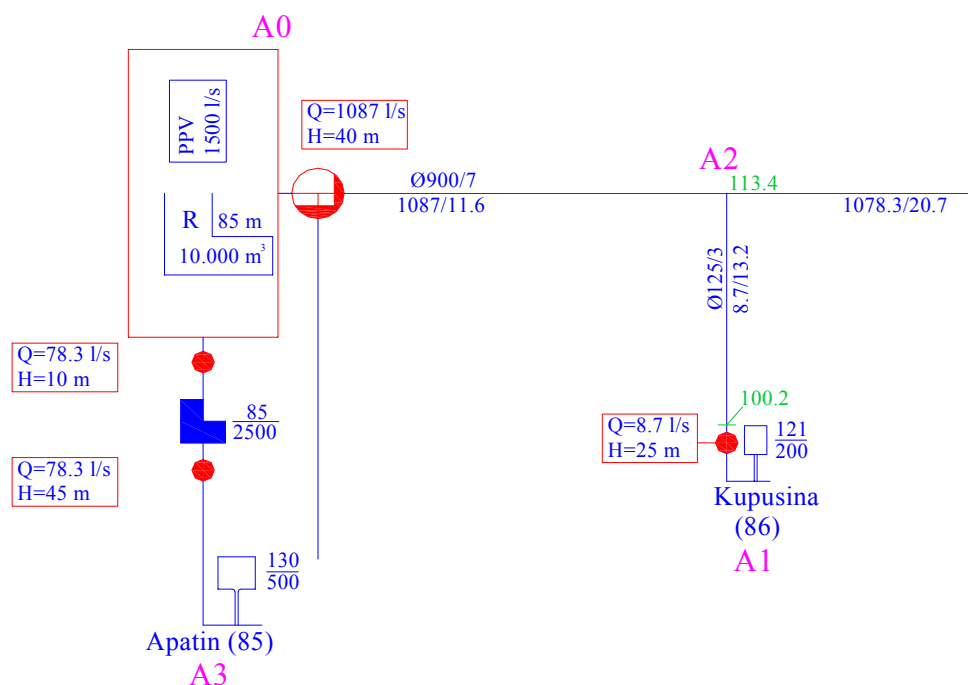




Date

4.10.2005

Project#

353

DRAFT REPORT: SUSTAINABLE SOLUTIONS TO  
IMPROVE THE QUALITY OF DRINKING WATER  
AFFECTED BY HIGH ARSENIC CONTENTS IN 3  
VOJVODINIAN REGIONS

BOOK 4 DISTRIBUTION SYSTEM CONCEPT

Stadt Wien MA 31 – Water Management

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LINES



## **4 DISTRIBUTION SYSTEM CONCEPT**

### **4.1 Introduction**

#### **4.1.1 General Overview of Water Supply Situation in Vojvodina**

Vojvodina makes almost a quarter of the Serbian territory or 21506 square kilometers. It consists of 45 municipalities with 463 settlements in 7 districts where seats are Subotica, Sombor, Novi Sad, Zrenjanin, Kikinda, Pančevo, and Sremska Mitrovica.

Vojvodina is intersected by three big rivers: the Danube, Tisa and Sava. They divide its territory into three clearly visible units: Banat in the East, Bačka in the North-West and Srem in the South-West. All three regions are characterized by fertile arable land, overall economic and cultural development as well as demographic variety.

#### **4.1.2 Water supply situation**

General characteristic of water supply situation in Vojvodina, as well as in Serbia as a whole, is a large number of small water supply systems. In other words, every settlement has its own water utility, and sometimes there are even several «micro water utilities» operating in one settlement. Water utilities covering several settlements in one municipality are frequently found, and according to the data available to us there is only one utility covering two municipalities (the city of Novi Sad water company).

Out of total number of settlements in Vojvodina, 392 settlements are provided with drinking water via public water companies (157 of them are under competence of municipal public utilities and 150 under competence of local communities, respectively). The group of 71 settlements without public water supply system comprises mainly settlements with less than 1000 inhabitants. About 96% of total population in Vojvodina live in settlements with public water supply system, whereas percentage of connections to public water supply systems is approximately 92%.

For water supply purposes groundwater from all aquifers and infiltration wells along the Danube shorelines is mainly used. About 6,6 m<sup>3</sup>/s (or 570.000 m<sup>3</sup>/day) is being withdrawn from about 1800

wells on a daily basis. Of that quantity approximately 5,5 m<sup>3</sup>/s (nearly 480.000 m<sup>3</sup>/day) account for residential, commercial and public water uses. In relation to total population it represents about 245 l/inhabitant/day on average for the entire Vojvodina. 58% of that quantity (142 l/inhabitant/day) is used by households, about 19 % (47 l/ inhabitant/day) by commercial and industrial consumers, while remaining 23% