom invertebrate, there are not so much experience and experts for other indicators. Furthermore, the new monitoring program requires for measuring many priority substances, which are also new for Bulgaria.

Therefore, it is necessary to consider the way of developing human resources to conduct these measurements, and consider stage-wise implementation of the new monitoring program, so that all of the required indicators and parameters by EU-WFD can be measured properly with sufficient accuracy.

(iii) Quality Control Program to be formulated and implemented

In terms of physico-chemical measurement, the existing data seems to be unreliable in many cases such as BOD5, COD_{Mn}, and heavy metals. Therefore, it is very necessary to formulate quality control program for sampling and laboratory test. As many priority substances are required to be measured, quality control is also important. It is recommendable to include followings in the quality control program.

- Central laboratory in EEA shall formulate quality control teams with qualified experts.
- In order to check the quality of the sampling and tests by different laboratories, test the same sample by different laboratories at the same time. In this case, the central laboratory (EEA) should coordinate the checking activity.
- Send samples to the reliable laboratories of other countries and compare the test results made by the laboratories in Bulgaria (heavy metals and priority substances etc.).
- The quality control team of the central laboratory shall periodically go around the regional laboratories in the country for checking the results of tests, and make guidance and training to the staff of the regional laboratories.

Supporting Report C

Tables

Table C.2.1 Results of the Supplemental Water Quality Survey by JICA - Physico-chemical Parameters and Bacteria

Point No.	EEA's Code	Latitude (N)	Longitude (E)	Altitude	River Basin	Temperature (°C)	pH	EC (μS/cm)	DO (mg/l)	SS (mg/l)	BOD5 (mg/l)	COD (mg/l)	TN (mg/l)	TP (mg/l)	Coliform (MPN / 100 ml)	Fecal coliform (MPN / 100 ml)
T1	30059243	42°39.400'	24°58.860'	739m	Tundzha	12.7	7.8	20.5	9.8	3.4	2.0	4.8	0.86	0.01	75	0
T2	30059311	42°32.719'	25°33.778'	314m	Tundzha	16.8	8.0	435.0	8.7	4.2	4.8	10.8	3.92	0.28	over 2400	0
T3		42°36.682'	26°11.940'	168m	Tundzha	17.9	8.1	402.0	10.2	2.4	2.4	5.5	1.73	0.02	43	0
T5	30059077	42°35.022'	26°19.360'	151m	Tundzha	18.4	7.8	553.0	7.1	8.0	5.5	12.0	5.56	0.40	over 2400	0
T8	30059152	42°31.372'	26°34.127'	129m	Tundzha	17.1	8.1	670.0	7.2	9.2	5.7	14.1	5.68	0.62	over 2400	0
T10		42°04.464'	26°33.993'	166m	Tundzha	18.0	8.0	507.0	8.8	7.2	1.3	4.8	3.43	0.06	1100	0
T11	30059328	42°03.147'	26°28.432'	81m	Tundzha	18.9	8.5	651.0	11.4	6.0	1.9	7.4	5.39	0.38	over 2400	11
MA2	30060085	42°14.418'	24°06.388'	254m	Maritsa	12.0	8.0	191.0	10.2	31.8	12.2	45.0	3.31	0.12	over 2400	15
MA4	30060156	42°12.600'	24°10.895'	238m	Maritsa	13.0	8.0	258.0	9.1	7.8	4.7	15.2	2.86	0.07	150	0
MA5	30060102	42°18.457'	24°22.293'	258m	Maritsa	19.0	8.0	838.0	11.0	33.6	3.5	10.6	6.12	0.04	120	0
MA8		42°17.877'	24°31.483'	215m	Maritsa	16.0	7.9	635.0	8.4	6.4	15.4	44.0	5.88	0.61	460	0
MA9	30060110	41°57.105'	24°51.542'	349m	Maritsa	11.0	8.7	280.0	9.8	4.2	3.6	13.8	3.12	0.12	over 2400	0
MA10	30060111	42°08.722'	24°52.570'	158m	Maritsa	16.8	7.8	451.0	8.0	10.2	4.2	11.2	4.55	0.05	over 2400	0
MA11		42°41.415'	24°34.215'	493m	Maritsa	14.5	7.6	83.4	9.7	8.8	2.4	6.7	1.35	0.04	over 2400	3
MA12	30060530	42°31.222'	24°50.815'	270m	Maritsa	16.6	7.9	241.0	10.0	10.2	3.7	8.6	3.95	0.05	over 2400	0
MA14		42°09.692'	24°56.862'	146m	Maritsa	18.1	7.9	370.0	8.2	14.2	5.5	18.8	3.26	0.22	over 2400	0
MA15	30060092	42°07.032'	25°12.805'	119m	Maritsa	18.7	8.0	413.0	7.5	10.6	19.6	58.8	3.65	0.18	over 2400	0
MA17		42°17.751'	25°52.333'	115m	Maritsa	16.7	7.7	543.0	1.0	10.6	13.8	30.0	4.79	1.05	over 2400	0
MA18		41°49.390'	25°52.292'	129m	Maritsa	18.0	8.1	616.0	9.1	8.4	13.8	38.4	2.95	0.04	over 2400	0
MA19	30060270	42°02.850'	25°52.225'	86m	Maritsa	18.8	7.9	802.0	5.8	24.4	13.2	38.0	4.52	0.64	over 2400	9
MA22	30060097	41°46.127'	26°11.610'	56m	Maritsa	18.9	8.2	514.0	8.7	24.6	17.5	61.2	4.22	0.25	1100	0
MA23		42°07.905'	26°05.787'	134m	Maritsa	18.1	7.6	671.0	9.6	1.4	<1,0	3.4	2.14	0.05	120	0
A1		41°39.242'	24°58.114'	883m	Arda	13.0	7.6	129.0	9.3	3.8	1.3	3.4	2.89	0.03	over 2400	0
A3	30061281	41°34.176'	25°23.262'	226m	Arda	23.0	8.6	344.0	10.6	19.4	1.5	5.6	1.80	0.04	1100	0
S1		42°30.267'	22°54.047'	637m	Struma	15.3	7.9	895.0	7.9	10.0	5.5	17.2	5.15	0.72	over 2400	0
S3		42°16.973'	22°47.213'	462m	Struma	17.8	8.5	612.0	15.2	3.6	3.6	10.8	1.72	0.14	210	0
S4		42°11.890'	23°03.100'	418m	Struma	22.3	9.3	555.0	12.3	11.6	5.2	15.2	3.61	0.35	240	0
S5		41°52.895'	23°07.138'	295m	Struma	20.0	8.5	441.0	10.8	24.8	4.5	12.8	2.56	0.21	over 2400	0
S6		41°42.652'	23°09.575'	154m	Struma	19.2	8.5	441.0	10.3	26.4	3.8	11.2	2.65	0.22	over 2400	0
S7		41°30.263'	23°15.155'	101m	Struma	19.4	8.5	442.0	11.3	26.2	4.8	13.6	2.64	0.18	over 2400	0
S8	30065649	41°24.377'	23°24.320'	125m	Struma	15.2	8.1	138.0	10.0	84.4	3.7	13.2	1.43	0.05	over 2400	9
S9		41°24.320'	23°20.550'	79m	Struma	21.5	8.4	447.0	10.1	30.2	7.1	20.0	2.30	0.18	over 2400	0
M3		41°53'570'	23°32.500'	769m	Mesta	15.0	8.2	272.0	8.3	20.0	5.1	14.4	3.50	0.16	over 2400	9
M4		41°46.880'	23°40.563'	668m	Mesta	15.5	9.0	235.0	11.2	10.2	4.6	15.0	2.93	0.06	over 2400	0
M6		41°28.177'	24°00.567'	425m	Mesta	16.9	8.2	272.0	9.6	23.8	5.6	14.8	2.85	0.10	over 2400	9
D1	30063626	41°33.518'	24°08.273'	1044m	Dospat	12.6	7.9	137.0	9.5	13.8	6.5	18.0	4.20	0.14	over 2400	0

Note: Gray color indicates relatively high values (such as more than Class III) of BOD5, COD, TP as well as high values of TN, Coliform and Fecal coliform.

Table C.2.2 Results of the Supplemental Water Quality Survey by JICA - Hydro-biological Survey with The Most Dominant Species

Point No.	Macrophytes	Phytobenthos	Benthic Invertebrate Fauna		Fish fauna		Remarks
	Hydrophytes (submerged and emergent aquatic plants)		The most dominant species	Irish Biotic Index (IBI)	The most dominant species	Biomass (kg/ha)	
T1	Fontinalis anthipyretica	Gomphonema	Cryptochironomus gr. defectus	4-5	Salmo trutta fario Linnaeus, 1758	55	
T2	Ceratophyllum demersum	Nitzschia	Gammarus arduus	3-4	Barbus cyclolepis Heckel, 1840	300	
T3	Potamogeton natans	Nitzschia	Gammarus sp.	4	Barbus cyclolepis Heckel, 1840	252	
T5	Potamogeton natans	Navicula	Cryptochironomus gr. defectus	2-3	Barbus cyclolepis Heckel, 1840	145	
T8	Potamogeton natans	Navicula	Tanytarsus gr. gregarius	4	Rutilus rutilus (Linnaeus, 1758)	280	
T10		Rhoicosphenia	Gammarus sp.	4-5	Barbus cyclolepis Heckel, 1840	71	
T11	Potamogeton natans	Navicula	B. lutheri	4	Barbus cyclolepis Heckel, 1840	581	
MA2	Vallisneria spiralis	Reimeria	Tanytarsus gregarius	3	Barbus cyclolepis Heckel, 1840	57	
MA4	Ceratophyllum demersum	Nitzschia amphibia	Chironomus riparius	3	Rhodeus sericeus (Bloch, 1782)	329	
MA5		Nitzschia	Chironomus gr. plumosus	2-3	Leuciscus cephalus (Linnaeus,1758)	145	
MA8	Potamogeton pusillus	Navicula	B. fuscatus	3	Carassius gibelio Bloch, 1782	250	
MA9		Nitzschia	Chironomus gr. plumosus	5	Barbus cyclolepis Heckel, 1840	140	
MA10		Navicula	H. cf. instabilis	2	Rhodeus sericeus (Bloch, 1782)	134	
MA11		Reimeria	B. rhodani	4-5	Phoxinus phoxinus (Linnaeus, 1758)	37	
MA12	Ceratophyllum demersum	Reimeria	B. fuscatus	3-4	Barbus cyclolepis Heckel, 1840	363	
MA14	Ceratophyllum demersum	Nitzschia	Chironomus riparius	3	Carassius gibelio Bloch, 1782	144	
MA15		Nitzschia	Calopteryx splendens	3	Barbus cyclolepis Heckel, 1840	353	
MA17	Cladophora sp.	Navicula	Tubifex tubifex	1-2	Carassius gibelio Bloch, 1782	2	Very bad smell of water
MA18		Nitzschia amphibia	Chironomus riparius	3-4	Rhodeus sericeus (Bloch, 1782)	60	
MA19		Nitzschia	Tanytarsus gregarius	2-3	Carassius gibelio Bloch, 1782	40	Very bad smell of water
MA22	Ceratophyllum demersum	Nitzschia	C. pseudorivulorum	4	Rhodeus sericeus (Bloch, 1782)	346	
MA23		Fragilaria	Limnodrilus sp.	2-3	Leuciscus cephalus (Linnaeus,1758)	142	
A1		Navicula	Chironomus riparius	4	Salmo trutta fario Linnaeus, 1758	24	
A3	Cyperus flavescens	Nitzschia	Chironomus riparius	4	Barbus cyclolepis Heckel, 1840	286	
S1	Potamogetonpectinatus	Rhoicosphenia	G. balcanicus	3-4	Rhodeus sericeus (Bloch, 1782)	185	
S3	Ceratophyllum demersum	Nitzschia	G. balcanicus	4	Barbus cyclolepis Heckel, 1840	340	
S4	Cladophora	Nitzschia amphibia	Cryptochironomus gr. defectus	2-3	Barbus cyclolepis Heckel, 1840	265	
S5	Ceratophyllum demersum	Nitzschia amphibia	C. pseudorivulorum	3-4	Barbus cyclolepis Heckel, 1840	350	
S6		Nitzschia	C. pseudorivulorum	3-4	Barbus cyclolepis Heckel, 1840	231	
S7	Ceratophyllum demersum	Nitzschia	C. pseudorivulorum	4	Barbus cyclolepis Heckel, 1840	169	
S8	Fontinalis anthipyretica	Nitzschia	B. rhodani	3-4	Barbus cyclolepis Heckel, 1840	125	
S9		Nitzschia	Chironomus riparius	3	Alburnoides bipunctatus (Bloch, 1782)	263	
M3	Cladophora sp.	Navicula	B. rhodani	3-4	Barbus cyclolepis Heckel, 1840	65	
M4	Fontinalis anthipyretica	Navicula	B. rhodani	3-4	Barbus cyclolepis Heckel, 1840	215	
M6	Equisetum palustis	Nitzschia	B. fuscatus	4	Barbus cyclolepis Heckel, 1840	230	
D1	Potamogeton pectinatus	Nitzschia	Tipula sp.	3-4	Phoxinus phoxinus (Linnaeus, 1758)	5	

Table C.3.1 Existing Municipal Wastewater Treatment Plants in Bulgaria

(1/2)

No.	Municipal WWTP	Outflow to	Municipality	Maintained by	Const. / Rehabili. Year	Treatment Level	Population		Discharge Volume (m3/day)		Remarks
							Inhabitants	Population Equivalent	Design	Actual	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1.	**Ogosta River Basin**										
1-1	Vratsa	Dabnika River	Vratsa	W&S Co. Vratsa	1985	Secondary	69,423	104,135	43,200	40,608	
1-2	Varshets	Ogosta River	Varshets	W&S Co. Montana	1971	Secondary	7,271	10,907	3,800	5,180	
2.	**Iskar River Basin**										
2-1	Borovets Resort, Rila Hotel	Iskar River	Samokov	W&S Co. Sofia-Region	1992	Secondary		4,000		1,800	
2-2	Borovets Resort, Yaitzeto	Iskar River	Samokov	W&S Co. Sofia-Region		Secondary		6,000	2,880		Forthcoming officialy acception
2-3	Samokov ERM	Iskar River	Samokov	W&S Co. Sofia-Region	1973	Secondary	27,664	58,500	17,280	12,960	Up-graded in 2001
2-4	Sofia ERM	Iskar River	Sofia	W&S Co. Sofia	1984	Secondary	1,173,811	2,037,000	500,000	450,000	
2-5	Kremikovtsi	Lesnovska River	Sofia	W&S Co. Sofia	1978	Secondary	16,232	48,696	31,100	10,800	
2-6	Elin Pelin	Lesnovska River	Elin Pelin	W&S Co. Sofia	1962	Primary	3,930	6,000		518	
2-7	Botevgrad	Kalnitsa River	Botevgrad	W&S Co. Botevgrad	1963	Primary	21,653	32,480	7,128	5,184	Not works properly
2-8	Pravets	Malki Iskar River	Pravets	W&S Co. Sofia	1993	Secondary	4,773	7,160	4,060	1,240	
3.	**Vit River Basin**										
3-1	Pleven	Vit River	Pleven	W&S Co. Pleven	1988	Secondary	122,149	183,224	141,500	72,591	1991 - sludge treatment
4.	**Osam River Basin**										
4-1	Troyan	Osam River	Troyan	W&S Co. Troyan	2004	Primary	23,623	32,570			
5.	**Yantra River Basin**										
5-1	Veliko Tarnovo ERM	Yantra River	Veliko Tarnovo	W&S Co. Yovkovtsi	2002	Secondary	66,998	95,000	45,619	37,500	
5-2	Gabrovo	Yantra River	Gabrovo	W&S Co. Gabrovo	1985	Secondary	67,350	101,025	79,200	40,000	
5-3	Strazhitsa	Strazhishka River	Strazhitsa	W&S Co. Gabrovo	2001	Primary	5,309	10,000	4,500		
5-4	Gorna Oryahovitsa	Yantra River	Gorna Oryahovitsa	W&S Co. Yovkovtsi	2007	Secondary, N, P	44,904	102,535	16,178		Under defect notification period
6.	**Rusenski Lom River Basin**										
6-1	Razgrad	Beli Lom	Razgrad	W Co. Dunav	1974	Secondary	39,036	60,000	35,810	18,600	
7.	**Dobrudzhanski Rivers and Dry Valleys**										
7-1	Dobrich	Suha River	Dobritch	W&S Co. Dobritch	1986	Secondary	100,379	150,569	57,000	25,532	
7-2	General Toshevo	Dry Valley	General Toshevo	W&S Co. Dobritch	1996	Secondary	8,159	12,239	899	186	
7-3	Tervel	Dry Valley	Tervel	W&S Co. Dobritch	1993	Primary	7,328	10,992	560	288	
7-4	Kubrat	Dry Valley	Kubrat	W&S Co Meden Kladenets	2004	Primary	9,045	10,939	839		
7-5	Dulovo	Dry Valley	Dulovo	Soch Ltd.- Dulovo	2006	Primary	7,001	8,400	825		Forthcoming officialy acception
7-6	Isperih	Dry Valley	Isperih	W&S Co Isperih	2001	Primary	9,953	11,944	400		
8.	**Black Sea Coast**										
8-1	Shabla	Shablensko lake	Shabla	W&S Co. Dobritch	1991	Secondary	4,002	6,003	346		
8-2	Rusalka Resort	Black Sea	Kavarna	WS Rusalka	1968	Primary		5,000			
8-3	Kavarna	Black Sea	Kavarna	W&S Co. Dobritch	1999	Secondary	11,588	17,382	16,500		
8-4	Balchik	Black Sea	Baltchik	W&S Co. Dobritch	1970	Primary	12,629	70,000	1,100	1,500	
8-5	Albena Resort	Black Sea	Baltchik	Albena 2000 JSC	1972	Secondary		13,500	22,500	15,000	
8-6	Zlatni Pyastsi Resort	Black Sea	Varna	W&S Co. Varna	1983	Secondary		14,000	14,536	9,130	
8-7	Saint Konstantin Resort / Elena Grand Hotel	Black Sea	Varna	Grand Hotel Varna	1982	Secondary		5,000		1,500	
8-8	Saint Konstantin Resort / Elena Druzhba II	Black Sea	Varna	W&S Co. Varna	1959	Primary		5,000		1,500	
8-9	Varna	Varnensko Lake	Varna	W&S Co. Varna	1985	Secondary	322,204	420,000	156,000	95,000	
8-10	Asparuhovo	Varnensko Lake	Varna	W&S Co. Varna	1966	Primary	23,771	48,406	3,200	3,500	
8-11	Kamchiya	Kamchiya River before	Avren	W&S Co. Varna	1983	Secondary		11,000	12,500	4,500	
8-12	Obzor -Biala	Dvoinitsa River before Black sea	Nesebar	W&S Co. Burgas	2004	Secondary	4,086	40,000	10,000		
8-13	Elenite Resort	Black Sea	Nesebar	Elenite Rezort	1986	Secondary		5,000	4,560	584	
8-14	Ravda-Sunny Beach Resort	Black Sea	Nesebar	W&S Co. Burgas	1976	Secondary	10,357	65,000	27,200	35,000	
8-15	Pomorie	Black Sea	Pomorie	W&S Co. Burgas	1998	Secondary	13,710	20,565	16,000		
8-16	Burgas	Vaya Lake	Burgas	W&S Co. Burgas	1986	Secondary	193,316	289,974	120,000	50,630	1989 - sludge treatment
8-17	Meden Rudnuk	Chanel after Mandra dam	Burgas	W&S Co. Burgas	1977	Primary	56,849	90,000	10,886	4,752	1986 -new facilities
8-18	Duni Resort	Gabera Dam	Sozopol	Duni Resort	1986	Secondary		5,000	760	445	
8-19	Kiten - Primorsko	Karaagach River before Black Sea	Tsarevo	W&S Co. Burgas	1980	Secondary	3,323	25,000	13,900	27,650	
8-20	Lozenets	Karaagach River	Tsarevo	Sotcialen Otdih	1988	Secondary		5,000	2,000	1,700	
8-21	Tsarevo	Popska River	Tsarevo		2006	Secondary	5,956	25,000	15,750		Forthcoming officialy acception
8-22	Sredets	Sredetska River	Sredets		2006	Secondary, N, P	9,764	14,646	5,000		Forthcoming officialy acception

Table C.3.1 Existing Municipal Wastewater Treatment Plants in Bulgaria

(2/2)

No.	Municipal WWTP	Outflow to	Municipality	Maintained by	Const. / Rehabili. Year	Treatment Level	Population: Inhabitants	Population: Population Equivalent	Discharge Volume (m3/day): Design	Discharge Volume (m3/day): Actual	Remarks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
9.	**Kamchiya River Basin**										
9-1	Loznitsa	Loznishka River	Loznitsa	W Co. Dunav	1976	Secondary	2,769	4,154	1,100	1,730	
9-2	Smyadovo	Smyadovska River	Smyadovo	Smyadovo Hydropower JSC	1982	Secondary	4,493	6,740	3,124		
9-3	Dalgopol	Golyama Kamchiya River	Dalgopol	W&S Co. Varna	1982	Secondary	5,445	8,168	1,730	470	
9-4	Shumen	Poroina River	Shumen	W&S Co. Shumen	2002	Primary	89,054	151,841	86,400		
9-5	Dolen Chiflik	Cheir Dry River	Dolen Chiflik	Wood Processing Plant "Ticha"	1980	Secondary	6,965	10,448	1,200	800	
10.	**Provadiiska and Devnenska River Basin**										
10-1	Provadia	Provadiiska River	Provadia	W&S Co. Varna	1970	Primary	14,361	21,542	9,150	3,200	
10-2	Devnya	Devnenska River	Devnya	W&S Co. Varna	1975	Secondary	8,799	13,199	15,550	16,000	
10-3	Wetrino	Zlatina R	Wetrino	W&S Co. Varna	1995	Secondary	1,168	1,402	173	118	
10-4	Beloslav	Beloslavsko Lake	Beloslav	W&S Co. Varna	1976	Secondary	8,099	12,149	3,400	1,600	
11.	**Struma River Basin**										
11-1	Pernik	Struma River	Pernik	W&S Co. Pernik	1984	Secondary	86,133	129,200	60,000	49,248	Rehabilitated primary
11-2	Radomir	Struma River	Radomir	Radomir METALS JSC	1986	Secondary	15,835	23,753	9,936	6,912	
11-3	Zemen	Struma River	Zemen	Zemen Municipality	1996	Secondary	2,203	3,305	256	196	
11-4	Kovachevtsi	Svetlianska R	Pernik	Municipality Comp. Kovatchevtsi 96 Ltd.	1982	Primary		3,000	423	253	Not under operation
11-5	Dupnitsa	German River	Dupnitsa	W&S Co. Dupnitsa	1982	Secondary	38,323	57,485	62,208	39,744	
11-6	Kyustendil	Banishitsa River	Kyustendil	W&S Co. Kyustendil	1976	Secondary	50,243	75,365	50,112	27,648	
12.	**Mesta River Basin**										
12-1	Razlog	Iztok River	Razlog		2007	Secondary	12809	20926	6,000		Under defect notification period
13.	**Maritza River Basin**										
13-1	Ihitiman Leyarkomplekt	Mati vir River	Ihtiman	"Chugunoleene" JSCo	1983	Secondary	13,711	20,567	28,512	10,900	
13-2	Pamporovo Resort	Chepelarska River	Smolyan	W&S Co. Smolyan	1985	Secondary		7,000		3,200	
13-3	Plovdiv	Maritza River	Plovdiv	W&S Co. Plovdiv	1984	Secondary	340,638	662,590	213,000	149,000	Renovated in 2000
13-4	Hisaria	Sinia reka dam	Hisar	W&S Co. Plovdiv	1963	Primary	8,544	12,816	9,371		
13-5	Nova Zagora	Blatnitsa River	Nova Zagora	W&S Co. Sliven	1983	Secondary	25,453	38,180	17,546	14,250	
13-6	Radnevo	Sazliyka R	Radnevo	W&S Co. Stara Zagora	1970	Secondary	14,538	21,807	4,200	3,300	Under renovation in 2006
14.	**Tundja River Basin**										
14-1	Sliven	Asenovska River	Sliven	W&S Co. Sliven	1984	Secondary	100,695	106,000	74,304	47,520	Not works properly
14-2	Pavel Banya	Tundja River	Pavel Banya	W&S Co. Stara Zagora	1987	Secondary	3,097	4,646	1,640		
14-3	Kazanlak	Tundja River	Kazanlak	W&S Co. Stara Zagora	2000	Secondary	54,021	80,000	27,000		
15.	**Arda River Basin**										
15-1	Rudozem	Arda River	Rudozem	W&S Co. Smolyan	2007	Secondary	6768	9767	1717		Under defect notification period
15-2	Madan	Arda River	Madan	W&S Co. Smolyan	2007	Secondary	5050	9750	1390		Under defect notification period
15-3	Zlatograd	Varbitsa River	Zlatograd	W&S Co. Smolyan	2007	Secondary	5413	9913	1457		Under defect notification period

Total number of WWTPs = 73

Notes: 1) Data Sources: (1) to (4) and (6) to (11) from MoEW, and (5) from the WWTPs.
2) ERM: Enlargement, modernization and rehabilitation
3) Population (item (7)) is based on the census data on Dec. 31, 2001.
4) Population equivalent is based on the WWTP projects or equal percentages to the population (150% or 120 %) depending on the population.

Table C.3.2 Status of the Construction of New WWTPs

	River valley	Town	Constructed	Designed	Implementation
1	Arda	Smolyan		EU ISPA	
2	Arda	Rudozem		EU PHARE	
3	Arda	Zlatograd		EU PHARE	
4	Black Sea Coast	Obzor-Byala	Constructed (up to secondary treatment)		
5	Black Sea Coast	Baltchik		EU ISPA	
6	Black Sea Coast	Tsarevo	Constructed (up to secondary treatment)		
7	Black Sea Coast	Varna-ERM		EU ISPA	
8	Black Sea Coast	Sozopol			under construction
9	Black Sea Coast	Ahtopol		ok	
10	Black Sea Coast	Primorsko-Kiten-ERM			under construction
11	Black Sea Coast	Asparuhovo-Varna		ISPA	
12	Black Sea Coast	Meden Rudnik - Bourgas		ISPA	tender procedure
13	Dobrudzha Plane Rivers	Isperih			under construction
14	Dobrudzha Plane Rivers	Dulovo			under construction
15	Iskar	Samokov	Constructed (up to secondary treatment)		
16	Iskur	Sofia-ERM		Phare etc.	
17	Kamtchiya	Shoumen	Primary treatment		
18	Kamtchiya	Veliki Preslav			under construction
19	Maritza	Stara Zagora			under construction
20	Maritza	Dimitrovgrad			under construction
21	Maritza	Haskovo			under construction
22	Maritza	Pazardjik			under construction
23	Maritza	Plovdiv-ERM		Cohision fund	
24	Maritza	Panagyurishte			
25	Ogosta	Montana		ISPA	tender procedure
26	Osum	Troyan	Primary treatment		
27	Osum	Lovetch		ISPA	tender procedure
28	Rossenski Lom	Razgrad-ERM			
29	Rossenski Lom	Popovo		ISPA	tender procedure
30	Struma	Blagoevgrad			under construction
31	Tundza	Kazanluk	Constructed (up to secondary treatment)		
32	Tundza	Sliven-ERM		Cohision fund	
33	Yantra	Veliko Turnovo -ERM	Constructed (up to secondary treatment)		
34	Yantra	Strazhitsa	Primary treatment		
35	Yantra	Gorna Oryahovitsa			Completed
36	Yantra	Sevlievo		ISPA	tender procedure

Table C.4.1 Major Industries in EABD: Directly Discharging Wastewater into the Rivers or Water Bodies

(1/2)

No	Name of industry	Business	RIVER BASIN	Location		TRIBUTARY RIVER	NAM Catch.	Discharge m3/s	BOD5 mg/l	BOD kg/year	Total N mg/l	Total N kg/year	Total P mg/l	Total P kg/year
				Settlement	Municipality									
1. Maritsa River Basin														
1	NEOHIM JSCo	Chemical industry	Maritsa	Dimitrovgrad	Dimitrovgrad	Maritsa river	MA_M2	0.252	34.4	273238	10.0	79471	0.70	5593
2	Trakya Paper JSCo	Production of paper, corrugated cardboard and packings	Maritsa	Pazardzhik	Pazardzhik	Pishmanska river	MA_M5	0.077	25	59897	5.0	11979	0.20	479
3	Gorubso Laki - Orc-dressing with tailing pond "Laki-2-complex"	Mining	Maritsa	Laki	Laki	Dzhurovska river	MA_YUG	0.067	25	52697	1.1	2319	0.01	30
4	Kamenitsa JSCo, Plovdiv, brewery Haskovo	Brewery	Maritsa	Haskovo	Haskovo	gully	MA_HAR1	0.018	90	51088	10.0	5676	5.00	2838
5	Biovet JSCo	Production of veterinary products	Maritsa	Peshtera	Peshtera	Stara reka river	MA_STA2	0.020	80.13	50540				
6	KCM-S.A., Plovdiv	metallurgy	Maritsa	land, municipality Ku	Kuklen	Chepelarska river	MA_M4	0.097	15	45989	1.1	3373	1.95	5979
7	TTP "Maritsa 3" Dimitrovgrad	Electric power - production	Maritsa	Dimitrovgrad	Dimitrovgrad	Maritsa river	MA_M2	0.032	25	30764	1.0	1203	0.20	241
8	Bimak JSCo/Chelopech Maining EAD	Cupper ore dressing	Maritsa	v. Chelopech	Chelopech	Vozodel/Chelopeshka/ river;	MA_TOP3	0.025	34	26764	27.3	21313	2.00	1559
9	Asarel-Medet JSCo	Extraction and processing of copper ore	Maritsa	Panagyurishte	Panagyurishte	Yana Luda river	MA_LUD2	0.030	25	23950	1.1	1054	0.20	192
10	Elit 95 Ltd, vDalbok izvor, Dairy	Dairy	Maritsa	v.Dalbok izvor	Parvomay	Topolnitsa river	MA_M3	0.000	1438	20995	10.0	146	2.00	29
11	Belovo - Paper Mill JSC - Belovo	Production of paper, corrugated cardboard and packings	Maritsa	Belovo	Belovo	Maritsa river	MA_M6	0.014	33.076	14488				
12	Elatsite - Med JSCo	Cupper ore dressing	Maritsa	v.Mirkovo	Sofia	Malka reka river	MA_TOP3	0.030	15	14250	14.0	13338	0.20	190
13	Konex Tiva Ltd, v.Orizovo	Processing of vegetables	Maritsa	v.Orizovo	Bratya Daskalovi	Suho dere river	MA_M3	0.006	50	9617	10.0	1923.33	5.00	962
14	Gorubso Laki - Mining "Druzhba"	Mining	Maritsa	Laki	Laki	Dzhurovska river	MA_YUG	0.012	25	9463	1.1	416	0.02	6
15	Agrya JSCo, Plovdiv	FUNGICIDES. INSECTICIDES, HERBICIDES	Maritsa	land, municipality Ku	Kuklen	Chepelarska river	MA_M4	0.012	25	9145				
16	Paper Factory AD, Stambolyski	Paper products	Maritsa	Stamboliyski	Stamboliyski	Maritsa river	MA_M4	0.029	9.2	8414				
17	Vulkan JSCo	rubber / tyre retreading	Maritsa	Dimitrovgrad	Dimitrovgrad	Maritsa river	MA_M2	0.010	25	7875	10.0	3150	0.59	186
18	Rikom - Ltd, Brezovo	Wine-production	Maritsa	Brezovo	Brezovo	Rozovetska river	MA_M3	0.000	2050	6232	34.3	104	1.10	3
19	Kristal JSCo	Glass ware - crystal	Maritsa	Velingrad	Velingrad	Chepinska river	MA_CPI1	0.006	30	5884	2.8	551	2.00	395
20	Mines"Trayanovo sever" and "Trayanovo 1"	Extraction of brown coal	Maritsa	v.Troyanovo	Radnevo	Ovacharitsa river	MA_SAZ1	0.004	25	3272	5.0	654	1.10	144
21	Terem - Georgi Benkovski SPLTD - Plovdiv	Repair military technics, aeroplanes	Maritsa	v.Graf Ignatievo	Maritsa	Pyasachnik river	MA_M4	0.006	15	3083	2.1	399	5.00	950
22	Mine "Trayanovo 3", v.Mednikarovo	Extraction of brown coal	Maritsa	v.Mednikarovo	Galabovo	Sokolitsa river	MA_SAZ1	0.003	25	2645	6.0	635	1.10	116
23	Boni Oborot 2	Processing of meat	Maritsa	Velingrad	Velingrad	Chepinska river	MA_CPI1	0.001	65	2600	0.4	16	2.00	80
24	Remotex Radnevo EAD	Coal output	Maritsa	Radnevo	Radnevo	Blatnitsa river	MA_BLA	0.003	25	2600	6.0	624	1.10	114
25	SKF Bearings Bulgaria, Sofia	machine-building, bearing elements	Maritsa	Karnare	Karlovo	Koru dere /gully/	MA_STR2	0.003	25	2502	1.1	110	5.00	500
26	Chugunoleene Invest JSCo	Iron-casting	Maritsa	Parvomay	Parvomay	Mechka river	MA_M3	0.004	15	2045	1.5	199	0.20	27
27	BDZ EAD -Engine-shed	Service for carriage and engine	Maritsa	Septemvri	Septemvri	Sechim dere /gully/	MA_CPI1	0.003	25	2000	8.1	650	5.00	400
28	Hydro - SPLTD	Process of ballast	Maritsa	Devin	Devin	Vacha river	MA_VAC2	0.002	25	1785	1.5	107	0.20	14
29	Konex Tiva Ltd	Canning factory	Maritsa	v.Choba	Brezovo	Rozovetska river	MA_M3	0.003	15	1609	6.0	643	0.20	21
30	Elhim-Iskra JSCo	Accumulation factory /production of accumulators/	Maritsa	Pazardzhik	Pazardzhik	Pishmanska river	MA_M5	0.013	4	1576	0.8	321	0.33	131
31	Insa Oil Ltd, Rakovski	Petroleum and petroleum products+C59	Maritsa	v.Belozem	Rakovski	Srebarna river	MA_M3	0.002	24	1188	3.0	146	0.20	10
32	Ognyanovo-K EAD	Different type of lime	Maritsa	Pazardzhik	Pazardzhik	Maritsa river	MA_M5	0.008	4.6	1138	1.7	432	2.01	502
33	SKF Bearings Bulgaria, Sofia	Machine-building, bearing elements	Maritsa	v.Bogdan	Karlovo	Stryama river	MA_STR2	0.001	25	1137	1.1	50	5.00	227
34	Polidey 2 Ltd, Karlovo, workshop for milk production	Workshop for milk production	Maritsa	v.Domlyan	Karlovo	Domlyanska river	MA_STR2	0.000	80	1133	6.7	95	1.10	16
35	Agri Bulgaria SPLTD	Process and package of cherry	Maritsa	v.Radinovo	Maritsa	drain canal /main collector 2/	MA_M4	0.002	15	1100	4.1	301	0.20	15
36	Kostenets HHI JSCo	Production of paper and pasteboard	Maritsa	Kostenets	Kostenets	Maritsa river	MA_M6	0.001	26	993	2.8	106	0.20	7
37	Bulgarian Rose JSCo, Karlovo	Parfume / rose oil	Maritsa	Karlovo	Karlovo	Batovo dere /gully/	MA_STR2	0.001	25	825	5.0	165	0.20	7

Table C.4.1 Major Industries in EABD: Directly Discharging Wastewater into the Rivers or Water Bodies

(2/2)

No	Name of industry	Business	RIVER BASIN	Location: Settlement	Location: Municipality	TRIBUTARY RIVER	NAM Catch.	Discharge m3/s	BOD5 mg/l	BOD kg/year	Total N mg/l	Total N kg/year	Total P mg/l	Total P kg/year
38	VMZ JSCo	Machine factory/ Anti-Tank guided Missiles, Anti-Tank UnguideD Missiles,AVIATION UNGUIDED Missiles,Artillery ammunition,FUZES/ and Abrasive Grinding Wheels,Cutting and Grinding Abrasive Discs for Metal and Non-metal,Diamond Tools,Machinery and Equipment f	Maritsa	v.Iganovo	Karlovo	Stryama river	MA_STR2	0.001	25	816	1.1	36	5.00	163
39	Ioka Ltd, Plovdiv, a canning factory	Canning - vegetable production	Maritsa	v. Kurtovo Konare	Stamboliyski	Drain canal	MA_STA1	0.002	15	783	10.0	522	5.00	261
40	P.A.L. BG - SPLTD	Process of fish	Maritsa	Devin	Devin	Shirokolashka river	MA_VAC2	0.001	45	765	18.0	306	1.00	17
41	Bor Chvor - D.Minev, v.Dalbok izvor, Dairy	Dairy	Maritsa	v.Dalbok izvor	Parvamay	Topolnitsa river	MA_M3	0.000	280	739	25.0	66	2.00	5
42	Bulgarian Rose JSCo, Karlovo	Parfume / rose oil	Maritsa	v.Hristo Danov	Karlovo	Belyata river	MA_STR2	0.000	50	720	1.1	16	0.12	2
43	Optikoelektron SPLTD	Factory for opitcs	Maritsa	Panagyurishte	Panagyurishte	Yana Luda river	MA_LUD2	0.001	15	476	2.8	91	0.50	16
44	Yulit - AS Ltd, Plovdiv town	Production of tiling-stone from marble, limestone	Maritsa	Brezovo	Brezovo	gully	MA_M5	0.001	25	425	0	0	0.10	2
45	Delikates-2 Ltd, v.Zhitnitsa, workshop meat production	Workshop meat production	Maritsa	v.Zhitnitsa	Brezovo	Pikla river	MA_STR1	0.000	50	415	12.0	100	11.00	91
46	Volex Ltd,/Glaus-2004 SPLTD/ Sofia, bird slaughterhouse	Slaughterhouse poultry	Maritsa	v.Milevo	Rodopi	Drain canal	MA_M3	0.001	15	315	2.6	54	10.00	210
47	TER-M Ltd, Plovdiv, bird slaughterhouse	Slaughterhouse	Maritsa	Parvomay	Parvamay	Drain canal	MA_M3	0.001	15	307	10	205	5.00	102
48	Terem JSCo	Repair military technics, aeroplanes	Maritsa	Kostenets	Kostenets	Chorbadzhiysko dere /gully/	MA_M6	0.000	25	271	2.1	23	5.00	54
49	Kaomet	Enamel UTENSIL	Maritsa	Bratsigovo	Bratsigovo	Umishka river	MA_STA2	0.000	20	259	60.5	782	0.40	5
50	Sokotab Bulgaria, Sofia, workshop for /SS/	Processing of oriental tobaccos	Maritsa	v.Radnevo	Maritsa	Drain canal	MA_BLA	0.000	15	234	6	94	1.10	17
2. Tundzha River Basin														
1	Arsenal JSCo	Weapons	Tundzha	Kazanlak	Kazanlak	Tundzha river	TU_M7	0.091	21	59047	4.10	11738	0.60	1718
2	Mirolio-Bulgaria JSCo Sliven	Textiles	Tundzha	Sliven	Sliven	Asenovska river	TU_ASE1	0.020	50	31536	6.00	3784	1.10	694
3	Yambolen JSCo	Chemistry	Tundzha	Yambol	Yambol	Tundzha river	TU_M2	0.011	37.1	12869.84	22.00	7632	0.43	149
4	Vinex Slaviantsi JSCo	Wine Production /WWTP/	Tundzha	v.Lozarevo	Sungulare	Dam-lake Petkovets	TU_MOC2	0.000	1200	9360	14.05	110	1.10	9
5	Arsenal JSCo	Weapons	Tundzha	Maglizh	Kazanlak	Asashtitsa river	TU_M6	0.009	25	7200	4.10	1181	0.60	173
6	VIN.S.Industries Ltd	Spirits and distiller /WWTP/	Tundzha	v.Tserkovski	Karnobat	Drain canal, inlet in Mochuritsa river	TU_MOC1	0.005	25	4325	30.06	5200	2.10	363
7	SIS Industries Ltd	Alcoholic drinks Bottling	Tundzha	v.Venets	Karnobat	open canal	TU_MOC2	0.002	25	1500	4.04	242	1.10	66
8	SKF Bearings Bulgaria, Sofia /IW/	Machine-building, bearing elements	Tundzha	Kalofer	Karlovo	Tundzha river	TU_M9	0.001	25	953	9.00	343	5.00	191
9	Bulgaria - K JSCo	Textiles	Tundzha	Kazanlak	Kazanlak	Kriva vada river	TU_M7	0.001	20	911	6.00	273	1.10	50
10	Viganlex Ltd Sofia	Workshop for production of essential oils	Tundzha	Gurkovo	Gurkovo	Lazova river	TU_M6	0.001	30	750	6.00	150	1.10	28
3. Arda River Basin														
1	Gorupso Zlatograd, Tailing pond "Erma river"	Mining /Process of lead-zink orc /	Arda	Zlatograd	Zlatograd	Golyama river	AR_VAR2	0.057	25	45175	6	10842	0.027	48.79
2	Gorubso Rudozem EAD - in porcess of closing	Mining /Process of lead-zink orc /	Arda	Rudozem	Rudozem	Arda river and Chepinska river	AR_M5	0.050	25	39420	6	9461	0.200	315.36
3	Gorubso-Kardzhali JSCo, Kardzhali, Mine "Enyovche"	Mining /Process of lead-zink orc /	Arda	v.Enyovche	Ardino	Enyovche river	AR_M5	0.025	25	19789	6	4749	0.921	729.25
4	Baydano mladost 95 Ltd	Meat production and processing of meat	Arda	Momchilgrad	Momchilgrad	Arda river	AR_VAR1	0.002	200	12552	56.7	3558	4.110	257.94
5	Gorubso-Kardzhali JSCo, Kardzhali, Mine "Pcheloyad"	Mining /Process of lead-zink orc /	Arda	Kardzhali	Kardzhali	Kodzha dere /gully/	AR_M2	0.100	25	7917	6	1900	0.040	12.53
6	Gorubso Kardzhali JSCo, Orc-dressing	Mining /Process of lead-zink orc /	reservoir "Studen Kladenets"	Kardzhli	Kardzhli	Arda river	AR_M2	0.005	25	4096	6	983	0.200	32.77
7	Gorubso Madan - JSCo Mining "Krushev dol"	Mining /Process of lead-zink orc /	Arda	Madan	Madan	Madanska river	AR_M5	0.003	25	2288	6	549	0.200	18.30
8	Progresstroy	Building	Arda	Rudozem	Rudozem	Arda river	AR_M5	0.001	25	405	6	97	0.200	3.24
9	Betonstroy Ltd	Production of concrete	Arda	Madan	Madan	Arda river	AR_M5	0.000	25	228	6	55	0.200	1.82
10	Bentonit JSCo	Extraction of other non-metal material and raw materials	reservoir "Studen Kladenets"	Kardzhli	Kardzhli	Arda river	AR_M2	0.000	25	104	6	25	0.200	0.84

Table C.4.2 Major Industries in WABD: Directly Discharging Wastewater into the Rivers or Water Bodies

(1/2)

No	Name of industry	Business	RIVER BASIN	Location		TRIBUTARY RIVER	NAM Catch.	Discharge m3/s	BOD5 mg/l	BOD (kg/year)	Total N mg/l	Total N kg/year	Total P mg/l	Total P kg/year
				Settlement	Municipality									
1. Struma River Basin														
1	WWTP Leko Co SPLTD	Paint	Struma	Radomir	Radomir	Struma River	ST_M9	0.489	22	334238	8.21	126650	2.00	30853
2	PSK Spartak	Sand extraction	Struma	v.Sklave	Sandanski	Stream	ST_M1	0.500	20	319039	7.83	123516	0.35	5519
3	Bodzhinov & Co Ltd	Car-wash and service-station	Struma	Sandanski	Sandanski	Gully	ST_SAN	0.500	19	299592	10.00	157680	1.34	21129
4	Thermal Power Plant Bobov Dol SPJ	Energetics	Struma	Bobov Dol	Bobov dol	Razmetanitsa River	ST_DZH1	0.701	9	196643	4.00	88427	0.67	14850
5	Mines Bobov Dol JSCo	Mine industry	Struma	Bobov Dol	Bobov dol	Razmetanitsa River	ST_DZH1	0.099	57	177015	5.75	17936	0.93	2909
6	Versay Ltd	no data	Struma	Petrich	Petrich	Collector	ST_STR1	0.333	10	105015	4.00	42006	0.43	4551
7	Gausto-gold JSCo	Mine industry and transport	Struma	Kyustendil	Kyustendil	After water mirror /settling/	ST_M6	0.085	25	66620	8.00	21318	0.33	873
8	Stomana industry JSCo	Steel production	Struma	Pernik	Pernik	Struma River	ST_M9	0.051	39	62778	41.30	65965	50.65	80894
9	Toploficatsia - Pernik EAD	Tailing pond	Struma	Pernik	Pernik	Dere "Kalkas" /gully/	ST_M9	0.278	6	56134	10.83	94989	0.40	3527
10	V&VGD Orandzherii-Petrich Ltd	greenhouse / agricultural-plants	Struma	Petrich	Petrich	Drainage channel	ST_STR1	0.012	135	53019	24.00	9398	19.00	7440
11	Belasitsa S.A.	Mechanicals /Water-meter	Struma	Petrich	Petrich	Collector	ST_STR1	0.007	136	30077	8.00	1766	5.00	1104
12	Benet Ltd	Food - meat	Struma	Breznik	Pernik	Turska River	ST_KON	0.003	164	15468	6.00	568	1.10	104
13	Sanel JSCo	Steel / metals articles	Struma	Sandanski	Sandanski	Collector	ST_SAN	0.012	79	14874	3.00	1135	0.27	101
14	Mines Otkrit Vagledobiv JSCo	Mine industry	Struma	Pernik	Pernik	Krivobarska River	ST_M9	0.010	36	11733	21.09	6910	50.49	16544
15	"Osogovo" - EAD/sanitry sewage/	Mining	Struma	v. Garlyano	Kyustendil	Smolyanska Bistritsa	ST_SOV	0.014	25	10950	6.00	2628		0
16	Bugarkoop SPLTD-Frukta	Food industry - fruit	Struma	v. Kopilovtsi	Kyustendil	Struma River	ST_M6	0.013	25	10157	4.00	1625	0.02	9
17	ZIIU Standart JSCo	Mechanicals / meters	Struma	Blagoevgrad	Blagoevgrad	Collector	ST_BRA	0.008	40	10092	3.00	757	0.27	68
18	Gausto-gold JSCo	Mine industry, transport	Struma	Kyustendil	Kyustendil	avarage load	ST_M6	0.002	123	8452	2.32	160	1.31	90
19	Georesurs SPLTD	Extraction of ballast	Struma	Simitli	Simitli	Struma River	ST_M4	0.012	18	6365	2.22	805	0.30	107
20	Ekoengineering - PM SPLTD	Uranium mine -pollution with radio-nukl	Struma	v. Senokos	Simitli	Luda reka river	ST_M4	0.008	25	6306	8.00	2018	0.27	68
21	Bistritsa Ltd TMSI	Extraction of ballast	Struma	v. Pokrovnik	Blagoevgrad	Struma River	ST_M4	0.006	27	5090	2.01	381	0.38	73
22	Vitren SA	Coal extraction	Struma	Kyustendil	Kyustendil	Struma River	ST_M6	0.006	25	4888	8.00	1564	0.43	85
23	Mines Otkrit Vagledobiv JSCo	Mine industry	Struma	Pernik	Pernik	Buchinsko dere/gully/	ST_M9	0.006	25	4888	5.00	978	0.27	52
24	Elektrik JSCo	Electrical appliance.	Struma	Radomir	Radomir	Collector	ST_M9	0.001	117	4441	10.20	386	2.76	104
25	Blagoevgrad BT S.A.	Tobacco processing	Struma	v. Izgrev	Blagoevgrad	Aydarowsko Dere /Gully/	ST_M4	0.006	13	2517	2.34	467	0.03	5
26	BULS Ltd	Leather industry	Struma	v. Topolnitsa	Petrich	Collector	ST_M1	0.008	8	1892	10.00	2365	0.16	39
27	Damianitza JSCo. /vinprom/	Food industry - Wine	Struma	v. Damyanitsa	Sandanski	Drainage channel	ST_M1	0.023	3	1826	1.26	922	0.14	105
28	Alpha komers Ltd	Car-washing	Struma	Radomir	Radomir	Lyulyakova River	ST_M9	0.003	19	1798	9.84	931	1.47	139
29	Visokogovoriteli SA	Electronics / speakers etc	Struma	Blagoevgrad	Blagoevgrad	Collector	ST_BRA	0.007	8	1770	4.66	1029	5.00	1104
30	ZPP SPLTD	Electrical articles / printing plate	Struma	Blagoevgrad	Blagoevgrad	Collector	ST_BRA	0.004	12	1674	6.82	932	5.00	683
31	Mines Otkrit Vagledobiv JSCo	Mine industry	Struma	Pernik	Pernik	Momishko dere/gully/	ST_M9	0.002	25	1595	5.00	319	0.27	17
32	Radomir Metali JSCo	Steel - metal industry	Struma	Radomir	Radomir	Varba Gully	ST_M9	0.002	25	1577	6.00	378	0.27	17
33	Bistritsa Ltd TMSI	Extraction of ballast	Struma	Kocherinovo	Kocherinovo	Struma River	ST_RIL	0.006	8	1552	2.42	458	0.21	39
34	Okeania-P.Stoilov, M.Stoilova	Concrete Production	Struma	Pernik	Pernik	Kalkas /Gully/	ST_M9	0.015	3	1419	6.00	2838	0.43	205
35	Stoun 2002 Ltd - TMSI	Extraction of ballast	Struma	v. Valkovo	Sandanski	Struma River	ST_M2	0.002	18	1107	5.21	329	2.19	138
36	ONIX Ltd	Sand and gravel washing	Struma	v. Krupnik	Simitli	Struma river	ST_M4	0.003	10	1080	4.00	432	0.20	22

Table C.4.2 Major Industries in WABD: Directly Discharging Wastewater into the Rivers or Water Bodies

(2/2)

No	Name of industry	Business	RIVER BASIN	Location		TRIBUTARY RIVER	NAM Catch.	Discharge m3/s	BOD5 mg/l	BOD (kg/year)	Total N mg/l	Total N kg/year	Total P mg/l	Total P kg/year
				Settlement	Municipality									
37	Mlechen Kombinat Rila-S.T.H	Food - milk products	Struma	Blagoevgrad	Blagoevgrad	Blagoevgradska Bistritsa River	ST_BRA	0.008	4	1012	1.75	428	5.00	1222
38	Strumateks JSCo	Textile	Struma	Blagoevgrad	Blagoevgrad	Collector	ST_BRA	0.005	6	978	3.70	583	2.00	315
39	Rosela Ltd	Iouioupioi	Struma	Simitli	Simitli	Struma River	ST_M4	0.005	6	965	8.70	1482	2.31	393
40	Hydrostroy - Yug 97 JSCo	Car (lorry) washing + Sand and gravel w	Struma	v. Katuntsi	Sandanski	Pirinska Bistritsa river	ST_PIR	0.001	25	919	10.00	368	1.50	55
41	Mesokombinat - Sandanski SPLTD	Food industry - meat	Struma	Sandanski	Sandanski	Sandanska Bistritsa River	ST_SAN	0.010	2	694	10.00	3154	5.00	1577
42	J P Dilars Lld	Equipment for cron spirits	Struma	v. Krupnik	Simitli	Collector	ST_M4	0.002	10	650	3.20	202	1.08	68
43	TPK Strimon-3		Struma	v. Zhilentsi	Kyustendil	Radushka River	ST_M6	0.000	156	616	12.00	48	2.10	8
44	Mes-Co SPLTD	Food -meat	Struma	Petrich	Petrich	Collector	ST_STR1	0.012	2	568	1.80	681	1.10	416
45	D B V Ltd-YMSI	Import of electrics materials	Struma	Boboshevo	Boboshevo	After settling	ST_M6	0.006	3	540	3.00	540	0.23	41
46	Energoremont-Kresna JSCo	Electrical appliance.	Struma	Kresna	Kresna	Manhole	ST_M2	0.002	5	388	10.00	736	1.14	84
47	Granit 97 SA	Road building	Struma	v. Nevestino	Nevestino	Struma River	ST_M6	0.004	3	331	2.20	243	0.13	15
48	Tri Bora - Valentin Manev	no data	Struma	Petrich	Petrich	Irrigation channel	ST_STR1	0.002	5	290	3.60	227	0.24	15
49	Saobshtitelan Tehnika JSCo	Machine-building	Struma	Blagoevgrad	Blagoevgrad	Blagoevgradska Bistritsa	ST_BRA	0.000	74	238	4.75	15	0.27	1
50	Arm Invest JSCo	Meat production	Struma	v.Meshtitsa	Pernik	Krivopadinska river	ST_KON	0.000	50	227	10.00	45	5.00	23
2. Mesta River Basin														
1	Pirinhard JSCo	Sand and gravel washing - WWTP	Mesta	Razlog	Razlog	Bela river	ME_IST2	0.181	10	56940	4.00	22776	0.50	2847
2	Incoms Telecom Holding JSCo	Electical items	Mesta	v.Banya	Razlog		ME_GLA	0.063	12	24053	1.95	3889	0.57	1145
3	Belasitsa 2002 SPLTD	Sand, stone and gravel extraction	Mesta	Gotse Delchev	Gotse Delchev	Mesta River	ME_NEV	0.005	72	11031	8.00	1230	0.27	42
4	Magnetic hand technology JSCo	Electronic / magnetic heads	Mesta	Razlog	Razlog	Collector	ME_IST2	0.048	2	2606	1.65	2472	5.00	7490
5	Zavod za telephonna aparatura JSCo	Electronic / telephone	Mesta	Bansko	Bansko	Collector	ME_GLA	0.008	10	2489	5.93	1496	5.00	1261
6	Bistritsa-2002 Ltd TMSI	Sand and gravel washing	Mesta	Gotse Delchev	Gotse Delchev	Mesta River	ME_NEV	0.002	10	540	4.00	216	0.43	23
7	Pirin Story SPLTD	Extraction of ballast	Mesta	v.Banya	Razlog	Iztok river	ME_GLA	0.001	18	540	3.00	90	0.80	24
8	Inkes SPLTD	Sand and gravel washing	Mesta	Hadzhidimovo	Hadzhidimovo	Matenitsa river	ME_M2	0.002	10	500	4.00	200	0.20	10
9	Kalida JSCo		Mesta	Gotse Delchev	Gotse Delchev	Collector	ME_NEV	0.006	3	475	2.56	484	0.27	51
10	Hemefa Bulgaria SPLTD	Furniture factory	Mesta	Razlog	Razlog	Iztok river	ME_IST2	0.000	25	189	4.00	30	1.10	8
11	Ahmed Dzhildzhov-Rodopi	Car Washing	Mesta	v.Satovcha	Satovacha	Satovchenska Bistritsa river	ME_M1	0.000	25	125	10.00	50	1.50	8
12	Strazhite SPLTD	Building materials	Mesta	Bansko	Bansko	Mesta River	ME_GLA	0.001	3	76	5.98	151	0.32	8
13	Neftotrans-2001 Ltd	Car washing, motor service, oil and gas s	Mesta	Belitsa	Belitsa	Mesta river	ME_M5	0.000	25	50	10.00	20	1.50	3
14	Ilya Ivanov Dimitrov	Car washing, Trading complex, oil and g	Mesta	v.Dabnitsa	Garmen	Varbitsa river	ME_M2	0.000	25	48	10.00	19	1.50	3
15	Mebelplast JSCo	Furniture factory	Mesta	Belitsa	Belitsa	Belishka river	ME_M5	0.000	25	18	5.00	4	1.00	1
3. Dospat River Basin														
1	Ekoengineering - PM SPLTD	Uranium mine - pollution with radio-nuk	Dospat	v. Pobit kamak	Velingrad	Gully	DO_M2	0.007	25	5566	5.00	1113	0.27	60
2	Rosi Ltd	Dairy	Dospat	Dospat	Dospat	Dospat river	DO_M1	0.000	50	225	10.00	45	2.00	9

Table C.4.3 Major Livestock Farms with their Pollution Loads in EABD

(1/2)

1. Arda River Basin

No	Region/Name	Species	Location: Settlement	Location: Municipality	Head	NAM Catchment	BOD kg / year / head	TN kg / year / head	TP kg / year / head	BOD kg / year	TN kg / year	TP kg / year
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	"Furazhi 2000" PLC	broylers	Momchilgrad	Momchilgrad	120000	AR_VAR1	0.05	0.03	0.002	6,000	3,600	240
2.	"Kokoimpex" PLC	laying hans	Smolyan - industrial zone	Smolyan	90000	AR_CHE	0.7	0.4	0.12	63,000	36,000	10,800
									Total	69,000	39,600	11,040

2. Tundzha River Basin

No	Region/Name	Species	Location: Settlement	Location: Municipality	Head	NAM Catchment	BOD kg / year / head	TN kg / year / head	TP kg / year / head	BOD kg / year	TN kg / year	TP kg / year
1	2	3	4	5	6	7	8	9	10	11	12	13
3.	"Todor Uzunov" ST	CATTLES	Venets village	Karnobat	300	TU_MOC1	230	79	1.4	69,000	23,700	420
2.	"Svinekomplex " JSCo	pigs	Krumovo Gradishte	Karnobat	1780	TU_MOC1	7.98	4.03	0.7385	14,204	7,173	1,315
6.	"Bulmaks - DM"	pigs	Vodenichane village	Straldzha	1293	TU_MOC1	7.98	4.03	0.7385	10,318	5,211	955
2.	"Gradus - Ivan Angelov"	broylers	Bolyarsko village	Tundzha	1200000	TU_KAL	0.05	0.03	0.002	60,000	36,000	2,400
4.	"Reproduktor po svinevadstvo" JSCo	pigs	Kalchevo village	Tundzha	12000	TU_M2	7.98	4.03	0.7385	95,760	48,360	8,862
5.	"Geomeks"	pigs	Yambol	Yambol	4226	TU_M2	7.98	4.03	0.7385	33,723	17,031	3,121
6.	"MCD -02" Ltd.	CATTLES	Samuilovo village	Sliven		TU_M3	230	79	1.4	0	0	0
1.	"Eko Farm 2005" Ltd.	laying hans	Samuilovo village	Sliven	60000	TU_M3	0.7	0.4	0.12	42,000	24,000	7,200
3.	"ZK Eko asorti" ST	pigs	Mechkarevo village	Sliven	1850	TU_M4	7.98	4.03	0.7385	14,763	7,456	1,366
7.	"SELEKT - Iliya Mihaylov" ST	CATTLES	Tvarditsa	Tvarditsa		TU_M5	230	79	1.4	0	0	0
8.	"ASKENT - Plamen Penchev" ST	CATTLES	Tvarditsa	Tvarditsa		TU_M5	230	79	1.4	0	0	0
5.	"Lyubomir Lyubenov" ST	CATTLES	Lozarevo village	Sungurlare	153	TU_MOC2	230	79	1.4	35,190	12,087	214
									Total	374,959	181,017	25,853

Table C.4.3 Major Livestock Farms with their Pollution Loads in EABD

(2/2)

3. Maritsa River Basin

No	Region/Name	Species	Location: Settlement	Location: Municipality	Head	NAM Catchment	BOD kg / year / head	TN kg / year / head	TP kg / year / head	BOD kg / year	TN kg / year	TP kg / year
1	2	3	4	5	6	7	8	9	10	11	12	13
8.	"DIANA MI" ST	CATTLE	Korten village	Nova Zagora	508	MA_BLA	230	79	1.4	116,840	40,132	711
10.	"VZhK - Rodopa" PLC	pigs	Nova Zagora	Nova Zagora	5015	MA_BLA	7.98	4.03	0.7385	40,020	20,210	3,704
10.	"Zhuliv"PLC	broylers	Nova Zagora	Nova Zagora	410000	MA_BLA	0.05	0.03	0.002	20,500	12,300	820
9.	"Deniker - Milk" JSCo	CATTLE	Dinevo village	Haskovo	200	MA_HAR1	230	79	1.4	46,000	15,800	280
8.	"Galus" JSCo	ducks	Haskovo	Haskovo	92000	MA_HAR1	0.2	0.1	0.006	18,400	9,200	552
3.	"Vasil Levski" Cooperation	CATTLE	Levski village		120	MA_LUD1	230	79	1.4	27,600	9,480	168
10.	"Emil Mihaylov" ST	CATTLE	Krepost village	Dimitrovgrad	100	MA_M2	230	79	1.4	23,000	7,900	140
15.	PK "Agromax" ST	pigs	Chernogorovo village	Dimitrovgrad	1500	MA_M2	7.98	4.03	0.7385	11,970	6,045	1,108
16.	"Elis" PLC	pigs	Klokotnitsa village	Haskovo	1200	MA_M2	7.98	4.03	0.7385	9,576	4,836	886
5.	"Ucheben tsentar"	CATTLE	Rakovski	Rakovski	950	MA_M3	230	79	1.4	218,500	75,050	1,330
6.	"ZhK Gendov"	CATTLE	Rakovski	Rakovski	250	MA_M3	230	79	1.4	57,500	19,750	350
3.	"Stomar Invest" JSCo	pigs	Belozem	Rakovski	9800	MA_M3	7.98	4.03	0.7385	78,204	39,494	7,237
6.	"Reya - 96" ST	pigs	Bolyartsi village	Sadovo	4500	MA_M3	7.98	4.03	0.7385	35,910	18,135	3,323
8.	"Bratya Kartevi 2003" ST	pigs	Manole village	Maritsa	7000	MA_M3	7.98	4.03	0.7385	55,860	28,210	5,170
9.	"Reya - 96" ST	pigs	Manole village	Maritsa	10000	MA_M3	7.98	4.03	0.7385	79,800	40,300	7,385
6.	"Gradus" PLC	broylers	Chirpan	Chirpan	560000	MA_M3	0.05	0.03	0.002	28,000	16,800	1,120
4.	"KOMSO"	CATTLE	Tsalapitsa village		1160	MA_M4	230	79	1.4	266,800	91,640	1,624
4.	"Dimitar Madzharov - svinevadstvo	pigs	Stamboliyski	Stamboliyski	1000	MA_M4	7.98	4.03	0.7385	7,980	4,030	739
7.	"Elit - 95" ST	pigs	Krumovo village	Rodopi	2424	MA_M4	7.98	4.03	0.7385	19,344	9,769	1,790
3.	"Andip 92" ST	laying hans	Plovdiv	Plovdiv	155000	MA_M4	0.7	0.4	0.12	108,500	62,000	18,600
4.	"Kalmitsa" JSCo	laying hans	Tsalapitsa	Rodopi	80000	MA_M4	0.7	0.4	0.12	56,000	32,000	9,600
1.	ZK "Maritsa - 95"	CATTLE	Pazardzhik	Pazardzhik	150	MA_M5	230	79	1.4	34,500	11,850	210
2.	"DANIELA 90"	CATTLE	Aleko Konstantinovo village		110	MA_M5	230	79	1.4	25,300	8,690	154
1.	"SVIKOM" JSCo	pigs	Apriltsi village	Pazardzhik	12000	MA_M5	7.98	4.03	0.7385	95,760	48,360	8,862
2.	"Ilma - Il" Ltd	laying hans	Pazardzhik	Pazardzhik	66000	MA_M5	0.7	0.4	0.12	46,200	26,400	7,920
11.	"Ayaks - 95"	pigs	Bozduganovo village	Radnevo	28000	MA_SAZ2	7.98	4.03	0.7385	223,440	112,840	20,678
12.	"Mihaela - Vasilka Zhelyazkova" ST	pigs	Han Asparuhovo village	Stara Zagora	5800	MA_SAZ2	7.98	4.03	0.7385	46,284	23,374	4,283
13.	"Agroslavyanin" PLC	pigs	Preslaven village	Stara Zagora	3900	MA_SAZ2	7.98	4.03	0.7385	31,122	15,717	2,880
14.	"TEDDI - COM"	pigs	Oryahovitsa village	Stara Zagora	3200	MA_SAZ2	7.98	4.03	0.7385	25,536	12,896	2,363
7.	"Apetit" PLC	broylers	Pamukchi village	Stara Zagora	100000	MA_SAZ2	0.05	0.03	0.002	5,000	3,000	200
2.	"GRMI - H. Hiusein" ST	pigs	Pshtera	Pshtera	3600	MA_STA2	7.98	4.03	0.7385	28,728	14,508	2,659
1.	"Angelov" ST	laying hans	Peshtera	Peshtera	120000	MA_STA2	0.7	0.4	0.12	84,000	48,000	14,400
5.	"Oskar - Kiril Nikolov" ST	pigs	Zhitnica village	Kaloyanovo	11290	MA_STR1	7.98	4.03	0.7385	90,094	45,499	8,338
5.	"Aerkok" PLC	laying hans	Trilistnik village	Maritsa	70000	MA_STR1	0.7	0.4	0.12	49,000	28,000	8,400
7.	"Elit - 95", "Elit - Milk - 2000"	CATTLE	Popovitsa		2186	MA_TOP2	230	79	1.4	502,780	172,694	3,060
									Total	2,614,047	1,134,909	151,044

Table C.4.4 Major Livestock Farms with their Pollution Loads in WABD

1. Struma River Basin

No	Region/Name	Species	Location		Head	NAM Catchment	BOD	TN	TP	BOD	TN	TP
			Settlement	Municipality			kg / year / head	kg / year / head	kg / year / head	kg / year	kg / year	kg / year
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	"Atanas "Yosifov"	CATTLE	Bersin village		106	ST_M6	230	79	1.4	24,380	8,374	148
1	Poultry farm "Valdis"	laying hens	Shishkovtsi village	Kyustendil	85850	ST_M6	0.7	0.4	0.12	60,095	34,340	10,302
2.	"Boris Kiroychev"	CATTLE	Kocherinovo	Kocherinovo	118	ST_RIL	230	79	1.4	27,140	9,322	165
1.	"Nikola Malinov"	CATTLE	Kamenik village	Boboshevo	136	ST_DZH1	230	79	1.4	31,280	10,744	190
1.	"Kembarou MM 5" JSCo	pigs	Zelen Dol village	Blagoevgrad	1000	ST_M5	7.98	4.03	0.7385	7,980	4,030	739
									Total	150,875	66,810	11,545

2. Mesta River Basin

No	Region/Name	Species	Location		Head	NAM Catchment	BOD	TN	TP	BOD	TN	TP
			Settlement	Municipality			kg / year / head	kg / year / head	kg / year / head	kg / year	kg / year	kg / year
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	"GHT - Pirin plast"	pigs	Borovo village	Gotse Delchev	1200	ME_M3	7.98	4.03	0.7385	9,576	4,836	886
									Total	9,576	4,836	886

Table C.4.5 Estimated Pollution Loads by NAM Catchments for EABD under the Present Condition

(1/2)

NAM Catchment Name	NAM Catch. Area (km2)	PE	BOD Load: Domestic & Industr. loads into SW (kg/day)	BOD Load: Fertilizer Non-point Load (kg/day)	BOD Load: Major Livestock Load (kg/day)	BOD Load: Livestock Non-point Load (kg/day)	BOD Load: Livestock Load Total (kg/day)	BOD Load: Industr. load direct inflow (kg/day)	BOD Load: Total BOD Load (kg/day)	TN Load: Domestic & Industr. loads into SW (kg/day)	TN Load: Fertilizer Non-point Load (kg/day)	TN Load: Major Livestock Load (kg/day)	TN Load: Livestock Non-point Load (kg/day)	TN Load: Livestock Load Total (kg/day)	TN Load: Industr. load direct inflow (kg/day)	TN Load: Total TN Load (kg/day)	TP Load: Domestic & Industr. loads into SW (kg/day)	TP Load: Fertilizer Non-point Load (kg/day)	TP Load: Major Livestock Load (kg/day)	TP Load: Livestock Non-point Load (kg/day)	TP Load: Livestock Load Total (kg/day)	TP Load: Industr. load direct inflow (kg/day)	TP Load: Total TP Load (kg/day)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Maritsa River Basin																							
MA_BLA	642	74,692	865		486	212	698	8	1,571	275	210	199	76	275	2	762	75	2	14	32	46	1	123
MA_CPI1	464	71,070	3,353			118	118	29	3,499	620	67		43	43	3	733	112	5		14	14	2	133
MA_CPI2	443	9,892	484			121	121		605	89	64		44	44		197	16	4		13	13		34
MA_CPL1	242	82,066	4,050			87	87		4,137	747	82		32	32		861	132	3		10	10		145
MA_CPL2	442	11,268	597			112	112		709	110	75		41	41		225	19	7		13	13		39
MA_HAR1	762	138,509	6,846		176	397	574	140	7,560	1,263	170	68	146	214	16	1,663	223	3	2	54	56	8	290
MA_HAR2	201	8,520	158			119	119		277	31	31		44	44		106	9	0		14	14		24
MA_LUD1	150	7,243	319		76	41	116		436	59	22	76	12	88		169	11	2	76	3	79		91
MA_LUD2	524	33,791	1,565			74	74	67	1,706	289	73		27	27	3	393	53	5		10	10	1	68
MA_M1	1,621	57,385	2,685			337	337		3,022	496	381		126	126		1,004	90	6		50	50		146
MA_M2	1,604	106,428	4,788		122	812	934	853	6,574	887	500	51	294	346	230	1,962	163	10	6	116	122	16	311
MA_M3	2,259	154,299	4,402		1,517	1,048	2,565	118	7,086	834	809	651	378	1,029	10	2,682	191	22	71	141	212	4	429
MA_M4	1,357	774,824	12,229		1,257	535	1,791	229	14,249	3,566	432	546	190	736	3	4,736	839	15	89	81	169	3	1,026
MA_M5	607	272,050	11,744		553	167	719	173	12,636	2,178	89	261	57	318	35	2,621	408	6	47	29	76	3	493
MA_M6	859	39,417	1,888			103	103	43	2,034	349	100		39	39	0	488	62	6		15	15	0	84
MA_M7	173	2,542	32			32	32		64	10	14		12	12		35	3	1		4	4		7
MA_PYA1	86	5,937	89			44	44	1	134	18	29		16	16	0	63	6	1		6	6	0	13
MA_PYA2	367	4,247	75			95	95		170	15	112		35	35		162	4	4		13	13		21
MA_RBA	70	0	0			14	14		14	0	10		5	5		15	0	1		2	2		2
MA_RDO	105	374	9			25	25		34	2	35		9	9		46	0	1		3	3		5
MA_ROV	292	4,267	69			101	101		171	14	126		37	37		177	4	2		14	14		20
MA_SAZ1	1,289	33,029	1,087			328	328	16	1,430	204	476		120	120	4	804	44	8		49	49	1	101
MA_SAZ2	1,143	256,571	13,644		908	385	1,293		14,937	2,511	476	460	132	592		3,580	431	9	83	58	141		580
MA_STA1	125	11,842	477			31	31	2	510	89	25		11	11	1	127	17	1		4	4	1	23
MA_STA2	271	43,079	2,441		309	44	353	139	2,933	448	39	171	13	184	2	674	75	3	47	6	53	0	131
MA_STR1	417	21,133	1,044		381	181	562	1	1,607	236	141	201	62	264	0	641	45	4	46	25	71	0	120
MA_STR2	969	83,700	3,370			233	233	20	3,623	627	328		86	86	1	1,042	121	10		30	30	3	164
MA_TOP1	341	9,887	211			58	58		269	41	46		22	22		108	11	3		9	9		23
MA_TOP2	487	26,007	435		1,377	2	1,379	0	1,815	123	42	473	2	475	0	640	29	2	8	8	17	0	47
MA_TOP3	609	26,581	1,505			117	117	112	1,735	276	55		42	42	95	469	46	3		14	14	5	68
MA_TOP4	338	6,597	390			52	52		442	72	33		19	19		123	12	2		6	6		20
MA_VAC1	183	27,862	1,265			43	43	0	1,308	234	61		16	16	0	311	43	2		6	6	0	51
MA_VAC2	1,496	23,567	1,074			311	311	7	1,392	199	216		114	114	1	529	36	23		36	36	0	95
MA_YUG	334	4,311	204			66	66	170	440	38	108		24	24	7	177	7	4		7	7	0	18
Total	**21,272**	**2,432,988**	**83,391**	**0**	**7,162**	**6,445**	**13,607**	**2,129**	**99,128**	**16,949**	**5,479**	**3,159**	**2,327**	**5,486**	**414**	**28,328**	**3,337**	**178**	**489**	**895**	**1,384**	**47**	**4,945**
			84%	**0%**	**7%**	**7%**	**14%**	**2%**	**100%**	**60%**	**19%**	**11%**	**8%**	**19%**	**1%**	**100%**	**67%**	**4%**	**10%**	**18%**	**28%**	**1%**	**100%**

Table C.4.5 Estimated Pollution Pollution Loads by NAM Catchments for EABD under the Present Condition

(2/2)

NAM Catchment Name	NAM Catch. Area (km2)	PE	BOD Load: Domestic & Industr. loads into SW (kg/day)	BOD Load: Fertilizer Non-point Load (kg/day)	BOD Load: Major Livestock Load (kg/day)	BOD Load: Livestock Non-point Load (kg/day)	BOD Load: Livestock Load Total (kg/day)	BOD Load: Industr. load direct inflow (kg/day)	BOD Load: Total BOD Load (kg/day)	TN Load: Domestic & Industr. loads into SW (kg/day)	TN Load: Fertilizer Non-point Load (kg/day)	TN Load: Major Livestock Load (kg/day)	TN Load: Livestock Non-point Load (kg/day)	TN Load: Livestock Load Total (kg/day)	TN Load: Industr. load direct inflow (kg/day)	TN Load: Total TN Load (kg/day)	TP Load: Domestic & Industr. loads into SW (kg/day)	TP Load: Fertilizer Non-point Load (kg/day)	TP Load: Major Livestock Load (kg/day)	TP Load: Livestock Non-point Load (kg/day)	TP Load: Livestock Load Total (kg/day)	TP Load: Industr. load direct inflow (kg/day)	TP Load: Total TP Load (kg/day)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2. Tundzha River Basin																							
TU_ARA	350	1,634	61			55	55		117	11	178		21	21		210	2	2		8	8		13
TU_ASE1	88	100,294	1,003			29	29	86	1,118	401	28		10	10	10	450	100	0		4	4	2	106
TU_ASE2	75	110	2			24	24		26	0	24		9	9		34	0	0		3	3		4
TU_BEL	371	13,595	204			104	104		307	41	120		38	38		199	14	1		14	14		28
TU_KAL	576	14,261	246		164	185	350		595	48	273	99	66	165		487	15	4	7	27	34		52
TU_M1	469	8,529	333			74	74		407	62	144		28	28		234	12	2		11	11		26
TU_M2	800	151,807	3,041		355	243	598	42	3,680	591	405	179	86	265	0	1,261	165	6	33	35	68	0	239
TU_M3	507	25,595	385		115	164	279		664	79	178	66	59	125		382	26	1	20	23	42		69
TU_M4	303	11,281	166		40	97	137		304	34	98	20	35	56		188	11	1	4	13	17		29
TU_M5	246	9,643	145		0	54	54		199	29	86		20	20		135	10	1		7	7		18
TU_M6	893	31,681	477			155	155	22	655	95	367		57	57	4	524	32	7		21	21	1	60
TU_M7	215	95,765	1,080			52	52	164	1,296	359	90		19	19	33	500	96	2		7	7	5	109
TU_M8	408	11,031	165			88	88		253	33	170		32	32		235	11	3		11	11		25
TU_M9	469	18,782	359			86	86	3	448	77	188		32	32	1	298	20	4		11	11	1	35
TU_MOC1	703	19,581	373		256	160	416	12	801	73	293	99	58	157	15	537	21	4	7	26	33	1	59
TU_MOC2	591	44,924	1,688		96	88	184	31	1,904	315	173	33	32	65	1	556	63	2	1	15	15	0	80
TU_POP1	346	4,318	143			38	38		181	27	173		14	14		214	6	2		6	6		14
TU_POP2	188	561	18			19	19		37	3	95		7	7		106	1	1		3	3		5
TU_SIN	293	10,700	376			50	50		425	70	91		19	19		180	15	1		8	8		23
Total	**7,891**	**574,092**	**10,264**	**0**	**1,027**	**1,765**	**2,792**	**360**	**13,417**	**2,351**	**3,176**	**496**	**644**	**1,140**	**64**	**6,731**	**619**	**43**	**71**	**252**	**322**	**9**	**994**
			77%	**0%**	**8%**	**13%**	**21%**	**3%**	**100%**	**35%**	**47%**	**7%**	**10%**	**17%**	**1%**	**100%**	**62%**	**4%**	**7%**	**25%**	**32%**	**1%**	**100%**
3. Arda River Basin																							
AR_CHE	270	72,453	3,719		173	79	252	0	3,719	640	38	99	27	126	0	804	115	5	30	9	39	0	158
AR_KRU1	391	16,654	652			180	180		652	89	22		67	67		179	21	0		22	22		43
AR_KRU2	283	6,846	293			137	137		293	30	15		51	51		96	8	0		17	17		24
AR_M0	83	5,329	210			0	0		210	39			0	0		39	8			0	0		8
AR_M1	716	5,487	544			182	182	240	544	24	149		68	68	58	298	6	2		24	24	0	33
AR_M2	644	94,737	4,524			456	456	33	4,524	749	38		168	168	8	963	141	0		55	55	0	197
AR_M3	475	6,835	506			284	284		506	42	46		104	104		191	9	2		32	32		43
AR_M4	646	24,320	974			297	297	0	1,028	128	73		107	107	13	321	30	8		30	30	2	70
AR_M5	517	32,145	1,475			215	215	116	1,475	214	73		77	77	28	392	44	9		23	23	1	77
AR_VAR1	467	24,280	1,194		16	359	376		1,228	154	25	10	132	142		321	32	0	1	42	42		75
AR_VAR2	723	46,928	2,066			553	553	158	2,066	257	62		201	201	39	559	59	5		59	59	1	124
Total	**5,213**	**336,013**	**16,158**	**0**	**189**	**2,743**	**2,932**	**548**	**16,246**	**2,366**	**542**	**108**	**1,002**	**1,110**	**146**	**4,164**	**472**	**31**	**30**	**314**	**344**	**4**	**851**
			78%	**0%**	**1%**	**17%**	**18%**	**3%**	**100%**	**57%**	**13%**	**3%**	**24%**	**27%**	**4%**	**100%**	**55%**	**4%**	**4%**	**37%**	**40%**	**0%**	**100%**
4. Byala River Basin																							
BI_M	599	3,168	116			127	127		243	22	109		47	47		178	4	2		16	16		22
Total	**599**	**3,168**	**116**	**0**	**0**	**127**	**127**	**0**	**243**	**22**	**109**	**0**	**47**	**47**	**0**	**178**	**4**	**2**	**0**	**16**	**16**	**0**	**22**
			48%	**0%**	**0%**	**52%**	**52%**	**0%**	**100%**	**12%**	**61%**	**0%**	**27%**	**27%**	**0%**	**100%**	**20%**	**7%**	**0%**	**73%**	**73%**	**0%**	**100%**
Grand Total	**34,975**	**3,346,261**	**109,930**	**0**	**8,378**	**11,080**	**19,458**	**3,037**	**129,034**	**21,688**	**9,305**	**3,763**	**4,021**	**7,784**	**624**	**39,400**	**4,433**	**254**	**590**	**1,477**	**2,067**	**60**	**6,813**
			85%	**0%**	**6%**	**9%**	**15%**	**2%**	**100%**	**55%**	**24%**	**10%**	**10%**	**20%**	**2%**	**100%**	**65%**	**4%**	**9%**	**22%**	**30%**	**1%**	**100%**

Table C.4.6 EABD Summary of Possible Reduction % of BOD Load from Towns/Settlements

No.	Zone No.	River Basin	Town / village	Towns and settlements	Municipality	PE in 2015	Present and Near Future Treated % (%)	BOD Load assuming of 100 % SW: P1 (kg/day)	BOD Load under future all treatment: P2 (kg/day)	Reduction of BOD Load: DP=P2-P1 (kg/day)	Acc. Reduction of BOD Load: ADP (kg/day)	Reduction % to Total BOD Load against Near Future Load (%)
A. Whole EABD Area												
1	B3	Tundzha	town	Yambol	Tundzha	118,971	0%	7,138	714	-6,424	-6,424	6.7%
2	A1	Maritsa	town	Asenovgrad	Asenovgrad	78,054	0%	4,683	468	-4,215	-10,639	11.1%
3	C1	Arda	town	Kardzhali	Kardzhali	67,346	0%	4,041	404	-3,637	-14,276	14.9%
4	A1	Maritsa	town	Plovdiv	Plovdiv	681,985	90%	10,230	6,820	-3,410	-17,686	18.4%
5	A5	Maritsa	town	Karlovo	Karlovo	37,181	0%	2,231	223	-2,008	-19,694	20.5%
6	B4	Tundzha	town	Karnobat	Karnobat	28,916	0%	1,735	173	-1,561	-21,255	22.2%
7	A1	Maritsa	town	Velingrad	Velingrad	28,752	0%	1,725	173	-1,553	-22,808	23.8%
8	A1	Maritsa	town	Peshtera	Peshtera	28,691	0%	1,721	172	-1,549	-24,357	25.4%
9	A3	Maritsa	town	Harmanli	Harmanli	28,538	0%	1,712	171	-1,541	-25,898	27.0%
10	A3	Maritsa	town	Svilengrad	Svilengrad	28,050	0%	1,683	168	-1,515	-27,413	28.6%
11	A2	Maritsa	town	Chirpan	Chirpan	25,413	0%	1,525	152	-1,372	-28,785	30.0%
12	A2	Maritsa	town	Rakovski	Rakovski	23,453	0%	1,407	141	-1,266	-30,051	31.3%
13	A6	Maritsa	town	Panagyurishte	Panagyurishte	23,029	0%	1,382	138	-1,244	-31,295	32.6%
14	A2	Maritsa	town	Parvomay	Parvomay	22,200	0%	1,332	133	-1,199	-32,494	33.9%
15	A1	Maritsa	town	Stamboliyski	Stamboliyski	18,068	0%	1,084	108	-976	-33,470	34.9%
B. Maritsa River Basin												
1	A1	Maritsa	town	Asenovgrad	Asenovgrad	78,054	0%	4,683	468	-4,215	-4,215	6.0%
2	A1	Maritsa	town	Plovdiv	Plovdiv	681,985	90%	10,230	6,820	-3,410	-7,625	10.8%
3	A5	Maritsa	town	Karlovo	Karlovo	37,181	0%	2,231	223	-2,008	-9,633	13.7%
4	A1	Maritsa	town	Velingrad	Velingrad	28,752	0%	1,725	173	-1,553	-11,185	15.9%
5	A1	Maritsa	town	Peshtera	Peshtera	28,691	0%	1,721	172	-1,549	-12,734	18.0%
6	A3	Maritsa	town	Harmanli	Harmanli	28,538	0%	1,712	171	-1,541	-14,276	20.2%
7	A3	Maritsa	town	Svilengrad	Svilengrad	28,050	0%	1,683	168	-1,515	-15,790	22.4%
8	A2	Maritsa	town	Chirpan	Chirpan	25,413	0%	1,525	152	-1,372	-17,163	24.3%
9	A2	Maritsa	town	Rakovski	Rakovski	23,453	0%	1,407	141	-1,266	-18,429	26.1%
10	A6	Maritsa	town	Panagyurishte	Panagyurishte	23,029	0%	1,382	138	-1,244	-19,673	27.9%
11	A2	Maritsa	town	Parvomay	Parvomay	22,200	0%	1,332	133	-1,199	-20,871	29.6%
12	A1	Maritsa	town	Stamboliyski	Stamboliyski	18,068	0%	1,084	108	-976	-21,847	31.0%
13	A5	Maritsa	town	Sopot	Sopot	11,466	0%	688	69	-619	-22,466	31.8%
14	A1	Maritsa	town	Kostenets	Kostenets	11,048	0%	663	66	-597	-23,063	32.7%
15	A7	Maritsa	town	Krichim	Krichim	10,403	0%	624	62	-562	-23,625	33.5%
16	A1	Maritsa	town	Septemvri	Septemvri	10,357	0%	621	62	-559	-24,184	34.3%
17	A8	Maritsa	town	Galabovo	Galabovo	10,338	0%	620	62	-558	-24,742	35.1%
18	A1	Maritsa	town	Rakitovo	Rakitovo	9,965	0%	598	60	-538	-25,280	35.8%
19	A6	Maritsa	town	Pirdop	Pirdop	9,647	0%	579	58	-521	-25,801	36.6%
20	A3	Maritsa	town	Lyubimets	Lyubimets	9,412	0%	565	56	-508	-26,309	37.3%
21	A2	Maritsa	town	Simeonovgrad	Simeonovgrad	8,816	0%	529	53	-476	-26,785	38.0%
22	A7	Maritsa	town	Devin	Devin	8,599	0%	516	52	-464	-27,250	38.6%
23	A1	Maritsa	town	Saedinenie	Saedinenie	7,562	0%	454	45	-408	-27,658	39.2%
24	A1	Maritsa	town	Kuklen	Kuklen	7,096	0%	426	43	-383	-28,041	39.7%
25	A1	Maritsa	town	Chepelare	Chepelare	6,686	0%	401	40	-361	-28,402	40.2%
26	A7	Maritsa	town	Perushtitsa	Perushtitsa	6,413	0%	385	38	-346	-28,749	40.7%
27	A6	Maritsa	town	Zlatitsa	Zlatitsa	6,397	0%	384	38	-345	-29,094	41.2%
28	A5	Maritsa	town	Hisarya	Hisarya	9,359	40%	374	56	-318	-29,412	41.7%
29	A1	Maritsa	village	Draginovo	Velingrad	5,705	0%	342	34	-308	-29,720	42.1%
30	A1	Maritsa	village	Malo Konare	Pazardzhik	5,612	0%	337	34	-303	-30,023	42.5%
31	A1	Maritsa	town	Dolna banya	Dolna banya	5,590	0%	335	34	-302	-30,325	43.0%
32	A1	Maritsa	town	Bratsigovo	Bratsigovo	5,492	0%	330	33	-297	-30,622	43.4%
33	A6	Maritsa	town	Strelcha	Strelcha	5,418	0%	325	33	-293	-30,914	43.8%
34	A1	Maritsa	village	Tsalapitsa	Rodopi	5,371	0%	322	32	-290	-31,204	44.2%
35	A1	Maritsa	town	Kostandovo	Rakitovo	5,227	0%	314	31	-282	-31,487	44.6%
C. Tundzha River Basin												
1	B3	Tundzha	town	Yambol	Tundzha	118,971	0%	7,138	714	-6,424	-6,424	49.4%
2	B4	Tundzha	town	Karnobat	Karnobat	28,916	0%	1,735	173	-1,561	-7,986	61.4%
3	B3	Tundzha	town	Elhovo	Elhovo	16,808	0%	1,008	101	-908	-8,893	68.3%
4		Tundzha	town	Topolovgrad	Topolovgrad	7,372	0%	442	44	-398	-9,292	71.4%
5	B4	Tundzha	town	Straldzha	Straldzha	7,206	0%	432	43	-389	-9,681	74.4%
6		Tundzha	town	Tvarditsa	Tvarditsa	6,934	0%	416	42	-374	-10,055	77.3%
7		Tundzha	town	Shivachevo	Tvarditsa	4,762	0%	286	29	-257	-10,312	79.2%
8	B1	Tundzha	village	Kran	Kazanlak	4,386	0%	263	26	-237	-10,549	81.0%
9	B4	Tundzha	town	Sungurlare	Sungurlare	4,385	0%	263	26	-237	-10,786	82.9%
10		Tundzha	town	Kalofer	Karlovo	4,229	0%	254	25	-228	-11,014	84.6%
11		Tundzha	town	Maglizh	Maglizh	4,176	0%	251	25	-226	-11,240	86.4%
12		Tundzha	village	Topolchane	Sliven	3,588	0%	215	22	-194	-11,433	87.8%
13		Tundzha	town	Gurkovo	Gurkovo	3,461	0%	208	21	-187	-11,620	89.3%
14	B1	Tundzha	village	Koprinka	Kazanlak	3,440	0%	206	21	-186	-11,806	90.7%
15		Tundzha	town	Nikolaevo	Nikolaevo	3,409	0%	205	20	-184	-11,990	92.1%
D. Arda River Basin												
1	C1	Arda	town	Kardzhali	Kardzhali	67,346	0%	4,041	404	-3,637	-3,637	30.2%
2	C2	Arda	town	Momchilgrad	Momchilgrad	9,415	0%	565	56	-508	-4,145	34.4%
3		Arda	town	Krumovgrad	Krumovgrad	6,235	0%	374	37	-337	-4,482	37.2%
4	C2	Arda	town	Nedelino	Nedelino	5,851	0%	351	35	-316	-4,798	39.8%
5	C4	Arda	town	Ivaylovgrad	Ivaylovgrad	4,795	0%	288	29	-259	-5,057	42.0%
6		Arda	town	Ardino	Ardino	4,409	0%	265	26	-238	-5,295	44.0%
7	C2	Arda	town	Dzhebel	Dzhebel	3,473	0%	208	21	-188	-5,482	45.5%
8	C2	Arda	village	Startsevo	Zlatograd	3,120	0%	187	19	-168	-5,651	46.9%
9		Arda	village	Chepintsi	Rudozem	2,462	0%	148	15	-133	-5,784	48.0%
10	C2	Arda	village	Benkovski	Kirkovo	2,345	0%	141	14	-127	-5,910	49.1%
11	C2	Arda	village	Chorbadzhiysko	Kirkovo	2,305	0%	138	14	-124	-6,035	50.1%

Table C.4.7 WABD Summary of Possible Reduction % of BOD Load from Towns/Settlements

No.	Zone No.	River Basin	Town / village	Towns and settlements	Municipality	PE in 2015	Present and Near Future Treated % (%)	BOD Load assuming of 100 % SW: P1 (kg/day)	BOD Load under future all treatment: P2 (kg/day)	Reduction of BOD Load: DP=P2-P1 (kg/day)	Acc. Reduction of BOD Load: ADP (kg/day)	Reduction % to Total BOD Load against Near Future Load (%)
A. Whole WABD Area												
1	F5	Struma	town	Petrich	Petrich	45,020	0%	2,701	270	-2,431	-2,431	8.0%
2	F5	Struma	town	Sandanski	Sandanski	40,358	0%	2,421	242	-2,179	-4,610	15.2%
3	G2	Mesta	town	Gotse Delchev	Gotse Delchev	30,185	0%	1,811	181	-1,630	-6,240	20.5%
4	F1	Struma	town	Pernik	Pernik	121,350	84%	2,160	728	-1,432	-7,672	25.2%
5	F2	Struma	town	Dupnitsa	Dupnitsa	55,224	74%	1,259	331	-928	-8,600	28.3%
6	G3	Mesta	town	Bansko	Bansko	11,493	0%	690	69	-621	-9,221	30.3%
7	F1	Struma	town	Radomir	Radomir	21,621	63%	612	130	-482	-9,703	31.9%
8	F4	Struma	town	Simitli	Simitli	8,242	0%	494	49	-445	-10,148	33.4%
B. Struma River Basin												
1	F5	Struma	town	Petrich	Petrich	45,020	0%	2,701	270	-2,431	-2,431	11.3%
2	F5	Struma	town	Sandanski	Sandanski	40,358	0%	2,421	242	-2,179	-4,610	21.4%
3	F1	Struma	town	Pernik	Pernik	121,350	84%	2,160	728	-1,432	-6,042	28.0%
4	F2	Struma	town	Dupnitsa	Dupnitsa	55,224	74%	1,259	331	-928	-6,970	32.3%
5	F1	Struma	town	Radomir	Radomir	21,621	63%	612	130	-482	-7,452	34.5%
6	F4	Struma	town	Simitli	Simitli	8,242	0%	494	49	-445	-7,897	36.6%
7	F2	Struma	town	Bobov dol	Bobov dol	7,619	0%	457	46	-411	-8,309	38.5%
8	F2	Struma	town	Sapareva banya	Sapareva banya	5,047	0%	303	30	-273	-8,581	39.8%
9	F1	Struma	town	Breznik	Breznik	4,782	0%	287	29	-258	-8,839	41.0%
10	F5	Struma	town	Kresna	Kresna	4,336	0%	260	26	-234	-9,074	42.1%
11	F5	Struma	village	Parvomay	Petrich	4,073	0%	244	24	-220	-9,293	43.1%
12		Struma	town	Rila	Rila	3,679	0%	221	22	-199	-9,492	44.0%
13		Struma	town	Kocherinovo	Kocherinovo	3,174	0%	190	19	-171	-9,664	44.8%
14	F1	Struma	town	Batanovtsi	Pernik	2,978	0%	179	18	-161	-9,824	45.5%
15	F2	Struma	village	Yahinovo	Dupnitsa	2,761	0%	166	17	-149	-9,974	46.2%
16	F4	Struma	village	Krupnik	Simitli	2,753	0%	165	17	-149	-10,122	46.9%
17	F5	Struma	village	Mikrevo	Strumyani	2,654	0%	159	16	-143	-10,265	47.6%
18	F2	Struma	village	Kraynitsi	Dupnitsa	2,580	0%	155	15	-139	-10,405	48.2%
19	F5	Struma	village	Kolarovo	Petrich	2,484	0%	149	15	-134	-10,539	48.8%
20	F1	Struma	village	Dragichevo	Pernik	2,467	0%	148	15	-133	-10,672	49.5%
21	F1	Struma	village	Divotino	Pernik	2,364	0%	142	14	-128	-10,800	50.1%
22	F1	Struma	village	Studena	Pernik	2,244	0%	135	13	-121	-10,921	50.6%
23	F2	Struma	village	Samoranovo	Dupnitsa	2,221	0%	133	13	-120	-11,041	51.2%
24	F3	Struma	village	Slokoshtitsa	Kyustendil	2,206	0%	132	13	-119	-11,160	51.7%
25	F5	Struma	village	Karnalovo	Petrich	2,189	0%	131	13	-118	-11,278	52.3%
26	F2	Struma	village	Bistritsa	Dupnitsa	2,028	0%	122	12	-110	-11,388	52.8%
27		Struma	village	Katuntsi	Sandanski	1,871	0%	112	11	-101	-11,489	53.2%
C. Mesta River Basin												
1	G2	Mesta	town	Gotse Delchev	Gotse Delchev	30,185	0%	1,811	181	-1,630	-1,630	21.3%
2	G3	Mesta	town	Bansko	Bansko	11,493	0%	690	69	-621	-2,251	29.4%
3	G1	Mesta	town	Yakoruda	Yakoruda	7,022	0%	421	42	-379	-2,630	34.3%
4	G2	Mesta	village	Breznitsa	Gotse Delchev	3,929	0%	236	24	-212	-2,842	37.1%
5	G1	Mesta	town	Belitsa	Belitsa	3,799	0%	228	23	-205	-3,047	39.7%
6	G3	Mesta	village	Banya	Razlog	3,463	0%	208	21	-187	-3,234	42.2%
7		Mesta	town	Dobrinishte	Bansko	3,364	0%	202	20	-182	-3,416	44.5%
8	G2	Mesta	town	Hadzhidimovo	Hadzhidimovo	3,282	0%	197	20	-177	-3,593	46.9%
9		Mesta	village	Ablanitsa	Hadzhidimovo	3,137	0%	188	19	-169	-3,762	49.1%
10		Mesta	village	Valkosel	Satovcha	3,024	0%	181	18	-163	-3,926	51.2%
11	G2	Mesta	village	Ribnovo	Garmen	2,952	0%	177	18	-159	-4,085	53.3%
12	G1	Mesta	village	Kraishte	Belitsa	2,720	0%	163	16	-147	-4,232	55.2%
13	G2	Mesta	village	Musomishta	Gotse Delchev	2,716	0%	163	16	-147	-4,379	57.1%
C. Dospat River Basin												
1		Dospat	town	Sarnitsa	Velingrad	4,328	0%	260	26	-234	-234	20.0%
2		Dospat	village	Kochan	Satovcha	3,672	0%	220	22	-198	-432	37.0%
3	G4	Dospat	town	Dospat	Dospat	3,218	0%	193	19	-174	-606	51.9%
4		Dospat	village	Barutin	Dospat	2,364	0%	142	14	-128	-733	62.9%

Table C.4.8 Estimated Quantity of Newly Treated Sewage and Reduction of Wastewater Loss for the High Priority Towns in EABD and WABD

No.	Town / Settlement	PE in 2015	Improvement of WWTP		Existing coverage of SW: P (%)	Improvement of Sewerage Networks		Total Sewage to be treated: A=200 l/d x PE	Sewage to be newly treated: B	Currently discharged sewage into the existing sewer pipes: C=A*P	Estimated Loss of SW: L	Currently lost sewage into ground: D=C x L	Estimated polluted groundwater by the loss sewage: suppose E=10 x D	Reduction of Groundwater Pollution by Renovation of Sewer pipes: F=0.9 x E
			New	Renovat.		Renovat.	New or Expansion	(m3/year)	(m3/year)	(m3/year)	(%)	(m3/year)	(m3/year)	(m3/year)
I.	**EABD Area**													
1.	**New WWTPs and Improvements of SW in the Maritsa River Basin**													
1-1	Asenovgrad	78,054	x		46%	x	x	5,697,942	5,697,942	2,621,053	40%	1,048,421	10,484,213	9,435,792
1-2	Plovdiv	681,985			85%	x	x	49,784,920	7,467,738	42,317,182	40%	16,926,873	169,268,727	152,341,854
1-3	Karlovo	37,181	x		85%	x	x	2,714,177	2,714,177	2,307,050	40%	922,820	9,228,200	8,305,380
1-4	Velingrad	28,752	x		90%	x	x	2,098,896	2,098,896	1,889,006	40%	755,603	7,556,026	6,800,423
1-5	Peshtera	28,691	x		99%	x	x	2,094,407	2,094,407	2,073,462	40%	829,385	8,293,850	7,464,465
1-6	Harmanli	28,538	x		67%	x	x	2,083,238	2,083,238	1,395,769	40%	558,308	5,583,077	5,024,769
1-7	Svilengrad	28,050	x		38%	x	x	2,047,650	2,047,650	778,107	40%	311,243	3,112,428	2,801,185
1-8	Chirpan	25,413	x		85%	x	x	1,855,149	1,855,149	1,576,877	40%	630,751	6,307,507	5,676,756
1-9	Rakovski	23,453	x		0%		x	1,712,033	1,712,033	0				
1-10	Panagyurishte	23,029	x		86%	x	x	1,681,137	1,681,137	1,445,778	40%	578,311	5,783,113	5,204,802
1-11	Parvomay	22,200	x		65%	x	x	1,620,600	1,620,600	1,053,390	40%	421,356	4,213,560	3,792,204
1-12	Stamboliyski	18,068	x		74%	x	x	1,318,928	1,318,928	976,006	40%	390,403	3,904,025	3,513,623
1-13	Kostenets	11,048	x		95%	x	x	806,533	806,533	766,207	40%	306,483	3,064,826	2,758,344
		1,034,460						75,515,608	33,198,426	59,199,888		23,679,955	236,799,551	213,119,596
2.	**New WWTPs and Improvements of SW in the Tundzha River Basin**													
2-1	Yambol	118,971	x		80%	x	x	8,684,883	8,684,883	6,947,906	40%	2,779,163	27,791,626	25,012,463
2-2	Karnobat	28,916	x		100%	x		2,110,832	2,110,832	2,110,832	40%	844,333	8,443,326	7,598,993
2-3	Elhovo	16,808	x		84%	x	x	1,226,948	1,226,948	1,030,636	40%	412,254	4,122,544	3,710,289
2-4	Kalofer	4,229	x		70%	x	x	308,702	308,702	216,092	40%	86,437	864,367	777,930
		168,923						12,331,364	12,331,364	10,305,465		4,122,186	41,221,862	37,099,676
3.	**New WWTPs and Improvements of SW in the Arda River Basin**													
3-1	Kardzhali	67,346	x		90%	x	x	4,916,252	4,916,252	4,424,627	50%	2,212,313	22,123,135	19,910,821
		67,346						4,916,252	4,916,252	4,424,627		2,212,313	22,123,135	19,910,821
4.	**Renovation of the Existing WWTPs and Improvements of SW**													
4-1	Nova Zagora	36,185		x	97%	x	x	2,641,469	79,244	2,562,224	40%	1,024,890	10,248,898	9,224,008
4-2	Radnevo	20,691		x	100%	x		1,510,443	0	1,510,443	40%	604,177	6,041,772	5,437,595
4-3	Ihtiman	20,234		x	95%	x	x	1,477,046	73,852	1,403,193	40%	561,277	5,612,773	5,051,496
4-4	Pavel banya	4,407		x	60%	x	x	321,711	128,684	193,027	40%	77,211	772,106	694,896
		81,516						5,950,668	281,781	5,668,887		2,267,555	22,675,549	20,407,994
		1,352,245						**98,713,892**	**50,727,823**	**79,598,867**		**32,282,010**	**322,820,097**	**290,538,087**
II.	**WABD Area**													
1.	**New WWTPs and Improvements of SW in the Struma River Basin**													
1-1	Petrich	45,020	x		100%	x		3,286,424	3,286,424	3,286,424	60%	1,971,854	19,718,541	17,746,687
1-2	Sandanski	40,358	x		100%	x		2,946,098	2,946,098	2,946,098	60%	1,767,659	17,676,585	15,908,927
1-3	Simitli	8,242	x		100%	x		601,637	601,637	601,637	60%	360,982	3,609,821	3,248,839
		93,619						6,834,158	6,834,158	6,834,158		4,100,495	41,004,947	36,904,452
2.	**New WWTPs and Improvements of SW in the Mesta River Basin**													
2-1	Gotse Delchev	30,185	x		96%	x	x	2,203,469	2,203,469	2,115,330	60%	1,269,198	12,691,979	11,422,781
2-2	Bansko	11,493	x		71%	x	x	839,011	839,011	595,698	60%	357,419	3,574,186	3,216,768
		41,678						3,042,479	3,042,479	2,711,027		1,626,616	16,266,165	14,639,548
3.	**New WWTPs and Improvements of SW in the Dospat River Basin**													
3-1	Dospat	3,218	x		40%	x	x	234,943	234,943	93,977	60%	56,386	563,864	507,477
		3,218						234,943	234,943	93,977		56,386	563,864	507,477
4.	**Renovation of the Existing WWTPs and Improvements of SW**													
4-1	Pernik	121,350		x	94%	x	x	8,858,550	531,513	8,327,037	60%	4,996,222	49,962,222	44,966,000
4-2	Dupnitsa	55,224		x	91%	x	x	4,031,352	362,822	3,668,530	60%	2,201,118	22,011,182	19,810,064
4-3	Radomir	21,621		x	90%	x	x	1,578,333	157,833	1,420,500	60%	852,300	8,522,998	7,670,698
		198,195						14,468,235	1,052,168	13,416,067		8,049,640	80,496,402	72,446,762
		336,710						**24,579,815**	**11,163,748**	**23,055,230**		**13,833,138**	**138,331,378**	**124,498,240**

Note:

1) Loss of new or renovated sewer pipes is assumed to be 10 %.
2) Loss from the newly expanded sewer networks is assumed to be almost same as the current condition with the loss from the septec tanks.

Table C.4.9 Estimated Construction Cost for the Proposed Wastewater Treatment Plants and Sewerage Improvements for the High Priority Towns in EABD and WABD

No.	Town / Settlement	Municipality	PE in 2015	New Construction or Renovation of the WWTPs											Improvement (including Expansion) or New Sewer Networks									Total Cost of WWTPs and Sewer Networks
				New or Renovat.	Unit Cost (EUR/PE)	Direct Cost (EUR)	Civil Works (EUR)	Mechani. Works (EUR)	Electrical Works (EUR)	Non-construction Activities (EUR)	Engineering Cost: Direct Cost x 10 % (EUR)	Administration Cost: Direct Cost x 5 % (EUR)	Physical Contingency: Direct Cost x 10 % (EUR)	Sub-total Cost of WWTPs (EUR)	Improv. / New	Required Length per PE (m / PE)	Required Length (m)	Unit Cost (EUR/m)	Direct Cost (EUR)	Engineering Cost: Direct Cost x 5 % (EUR)	Administration Cost: Direct Cost x 5 % (EUR)	Physical Contingency: Direct Cost x 10 % (EUR)	Sub-total Cost of Sewer Improvement (EUR)	(EUR)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
I.	**High Priority Towns and Settlements in EABD**																							
I-1	**New WWTPs and Improvements of SW in the Maritsa River Basin**																							
I-1-1	Asenovgrad	Asenovgrad	78,054	New	210	16,391,340	7,376,103	4,917,402	2,458,701	1,639,134	737,610	819,567	1,639,134	19,587,651	Improv.	3.2	249,773	398	99,409,574	4,970,479	4,970,479	9,940,957	119,291,489	138,879,141
I-1-2	Plovdiv	Plovdiv	681,985	-										0	Improv.	0.9	613,787	750	460,340,010	23,017,001	23,017,001	46,034,001	552,408,012	552,408,012
I-1-3	Karlovo	Karlovo	37,181	New	295	10,968,248	4,935,711	3,290,474	1,645,237	1,096,825	493,571	548,412	1,096,825	13,107,056	Improv.	4.0	148,722	340	50,565,480	2,528,274	2,528,274	5,056,548	60,678,576	73,785,632
I-1-4	Velingrad	Velingrad	28,752	New	320	9,200,640	4,140,288	2,760,192	1,380,096	920,064	414,029	460,032	920,064	10,994,765	Improv.	4.1	117,883	333	39,255,106	1,962,755	1,962,755	3,925,511	47,106,127	58,100,892
I-1-5	Peshtera	Peshtera	28,691	New	320	9,180,960	4,131,432	2,754,288	1,377,144	918,096	413,143	459,048	918,096	10,971,247	Improv.	4.1	117,631	333	39,171,140	1,958,557	1,958,557	3,917,114	47,005,368	57,976,615
I-1-6	Harmanli	Harmanli	28,538	New	320	9,132,000	4,109,400	2,739,600	1,369,800	913,200	410,940	456,600	913,200	10,912,740	Improv.	4.1	117,004	333	38,962,249	1,948,112	1,948,112	3,896,225	46,754,699	57,667,439
I-1-7	Svilengrad	Svilengrad	28,050	New	320	8,976,000	4,039,200	2,692,800	1,346,400	897,600	403,920	448,800	897,600	10,726,320	Improv.	4.1	115,005	332	38,181,660	1,909,083	1,909,083	3,818,166	45,817,992	56,544,312
I-1-8	Chirpan	Chirpan	25,413	New	335	8,513,355	3,831,010	2,554,007	1,277,003	851,336	383,101	425,668	851,336	10,173,459	Improv.	4.2	106,735	330	35,222,418	1,761,121	1,761,121	3,522,242	42,266,902	52,440,361
I-1-9	Rakovski	Rakovski	23,453	New	340	7,973,850	3,588,233	2,392,155	1,196,078	797,385	358,823	398,693	797,385	9,528,751	New	4.2	98,501	329	32,406,665	1,620,333	1,620,333	3,240,666	38,887,997	48,416,748
I-1-10	Panagyurishte	Panagyurishte	23,029	New	340	7,829,955	3,523,480	2,348,987	1,174,493	782,996	352,348	391,498	782,996	9,356,796	Improv.	4.2	96,723	329	31,821,859	1,591,093	1,591,093	3,182,186	38,186,231	47,543,027
I-1-11	Parvomay	Parvomay	22,200	New	340	7,548,000	3,396,600	2,264,400	1,132,200	754,800	339,660	377,400	754,800	9,019,860	Improv.	4.2	93,240	328	30,582,720	1,529,136	1,529,136	3,058,272	36,699,264	45,719,124
I-1-12	Stamboliyski	Stamboliyski	18,068	New	380	6,865,650	3,089,543	2,059,695	1,029,848	686,565	308,954	343,283	686,565	8,204,452	Improv.	4.6	83,111	325	27,010,913	1,350,546	1,350,546	2,701,091	32,413,095	40,617,547
I-1-13	Kostenets	Kostenets	11,048	New	395	4,364,118	1,963,853	1,309,235	654,618	436,412	196,385	218,206	436,412	5,215,121	Improv.	5.7	62,976	320	20,152,282	1,007,614	1,007,614	2,015,228	24,182,738	29,397,859
		Sub-total I-1	**1,034,460**			**106,944,116**	**48,124,852**	**32,083,235**	**16,041,617**	**10,694,412**	**4,812,485**	**5,347,206**	**10,694,412**	**127,798,218**			**2,021,089**		**943,082,074**	**47,154,104**	**47,154,104**	**94,308,207**	**1,131,698,489**	**1,259,496,707**
I-2	**New WWTPs and Improvements of SW in the Tundzha River Basin**																							
I-2-1	Yambol	Tundzha	118,971	New	145	17,250,795	7,762,858	5,175,239	2,587,619	1,725,080	776,286	862,540	1,725,080	20,614,700	Improv.	2.5	297,428	455	135,329,513	6,766,476	6,766,476	13,532,951	162,395,415	183,010,115
I-2-2	Karnobat	Karnobat	28,916	New	320	9,252,960	4,163,832	2,775,888	1,387,944	925,296	416,383	462,648	925,296	11,057,287	Improv.	4.1	118,554	333	39,478,332	1,973,917	1,973,917	3,947,833	47,373,999	58,431,286
I-2-3	Elhovo	Elhovo	16,808	New	365	6,134,738	2,760,632	1,840,421	920,211	613,474	276,063	306,737	613,474	7,331,011	Improv.	4.8	80,676	324	26,139,024	1,306,951	1,306,951	2,613,902	31,366,829	38,697,840
I-2-4	Kalofer	Karlovo	4,229	New	455	1,924,104	865,847	577,231	288,616	192,410	86,585	96,205	192,410	2,299,304	Improv.	7.2	30,447	299	9,103,761	455,188	455,188	910,376	10,924,513	13,223,817
		Sub-total I-2	**168,923**			**34,562,597**	**15,553,168**	**10,368,779**	**5,184,389**	**3,456,260**	**1,555,317**	**1,728,130**	**3,456,260**	**41,302,303**			**527,104**		**210,050,629**	**10,502,531**	**10,502,531**	**21,005,063**	**252,060,755**	**293,363,058**
I-3	**New WWTPs and Improvements of SW in the Arda River Basin**																							
I-3-1	Kardzhali	Kardzhali	67,346	New	215	14,479,373	6,515,718	4,343,812	2,171,906	1,447,937	651,572	723,969	1,447,937	17,302,850	Improv.	3.4	228,976	382	87,468,881	4,373,444	4,373,444	8,746,888	104,962,657	122,265,508
		Sub-total I-3	**67,346**			**14,479,373**	**6,515,718**	**4,343,812**	**2,171,906**	**1,447,937**	**651,572**	**723,969**	**1,447,937**	**17,302,850**			**228,976**		**87,468,881**	**4,373,444**	**4,373,444**	**8,746,888**	**104,962,657**	**122,265,508**
I-4	**Renovation of the Existing WWTPs and Improvements of SW**																							
I-4-1	Nova Zagora	Nova Zagora	36,185	Renovat	140	5,065,830	1,773,041	2,026,332	1,013,166	253,292	177,304	253,292	506,583	6,003,009	Improv.	4.0	144,738	340	49,210,920	2,460,546	2,460,546	4,921,092	59,053,104	65,056,113
I-4-2	Radnevo	Radnevo	20,691	Renovat	245	5,069,295	1,774,253	2,027,718	1,013,859	253,465	177,425	253,465	506,930	6,007,115	Improv.	4.3	88,971	326	29,004,644	1,450,232	1,450,232	2,900,464	34,805,573	40,812,687
I-4-3	Ihtiman	Ihtiman	20,234	Renovat	245	4,957,208	1,735,023	1,982,883	991,442	247,860	173,502	247,860	495,721	5,874,291	Improv.	4.3	87,004	326	28,363,320	1,418,166	1,418,166	2,836,332	34,035,984	39,910,275
I-4-4	Pavel banya	Pavel banya	4,407	Renovat	338	1,487,363	520,577	594,945	297,473	74,368	52,058	74,368	148,736	1,762,525	Improv.	7.3	32,171	297	9,554,817	477,741	477,741	955,482	11,465,780	13,228,305
		Sub-total I-4	**81,516**			**16,579,695**	**5,802,893**	**6,631,878**	**3,315,939**	**828,985**	**580,289**	**828,985**	**1,657,970**	**19,646,939**			**352,884**		**116,133,701**	**5,806,685**	**5,806,685**	**11,613,370**	**139,360,441**	**159,007,380**
		Total of I.	**1,352,245**			**172,565,780**	**75,996,632**	**53,427,704**	**26,713,852**	**16,427,593**	**7,599,663**	**8,628,289**	**17,256,578**	**206,050,310**			**3,130,054**		**1,356,735,285**	**67,836,764**	**67,836,764**	**135,673,529**	**1,628,082,342**	**1,834,132,652**
II.	**High Priority Towns and Settlements in WABD**																							
II-1	**New WWTPs and Improvements of SW in the Struma River Basin**																							
II-1-1	Petrich	Petrich	45,020	New	250	11,254,875	5,064,694	3,376,463	1,688,231	1,125,488	506,469	562,744	1,125,488	12,324,088	Improv.	3.8	171,074	347	59,362,713	2,968,136	2,968,136	5,936,271	71,235,255	83,559,343
II-1-2	Sandanski	Sandanski	40,358	New	260	10,492,950	4,721,828	3,147,885	1,573,943	1,049,295	472,183	524,648	1,049,295	11,489,780	Improv.	3.9	157,394	343	53,986,228	2,699,311	2,699,311	5,398,623	64,783,473	76,273,254
II-1-3	Simitli	Simitli	8,242	New	420	3,461,472	1,557,662	1,038,442	519,221	346,147	155,766	173,074	346,147	3,790,312	No info.	6.3	51,922	313	16,251,611	812,581	812,581	1,625,161	19,501,933	23,292,245
		Sub-total II-1	**93,619**			**25,209,297**	**11,344,184**	**7,562,789**	**3,781,395**	**2,520,930**	**1,134,418**	**1,260,465**	**2,520,930**	**27,604,180**			**380,390**		**129,600,551**	**6,480,028**	**6,480,028**	**12,960,055**	**155,520,662**	**183,124,842**
II-2	**New WWTPs and Improvements of SW in the Mesta River Basin**																							
II-2-1	Gotse Delchev	Gotse Delchev	30,185	New	320	9,659,040	4,346,568	2,897,712	1,448,856	965,904	434,657	482,952	965,904	10,576,649	Improv.	4.1	123,756	335	41,458,411	2,072,921	2,072,921	4,145,841	49,750,093	60,326,742
II-2-2	Bansko	Bansko	11,493	New	400	4,597,320	2,068,794	1,379,196	689,598	459,732	206,879	229,866	459,732	5,034,065	Improv.	5.6	64,362	320	20,595,994	1,029,800	1,029,800	2,059,599	24,715,192	29,749,258
		Sub-total II-2	**41,678**			**14,256,360**	**6,415,362**	**4,276,908**	**2,138,454**	**1,425,636**	**641,536**	**712,818**	**1,425,636**	**15,610,714**			**188,119**		**62,054,404**	**3,102,720**	**3,102,720**	**6,205,440**	**74,465,285**	**90,075,999**
II-3	**New WWTPs and Improvements of SW in the Dospat River Basin**																							
II-3-1	Dospat	Dospat	3,218	New	430	1,383,912	622,760	415,174	207,587	138,391	62,276	69,196	138,391	1,515,384	Improv.	7.3	23,494	300	7,048,296	352,415	352,415	704,830	8,457,955	9,973,339
		Sub-total II-3	**3,218**			**1,383,912**	**622,760**	**415,174**	**207,587**	**138,391**	**62,276**	**69,196**	**138,391**	**1,515,384**			**23,494**		**7,048,296**	**352,415**	**352,415**	**704,830**	**8,457,955**	**9,973,339**
II-4	**Renovation of the Existing WWTPs and Improvements of SW**																							
II-4-1	Pernik	Pernik	121,350	Renovat	84	10,193,400	4,077,360	3,567,690	2,038,680	509,670	407,736	509,670	1,019,340	11,110,806	Improv.	2.7	327,645	445	145,802,025	7,290,101	7,290,101	14,580,203	174,962,430	186,073,236
II-4-2	Dupnitsa	Dupnitsa	55,224	Renovat	175	9,664,200	3,382,470	3,865,680	1,932,840	483,210	338,247	483,210	966,420	10,485,657	Improv.	3.7	204,329	353	72,128,066	3,606,403	3,606,403	7,212,807	86,553,680	97,039,337
II-4-3	Radomir	Radomir	21,621	Renovat	245	5,297,145	1,854,001	2,118,858	1,059,429	264,857	185,400	264,857	529,715	5,747,402	Improv.	4.3	92,970	328	30,494,258	1,524,713	1,524,713	3,049,426	36,593,110	42,340,512
		Sub-total II-4	**198,195**			**25,154,745**	**9,313,831**	**9,552,228**	**5,030,949**	**1,257,737**	**931,383**	**1,257,737**	**2,515,475**	**27,343,865**			**624,944**		**248,424,350**	**12,421,217**	**12,421,217**	**24,842,435**	**298,109,220**	**325,453,085**
		Total of II.	**336,710**			**66,004,314**	**27,696,137**	**21,807,099**	**11,158,384**	**5,342,694**	**2,769,614**	**3,300,216**	**6,600,431**	**72,074,143**			**1,216,948**		**447,127,602**	**22,356,380**	**22,356,380**	**44,712,760**	**536,553,122**	**608,627,265**
													Total of I. and II.	**278,124,454**								**Total of I. and II.**	**2,164,635,464**	**2,442,759,918**

Table C.4.10 Estimated Operation and Maintenance Cost for the Proposed WWTPs and Sewer Improvements

No.	Town / Settlement	Municipality	PE in 2015	New Construction or Renovation of the WWTPs			Improvement (including Expansion) or New Sewerage Networks			Total O&M Cost
				New or Renovat.	Direct Cost (EUR)	O&M Cost (EUR/year)	Improv. / New	Direct Cost (EUR)	O&M Cost (EUR/year)	(EUR)
I.	**High Priority Towns and Settlements in EABD**									
I-1	**New WWTPs and Improvements of SW in the Maritsa River Basin**									
I-1-1	Asenovgrad	Asenovgrad	78,054	New	16,391,340	1,229,351	Improv.	99,409,574	1,491,144	2,720,494
I-1-2	Plovdiv	Plovdiv	681,985	-	0		Improv.	460,340,010	4,603,400	4,603,400
I-1-3	Karlovo	Karlovo	37,181	New	10,968,248	822,619	Improv.	50,565,480	758,482	1,581,101
I-1-4	Velingrad	Velingrad	28,752	New	9,200,640	690,048	Improv.	39,255,106	588,827	1,278,875
I-1-5	Peshtera	Peshtera	28,691	New	9,180,960	688,572	Improv.	39,171,140	587,567	1,276,139
I-1-6	Harmanli	Harmanli	28,538	New	9,132,000	684,900	Improv.	38,962,249	584,434	1,269,334
I-1-7	Svilengrad	Svilengrad	28,050	New	8,976,000	673,200	Improv.	38,181,660	572,725	1,245,925
I-1-8	Chirpan	Chirpan	25,413	New	8,513,355	638,502	Improv.	35,222,418	528,336	1,166,838
I-1-9	Rakovski	Rakovski	23,453	New	7,973,850	598,039	New	32,406,665	486,100	1,084,139
I-1-10	Panagyurishte	Panagyurishte	23,029	New	7,829,955	587,247	Improv.	31,821,859	477,328	1,064,575
I-1-11	Parvomay	Parvomay	22,200	New	7,548,000	566,100	Improv.	30,582,720	458,741	1,024,841
I-1-12	Stamboliyski	Stamboliyski	18,068	New	6,865,650	514,924	Improv.	27,010,913	405,164	920,087
I-1-13	Kostenets	Kostenets	11,048	New	4,364,118	327,309	Improv.	20,152,282	302,284	629,593
		Sub-total I-1	**1,034,460**		**106,944,116**	**8,020,809**		**943,082,074**	**11,844,531**	**19,865,340**
I-2	**New WWTPs and Improvements of SW in the Tundzha River Basin**									
I-2-1	Yambol	Tundzha	118,971	New	17,250,795	1,293,810	Improv.	135,329,513	2,029,943	3,323,752
I-2-2	Karnobat	Karnobat	28,916	New	9,252,960	693,972	Improv.	39,478,332	592,175	1,286,147
I-2-3	Elhovo	Elhovo	16,808	New	6,134,738	460,105	Improv.	26,139,024	392,085	852,191
I-2-4	Kalofer	Karlovo	4,229	New	1,924,104	144,308	Improv.	9,103,761	136,556	280,864
		Sub-total I-2	**168,923**		**34,562,597**	**2,592,195**		**210,050,629**	**3,150,759**	**5,742,954**
I-3	**New WWTPs and Improvements of SW in the Arda River Basin**									
I-3-1	Kardzhali	Kardzhali	67,346	New	14,479,373	1,085,953	Improv.	87,468,881	1,312,033	2,397,986
		Sub-total I-3	**67,346**		**14,479,373**	**1,085,953**		**87,468,881**	**1,312,033**	**2,397,986**
I-4	**Renovation of the Existing WWTPs and Improvements of SW in EABD**									
I-4-1	Nova Zagora	Nova Zagora	36,185	Renovat.	5,065,830	542,768	Improv.	49,210,920	738,164	1,280,931
I-4-2	Radnevo	Radnevo	20,691	Renovat.	5,069,295	543,139	Improv.	29,004,644	435,070	978,208
I-4-3	Ihtiman	Ihtiman	20,234	Renovat.	4,957,208	531,129	Improv.	28,363,320	425,450	956,579
I-4-4	Pavel banya	Pavel banya	4,407	Renovat.	1,487,363	148,736	Improv.	9,554,817	143,322	292,059
		Sub-total I-4	**81,516**		**16,579,695**	**1,765,772**		**116,133,701**	**1,742,006**	**3,507,777**
		Total of I.	**1,352,245**		**172,565,780**	**13,464,728**		**1,356,735,285**	**18,049,329**	**31,514,057**
II.	**High Priority Towns and Settlements in WABD**									
II-1	**New WWTPs and Improvements of SW in the Struma River Basin**									
II-1-1	Petrich	Petrich	45,020	New	11,254,875	844,116	Improv.	59,362,713	890,441	1,734,556
II-1-2	Sandanski	Sandanski	40,358	New	10,492,950	786,971	Improv.	53,986,228	809,793	1,596,765
II-1-3	Simitli	Simitli	8,242	New	3,461,472	259,610	No info.	16,251,611	243,774	503,385
		Sub-total II-1	**93,619**		**25,209,297**	**1,890,697**		**129,600,551**	**1,944,008**	**3,834,706**
II-2	**New WWTPs and Improvements of SW in the Mesta River Basin**									
II-2-1	Gotse Delchev	Gotse Delchev	30,185	New	9,659,040	724,428	Improv.	41,458,411	621,876	1,346,304
II-2-2	Bansko	Bansko	11,493	New	4,597,320	344,799	Improv.	20,595,994	308,940	653,739
		Sub-total II-2	**41,678**		**14,256,360**	**1,069,227**		**62,054,404**	**930,816**	**2,000,043**
II-3	**New WWTPs and Improvements of SW in the Dospat River Basin**									
II-3-1	Dospat	Dospat	3,218	New	1,383,912	103,793	Improv.	7,048,296	105,724	209,518
		Sub-total II-3	**3,218**		**1,383,912**	**103,793**		**7,048,296**	**105,724**	**209,518**
II-4	**Renovation of the Existing WWTPs and Improvements of SW in WABD**									
II-4-1	Pernik	Pernik	121,350	Renovat.	10,193,400	1,274,175	Improv.	145,802,025	2,187,030	3,461,205
II-4-2	Dupnitsa	Dupnitsa	55,224	Renovat.	9,664,200	1,035,450	Improv.	72,128,066	1,081,921	2,117,371
II-4-3	Radomir	Radomir	21,621	Renovat.	5,297,145	567,551	Improv.	30,494,258	457,414	1,024,965
		Sub-total II-4	**198,195**		**25,154,745**	**2,877,176**		**248,424,350**	**3,726,365**	**6,603,541**
		Total of II.	**336,710**		**66,004,314**	**5,940,894**		**447,127,602**	**6,706,914**	**12,647,808**
					Total	**19,405,622**			**24,756,243**	**44,161,865**

Supporting Report C

Figures

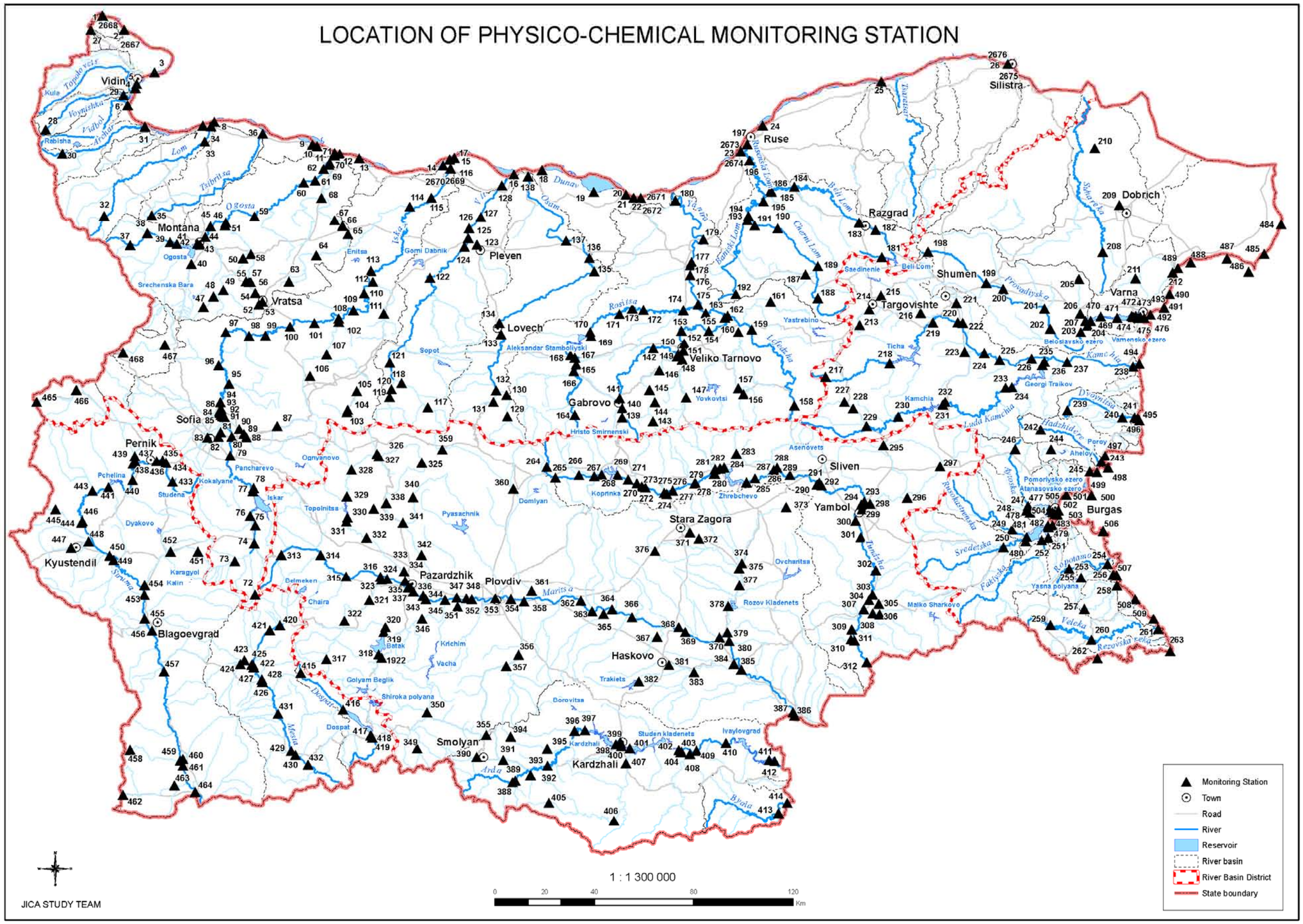


Figure C.2.1 Location of Physico-Chemical Monitoring Station

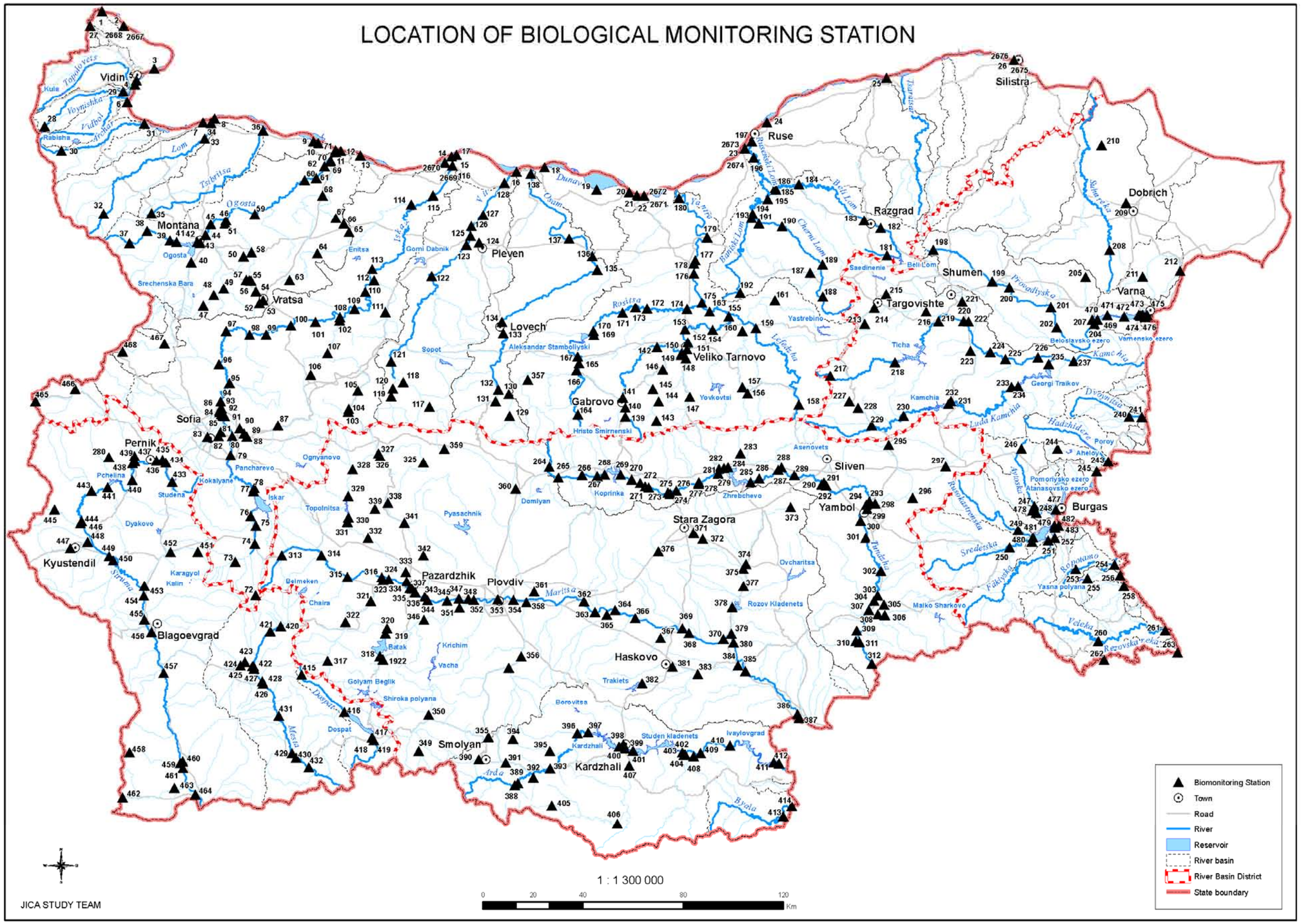


Figure C.2.2 Location of Biological Monitoring Station

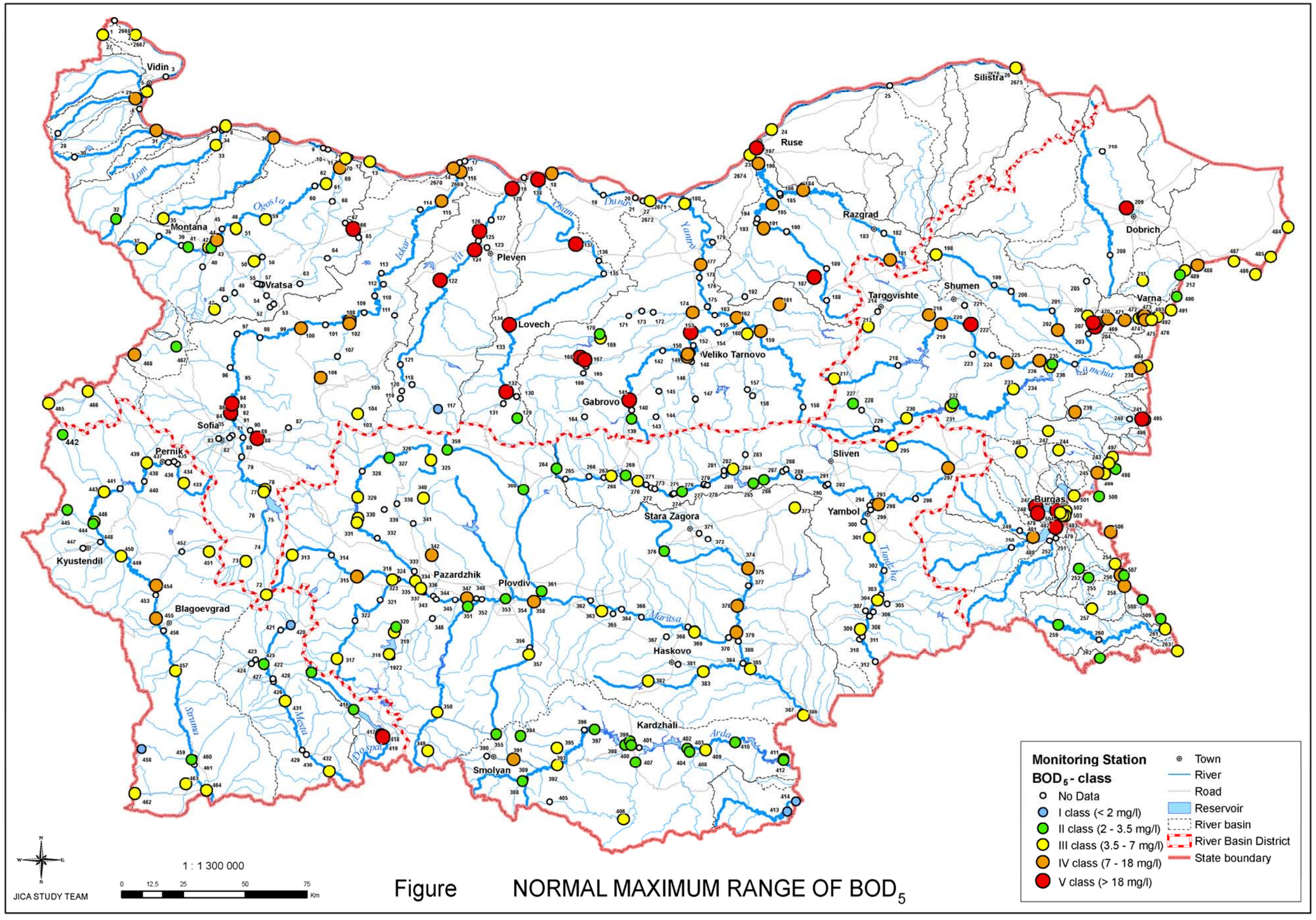


Figure C.2.3 Normal Maximum Range of BOD5

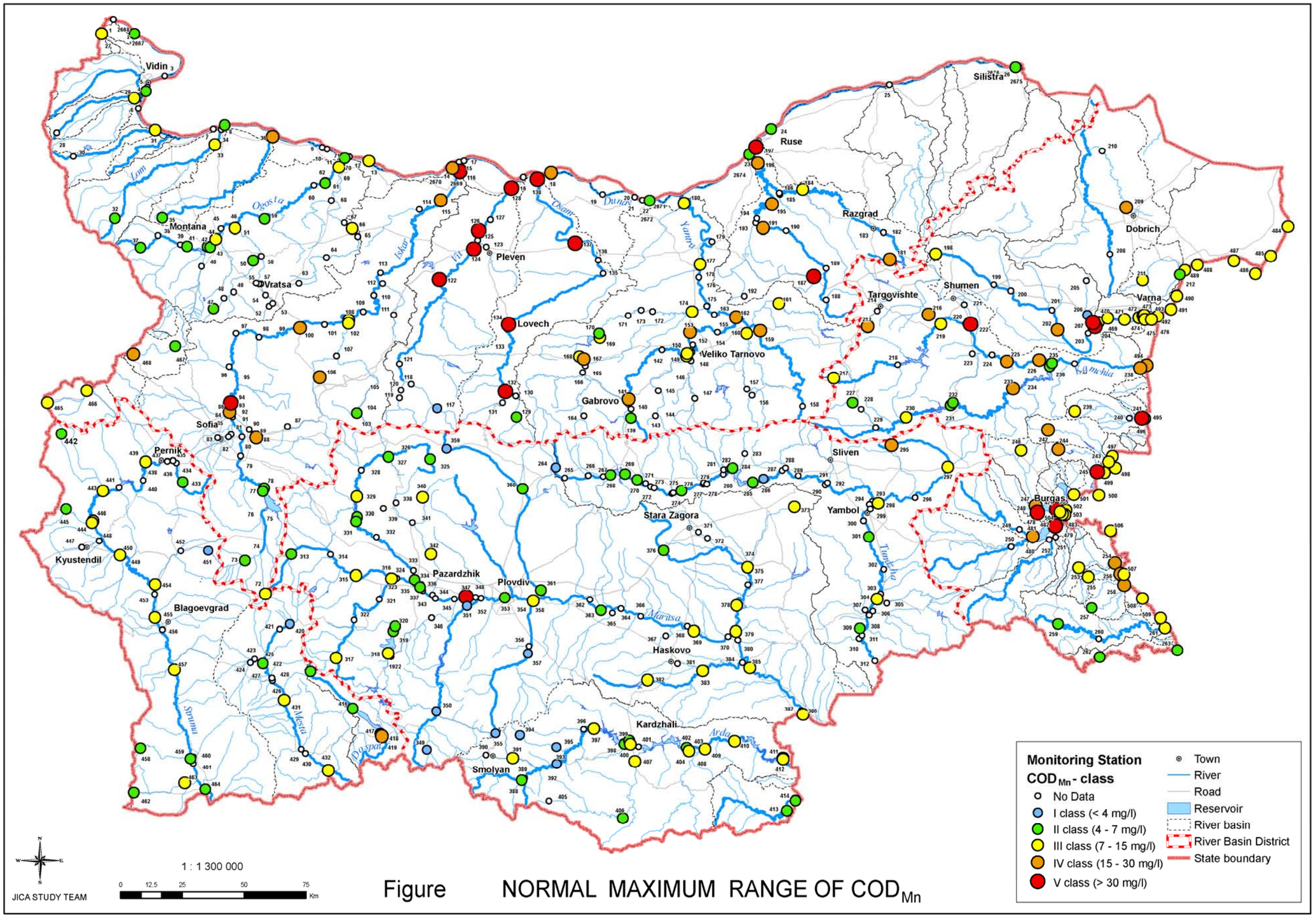


Figure C.2.4 Normal Maximum Range of COD

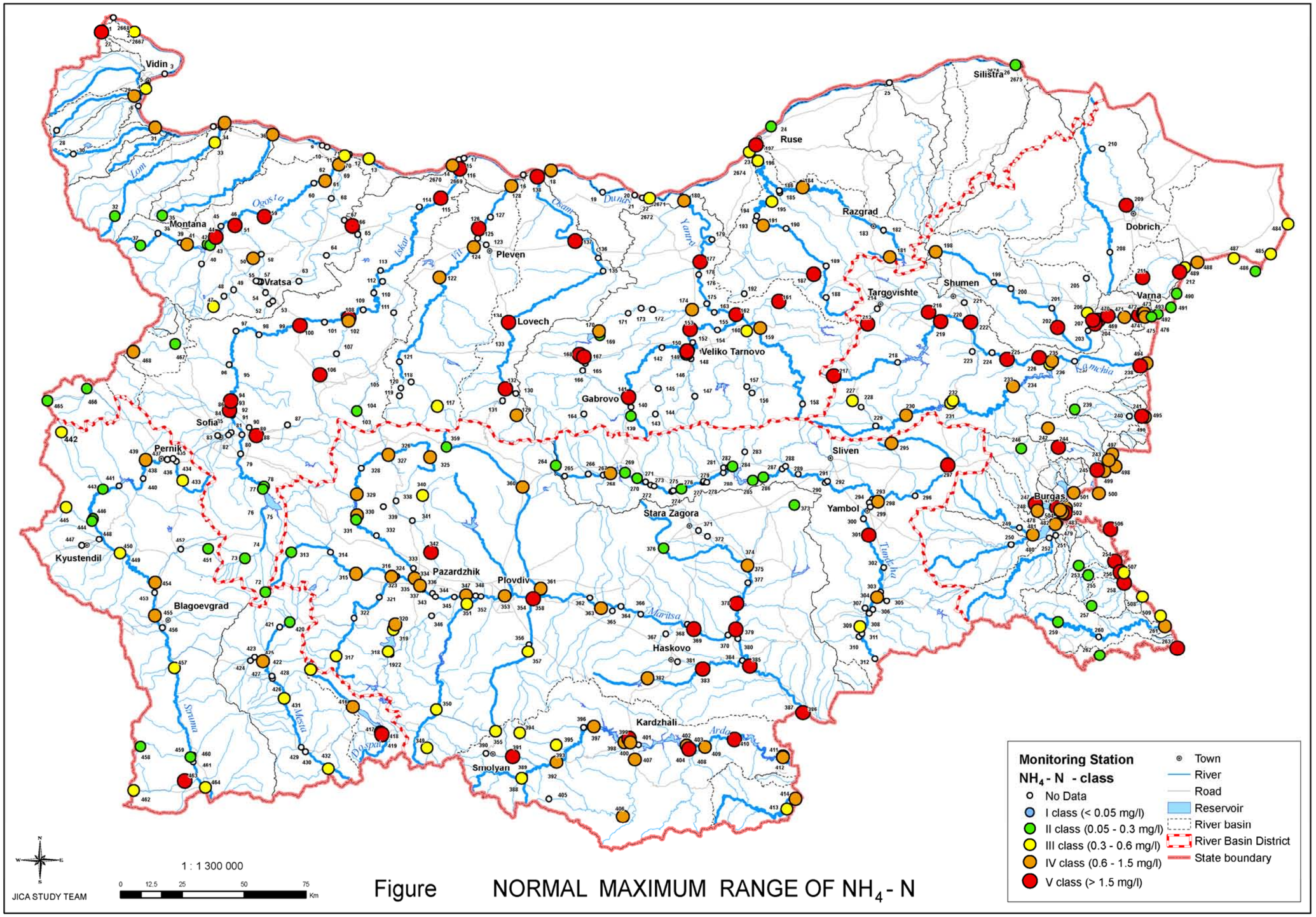


Figure NORMAL MAXIMUM RANGE OF NH_4 - N

Figure C.2.5 Normal Maximum Range of NH4-N

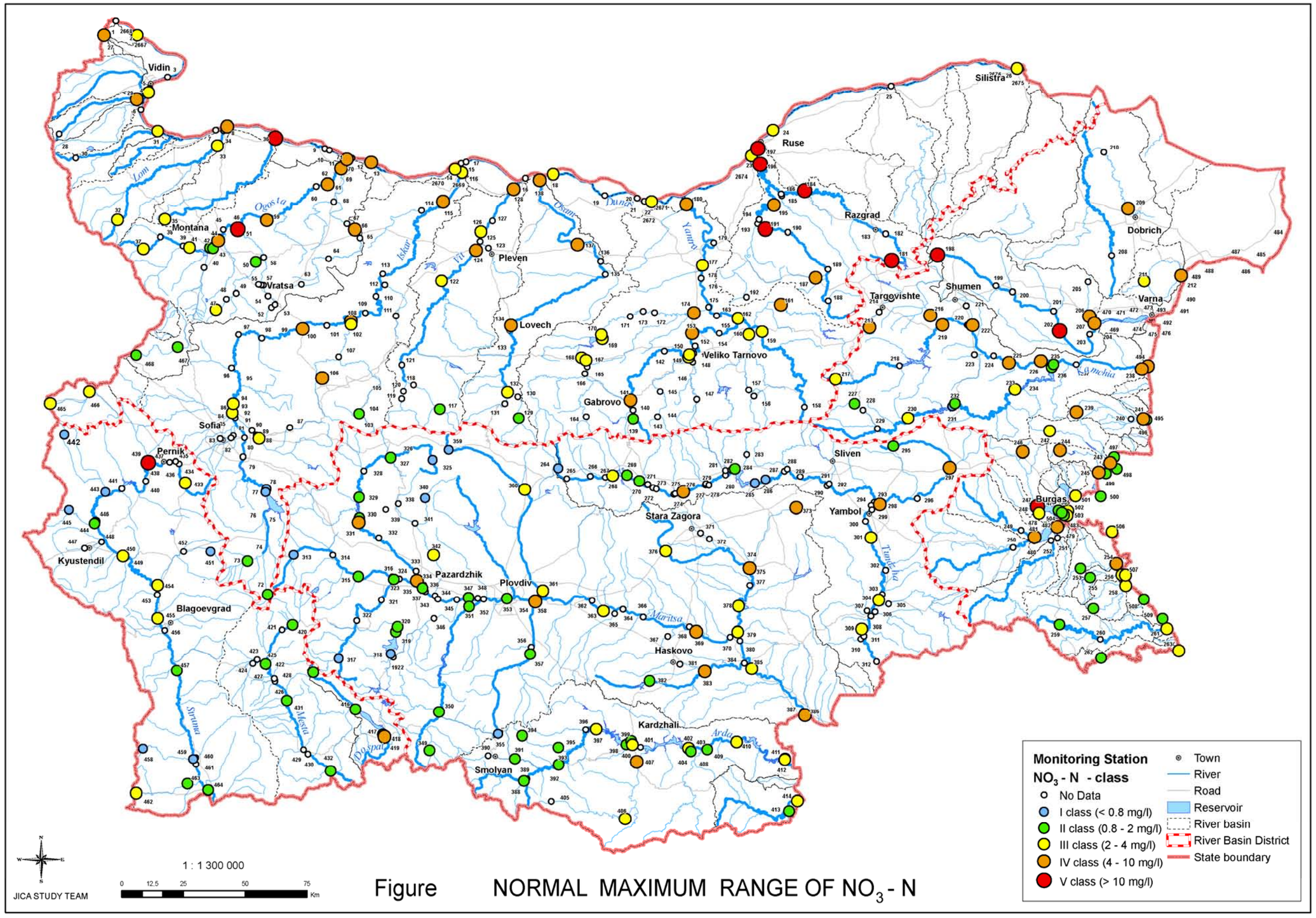


Figure C.2.6 Normal Maximum Range of NO3-N

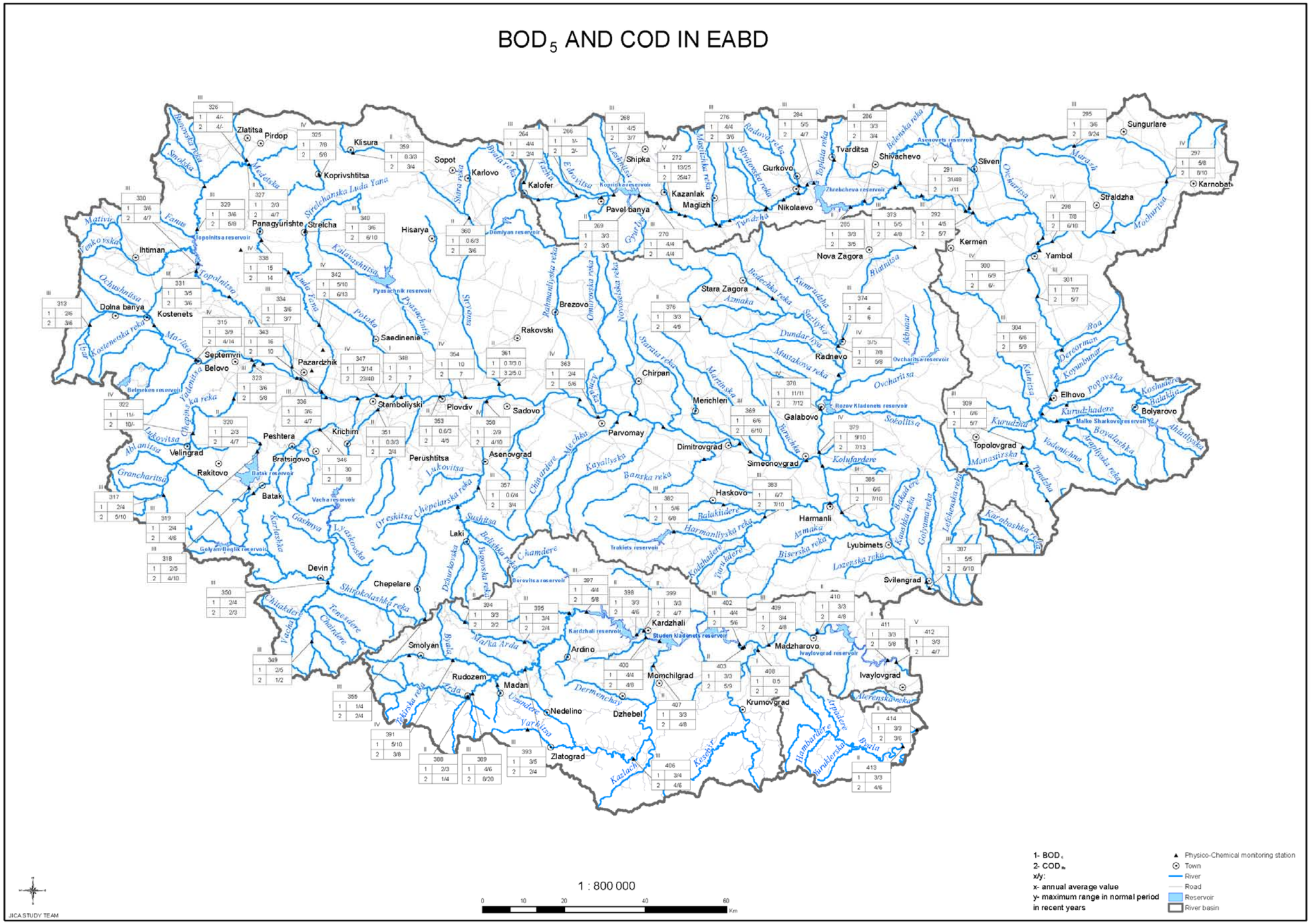


Figure C.2.7 BOD 5 and COD in EABD

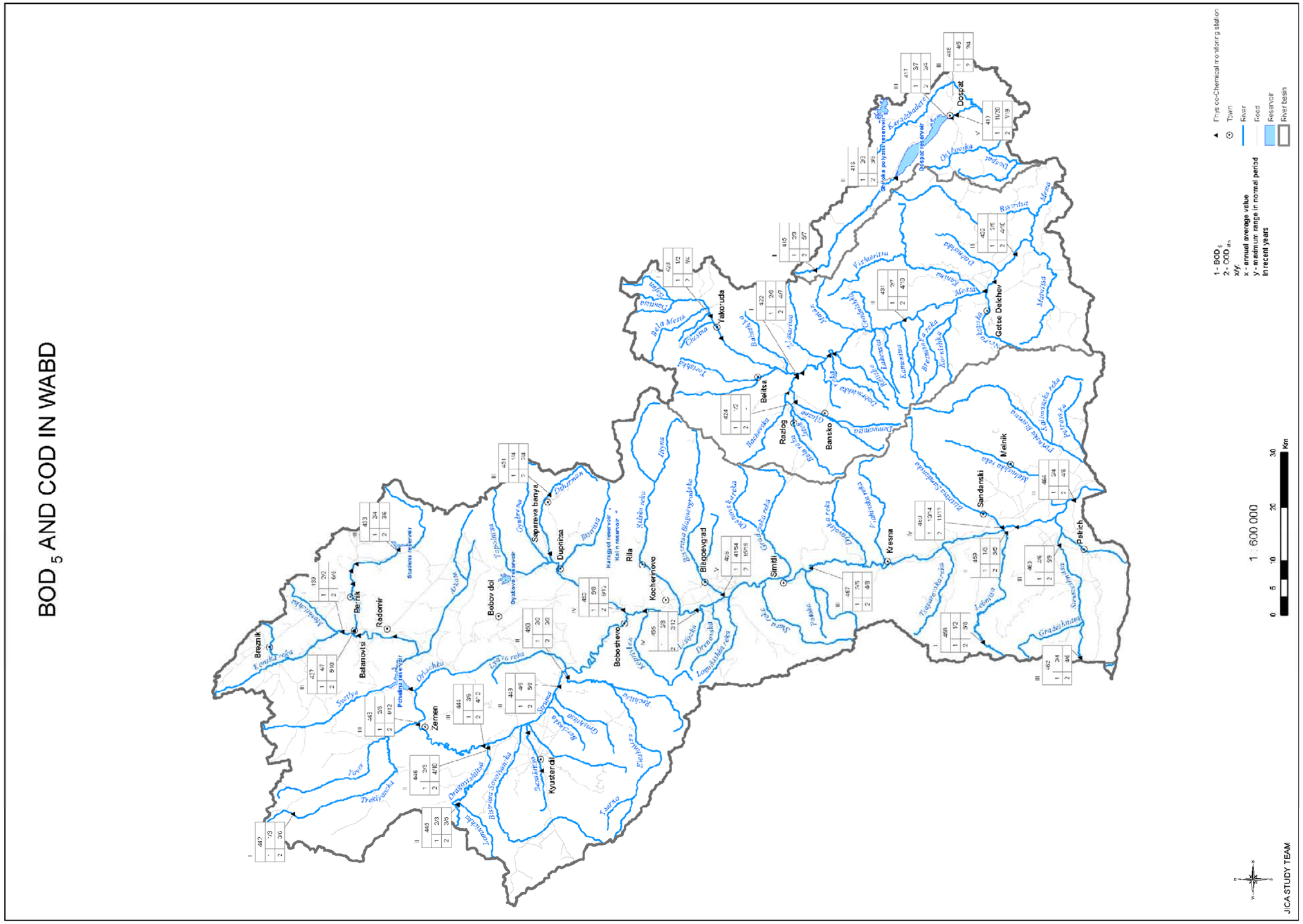


Figure C.2.8 BOD5 and COD in WABD

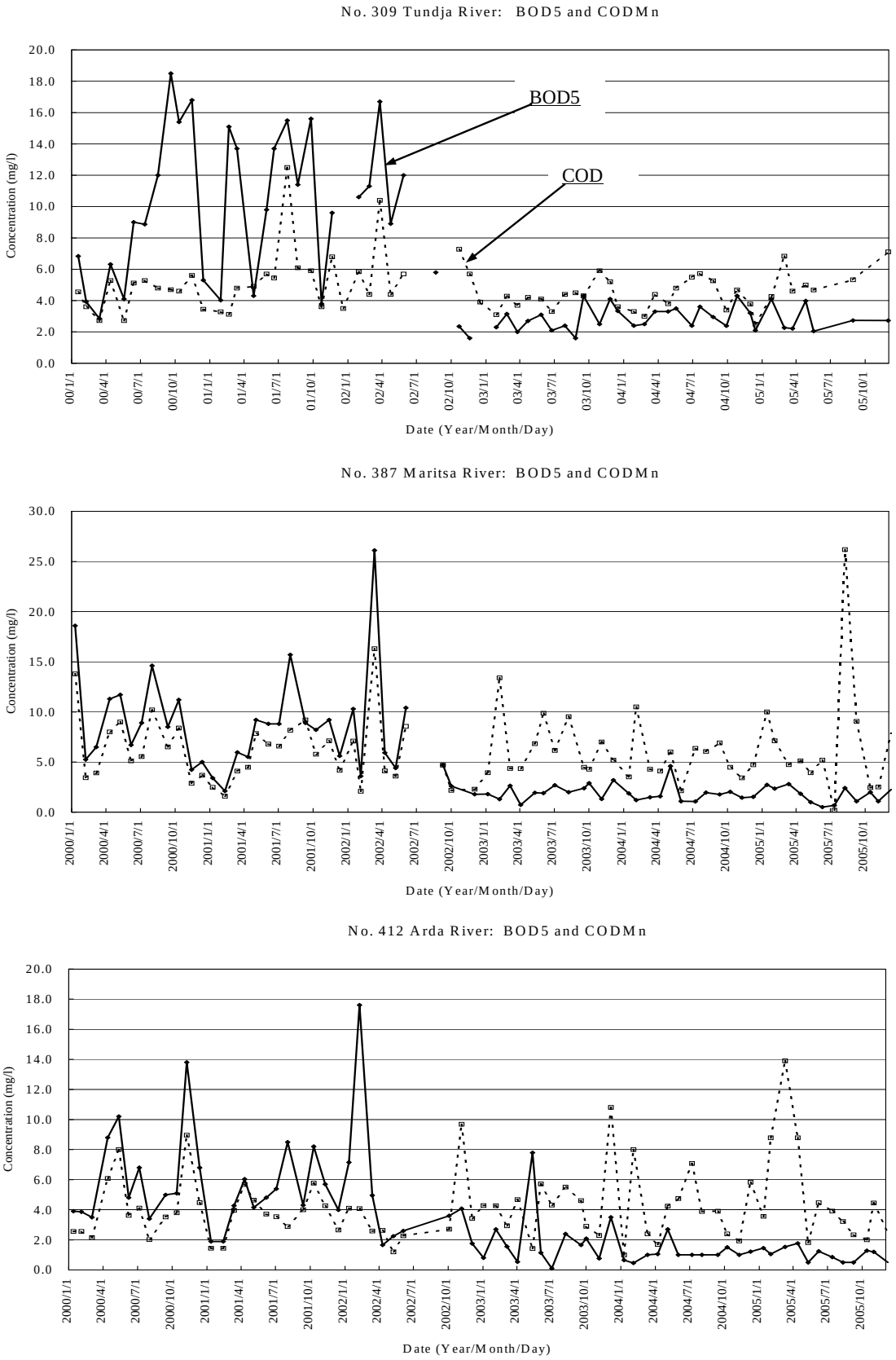
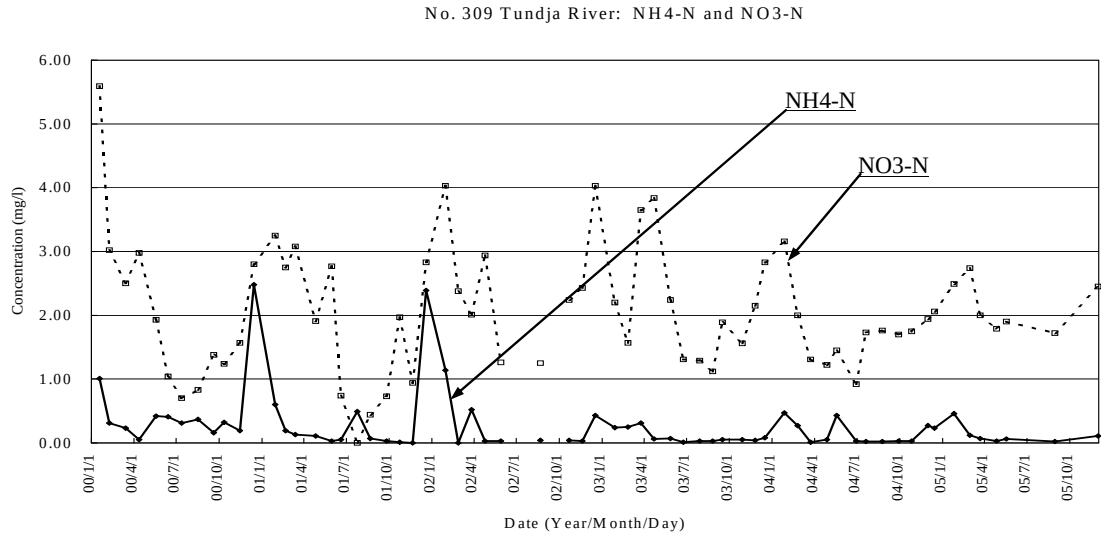
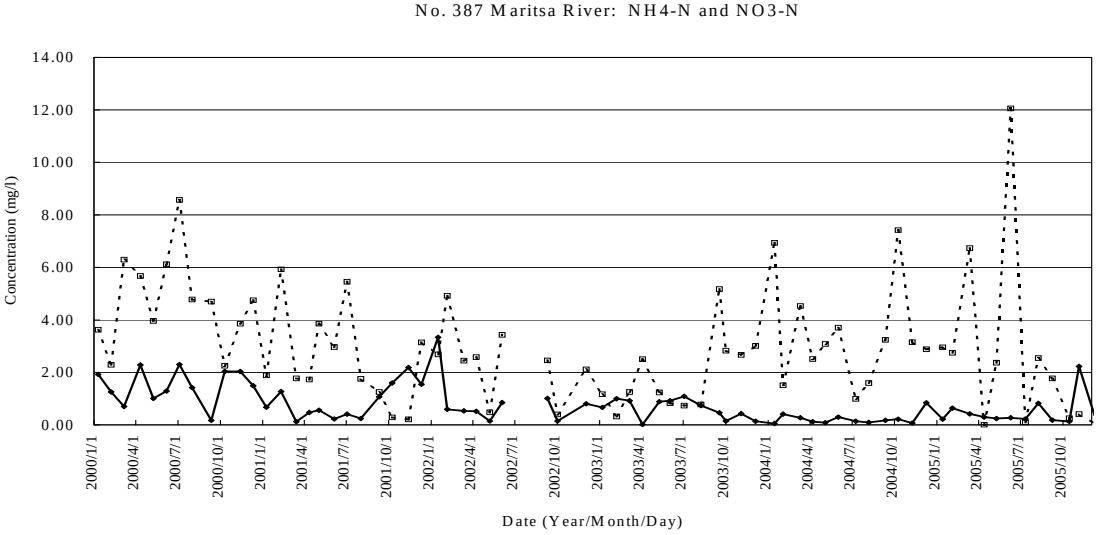


Figure C.2.9 Example of Trend Analysis for EABD





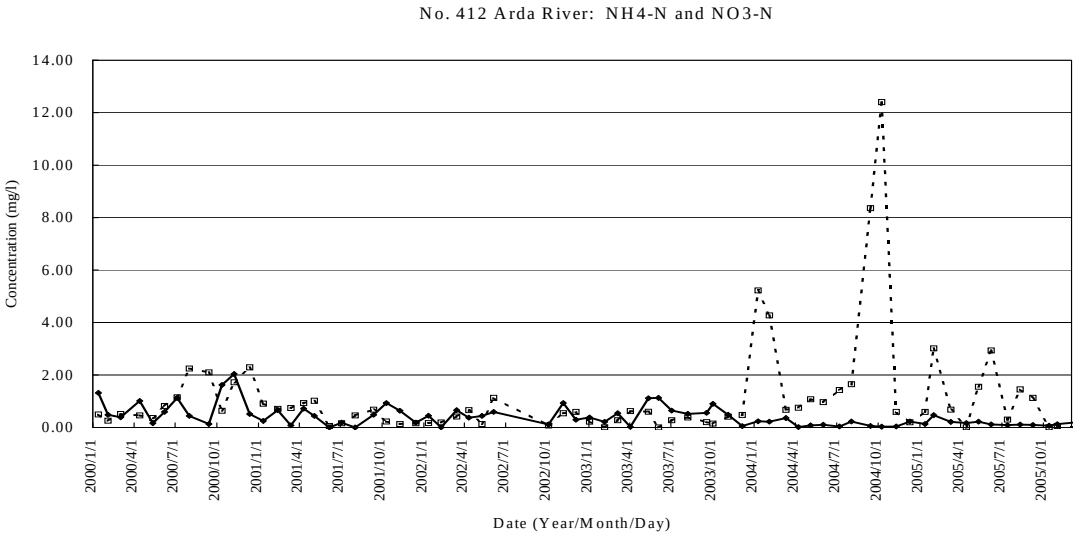


Figure C.2.10 Example of Trend Analysis for EABD

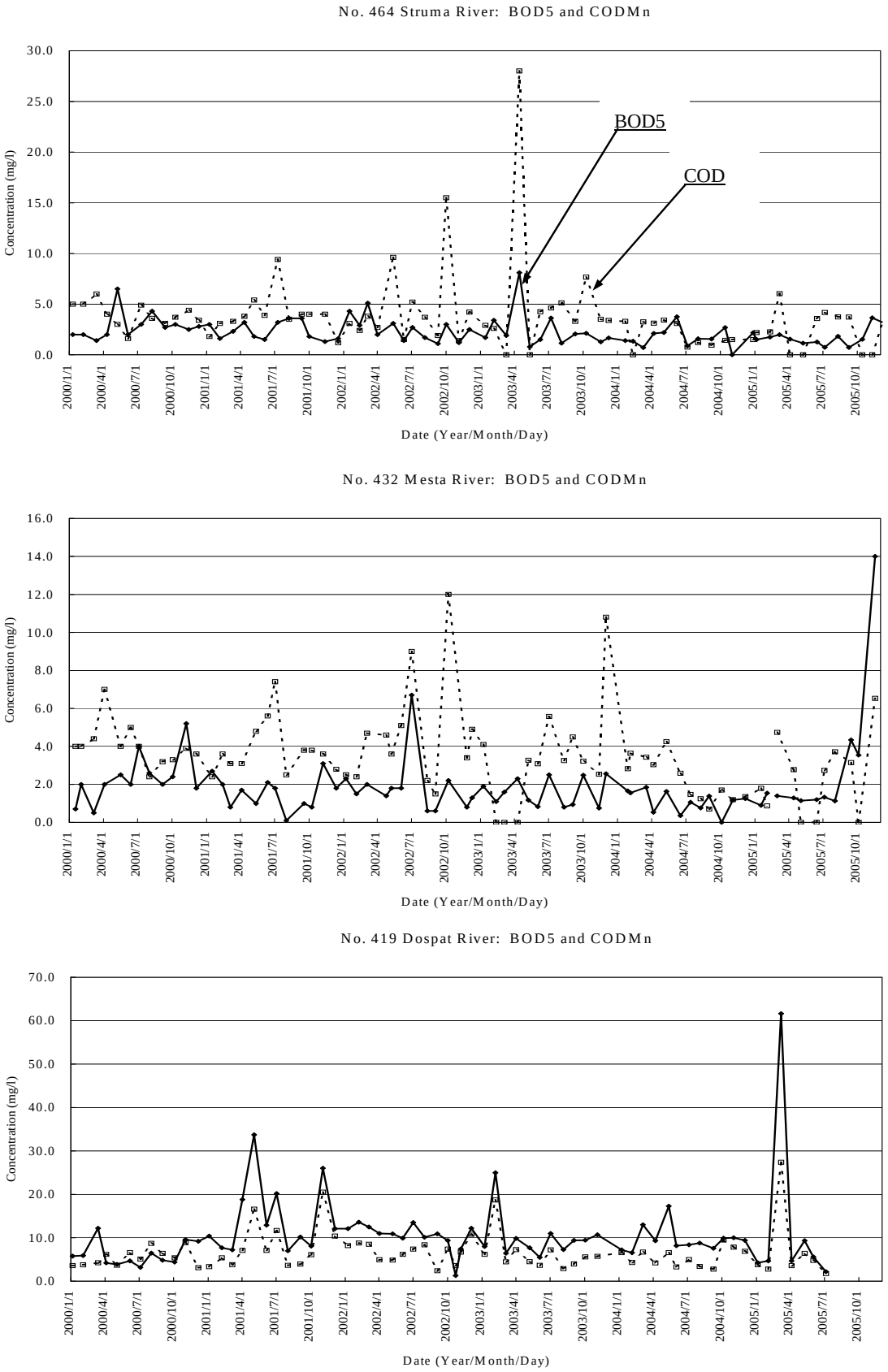


Figure C.2.11 Example of Trend Analysis for WABD

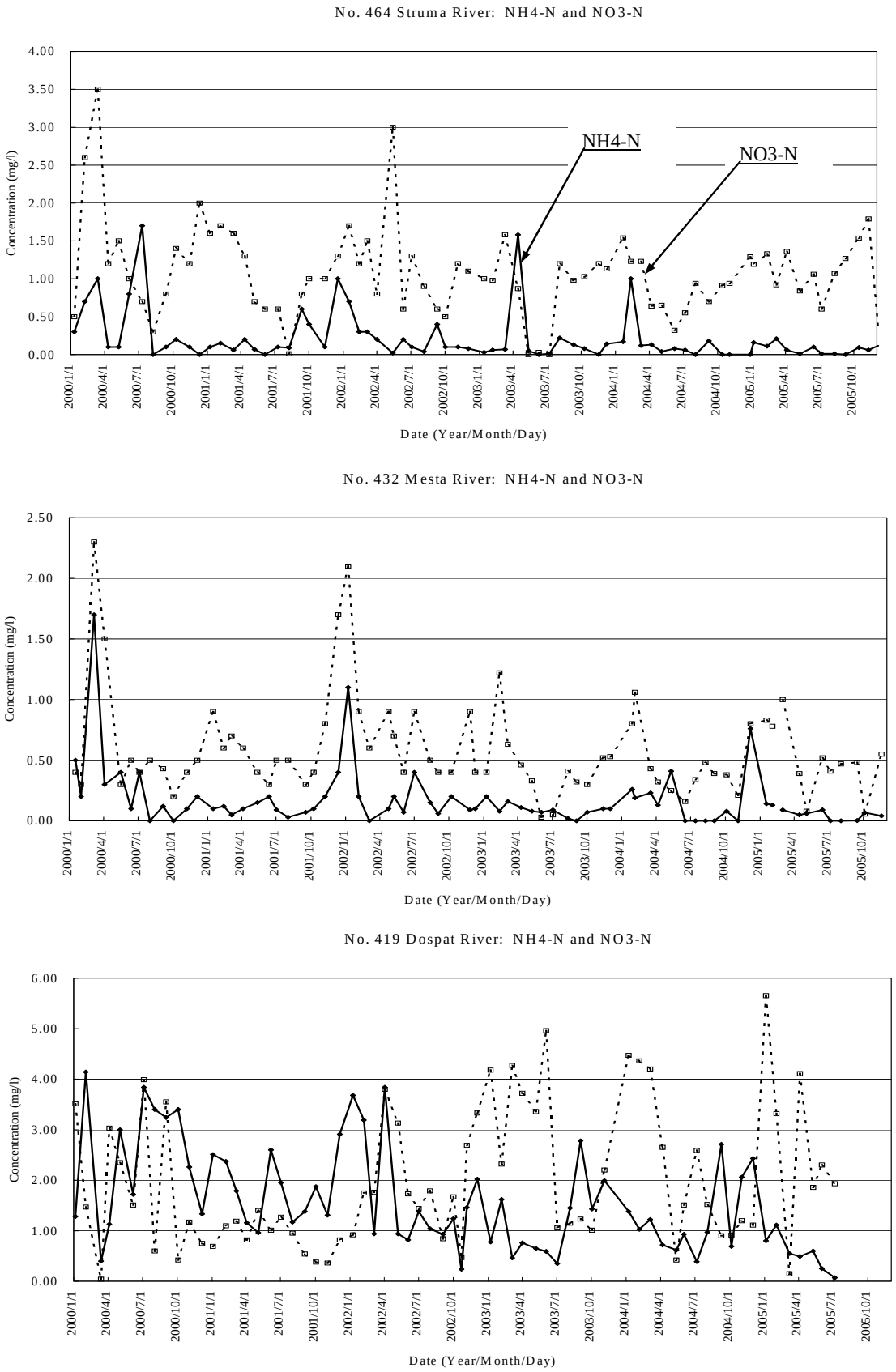


Figure C.2.12 Example of Trend Analysis for WABD

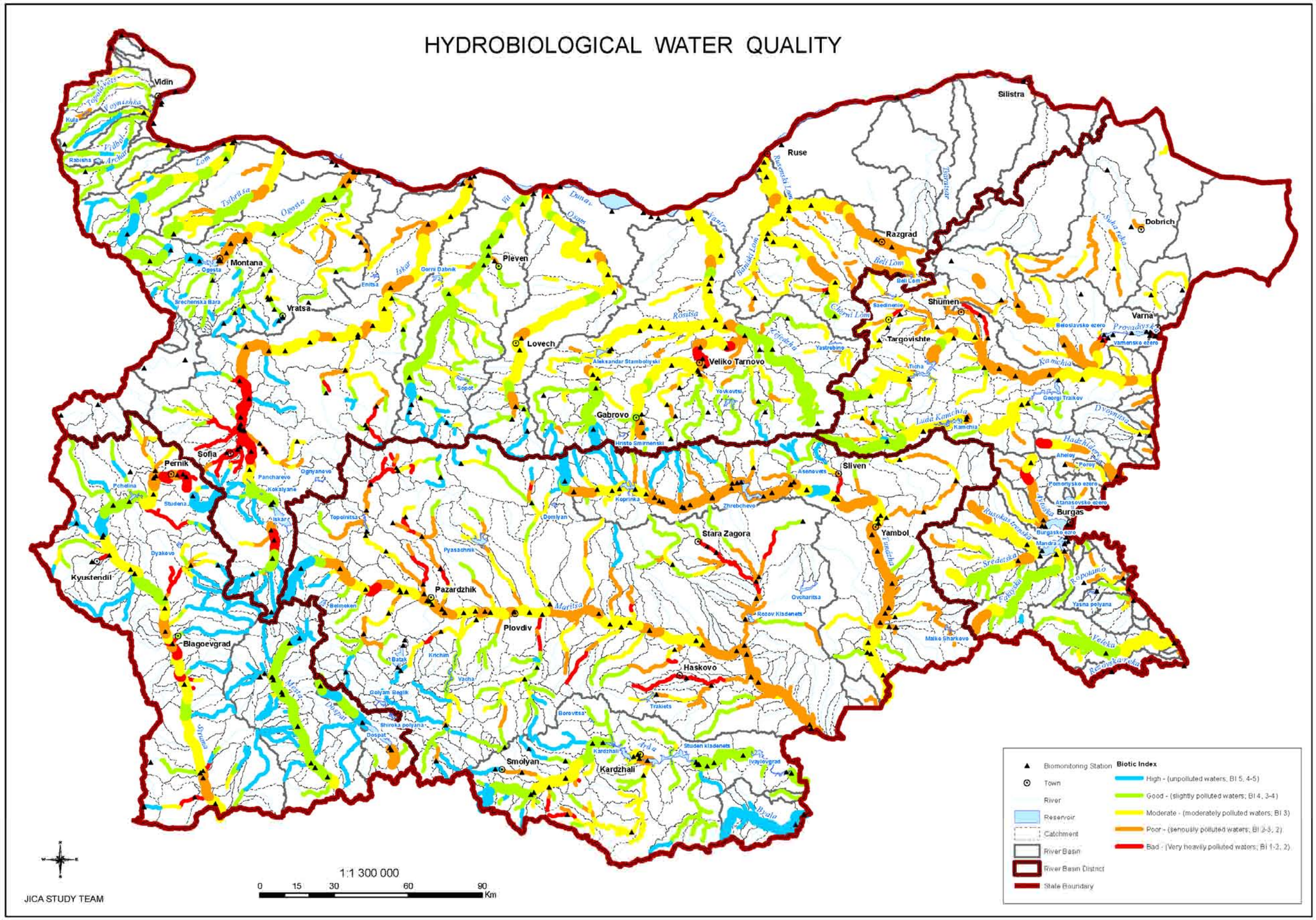


Figure C.2.13 Hydrobiological Water Quality

Figure C.2.14 Location of Supplemental Water Quality Survey

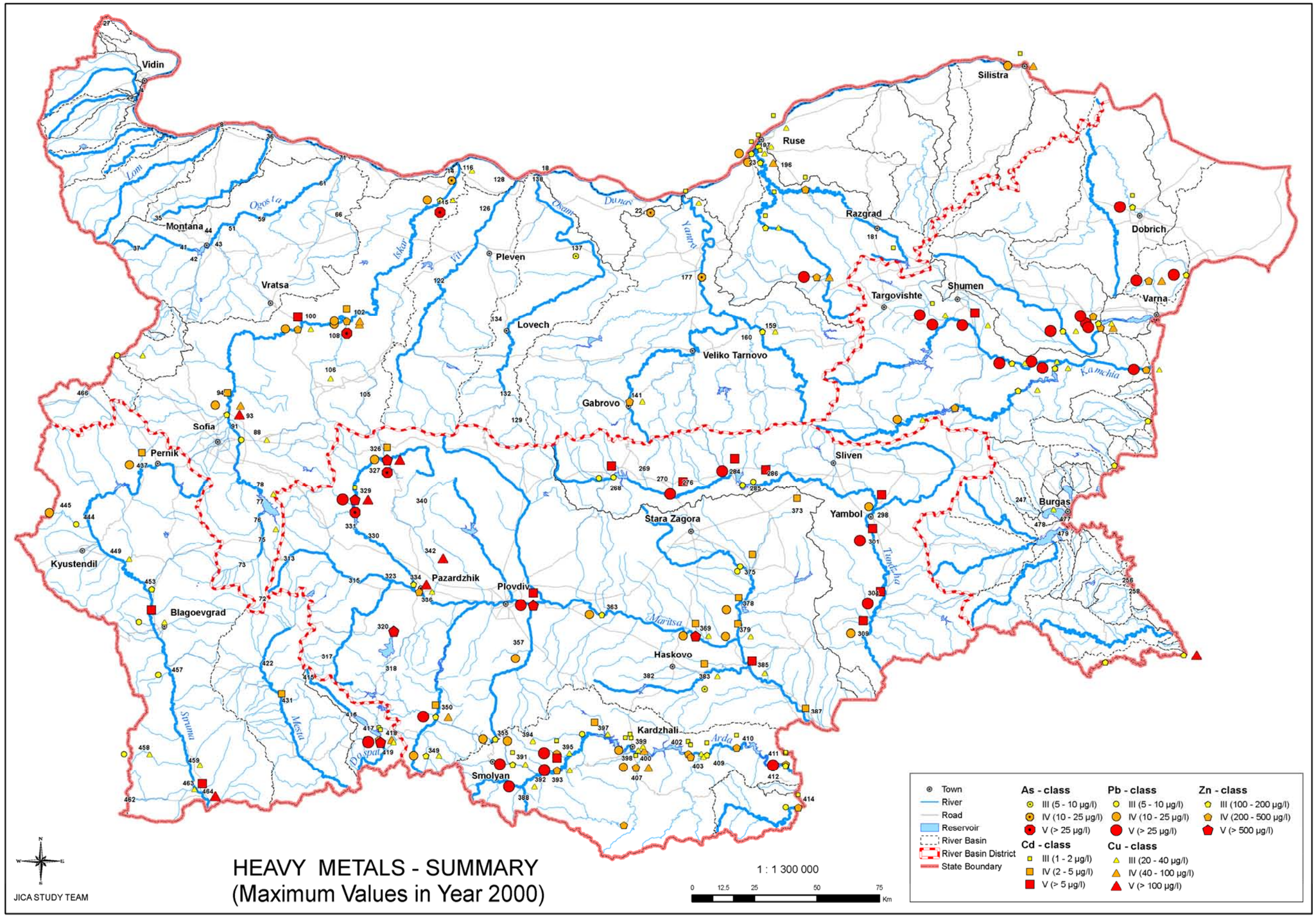


Figure C.2.15 Water Quality Class of Maximum Values of Heavy Metals in 2000

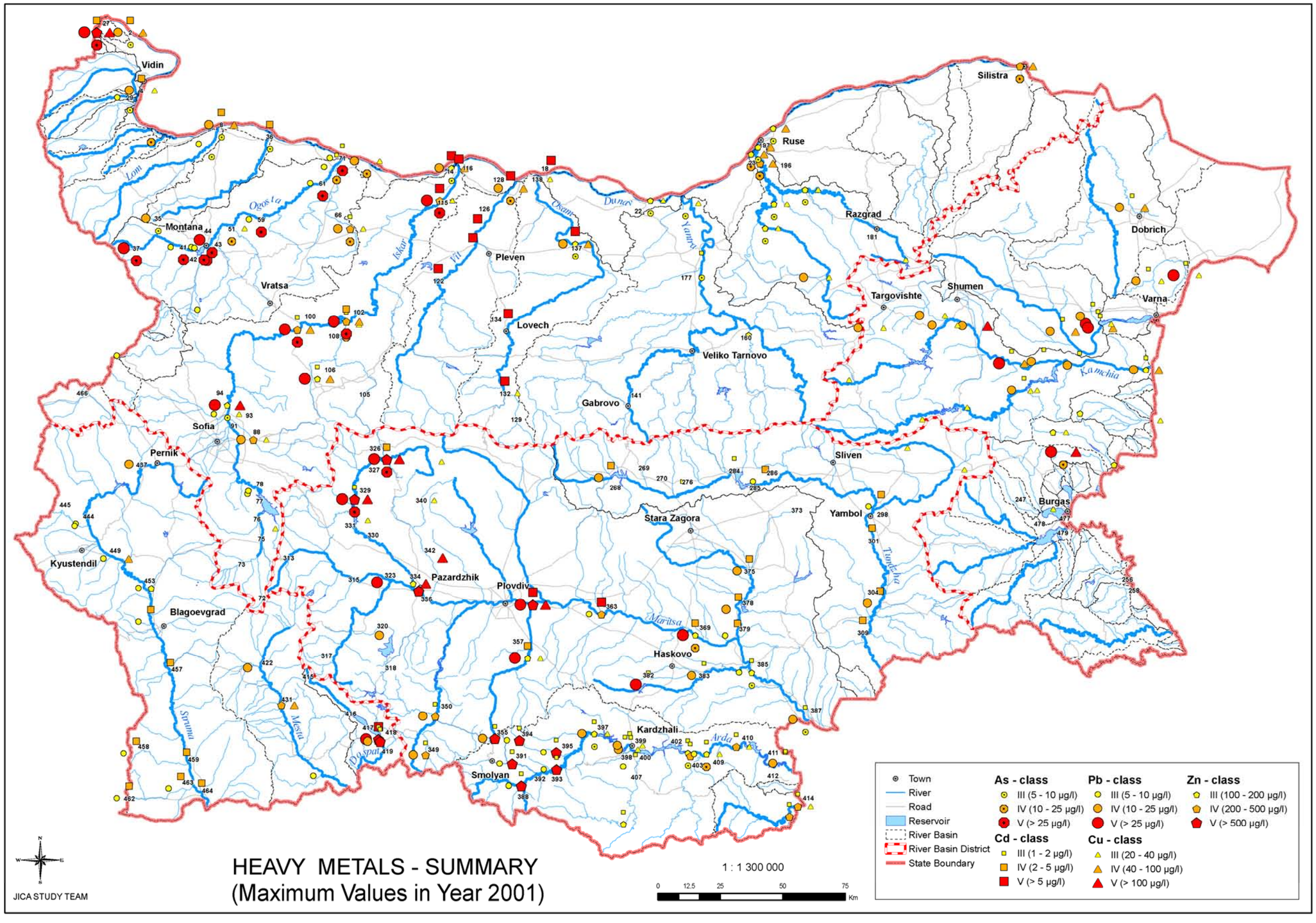


Figure C.2.16 Water Quality Class of Maximum Values of Heavy Metals in 2001

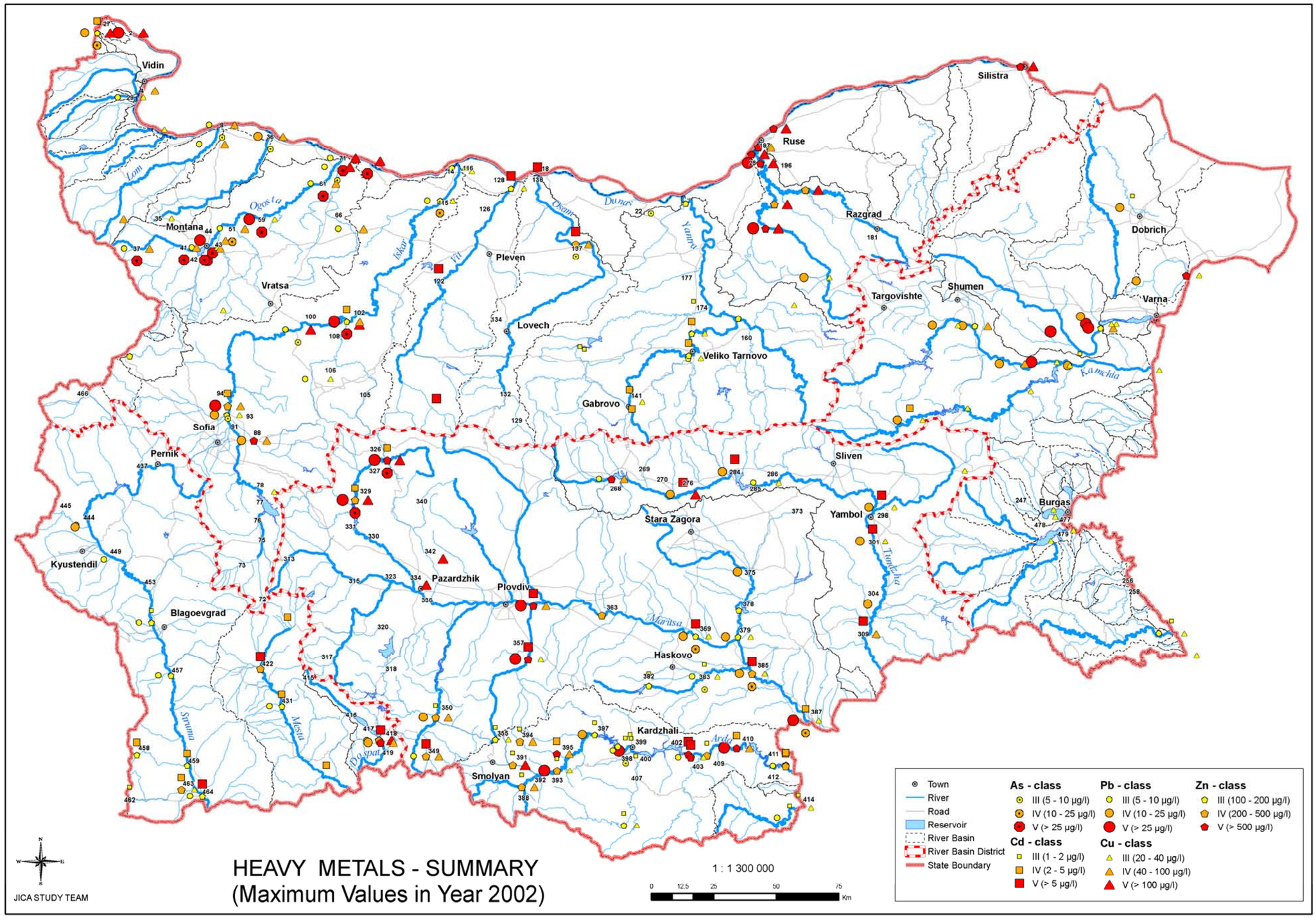


Figure C.2.17 Water Quality Class of Maximum Values of Heavy Metals in 2002

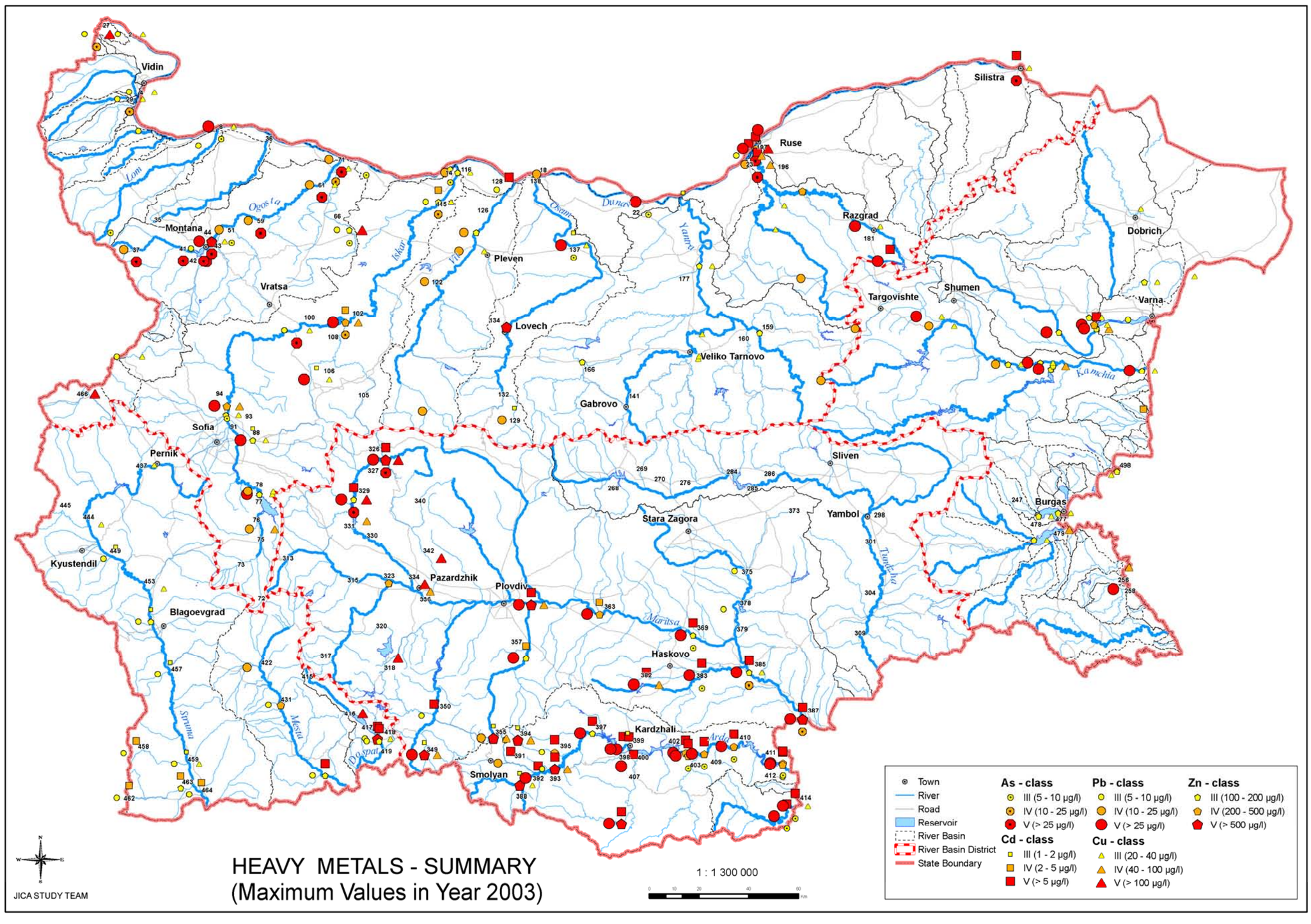


Figure C.2.18 Water Quality Class of Maximum Values of Heavy Metals in 2003

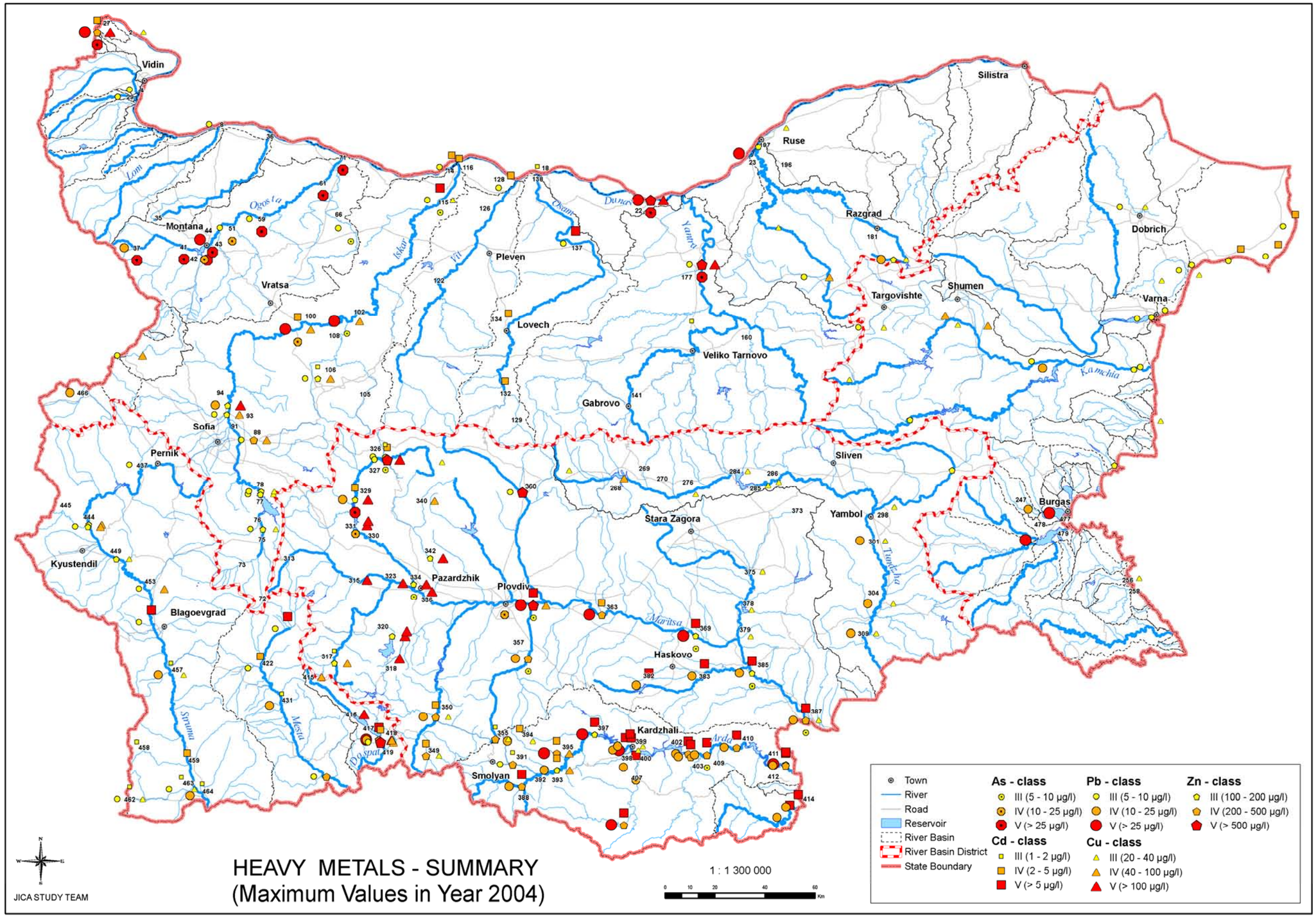


Figure C.2.19 Water Quality Class of Maximum Values of Heavy Metals in 2004

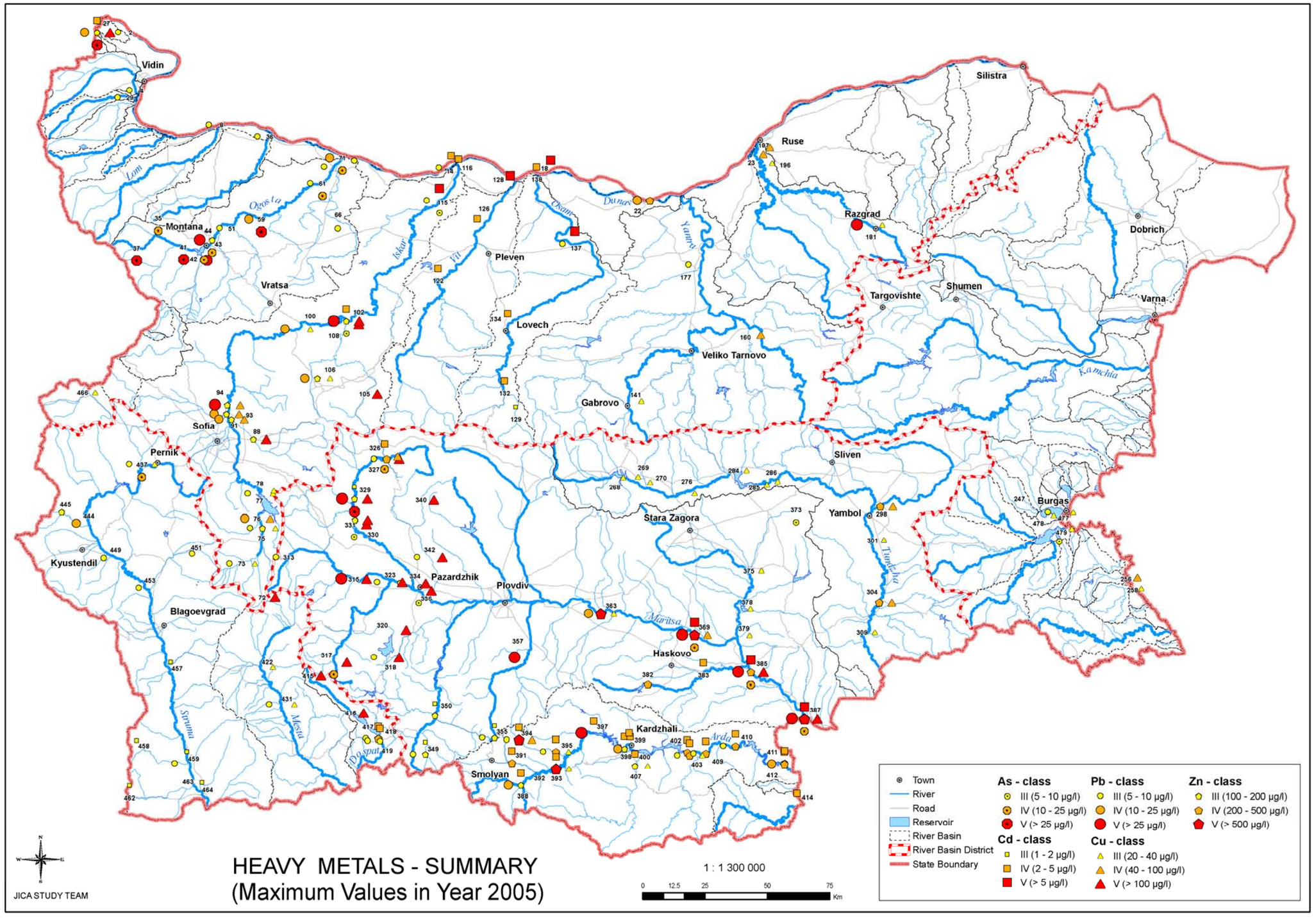


Figure C.2.20 Water Quality Class of Maximum Values of Heavy Metals in 2005

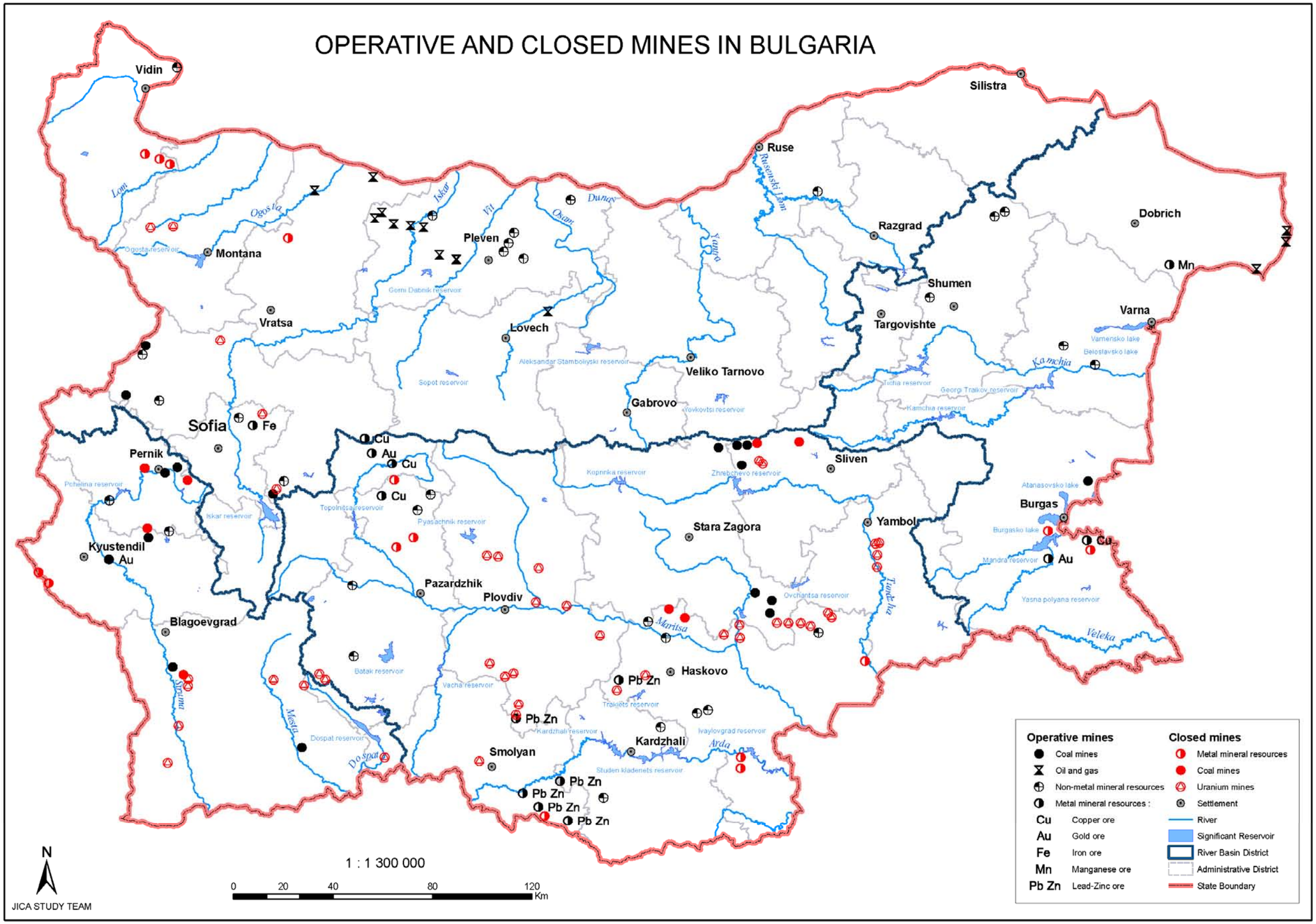


Figure C.2.21 Operative and Closed Mines in Bulgaria

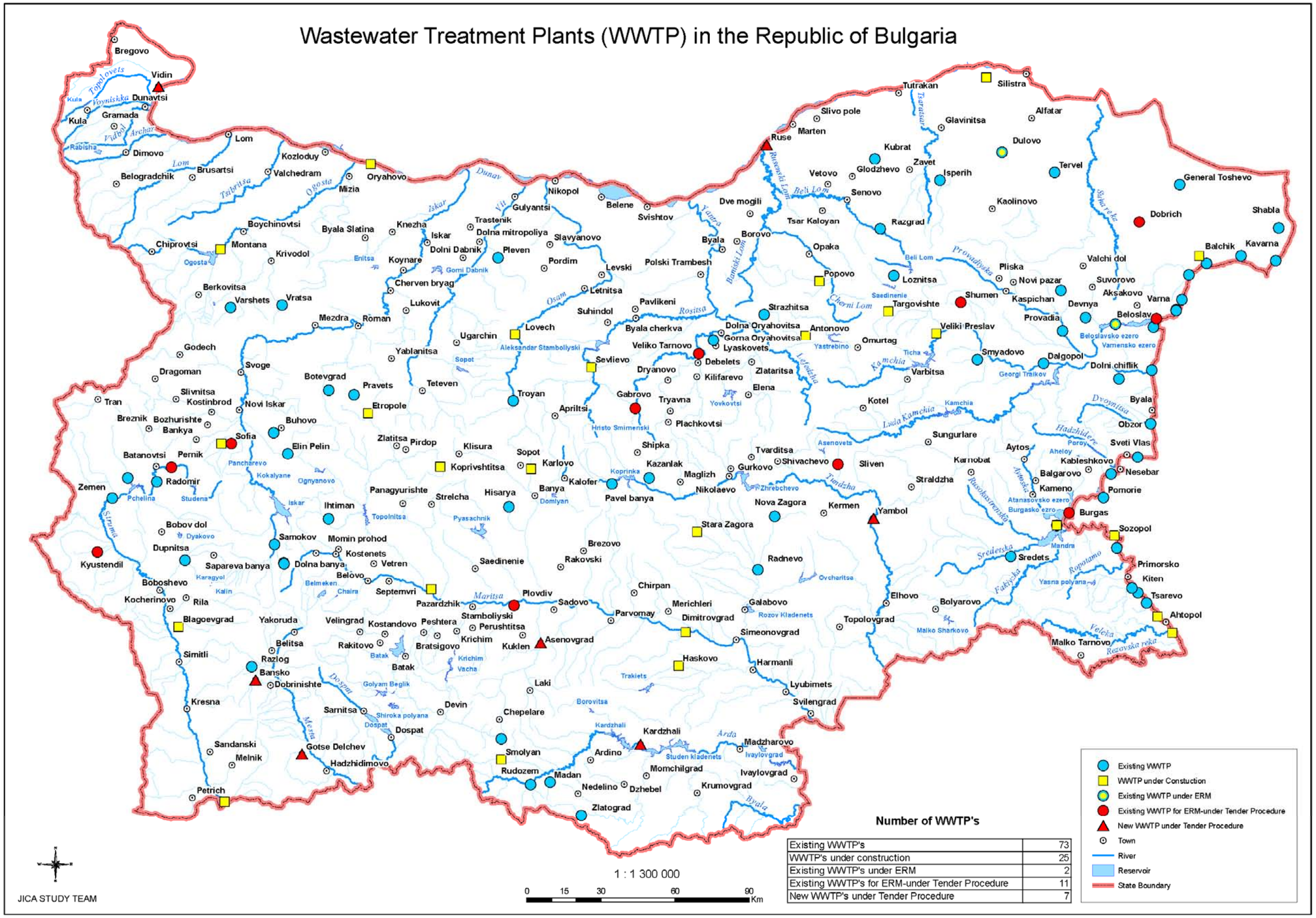


Figure C.3.1 Wastewater Treatment Plants (WWTP) in the Republic of Bulgaria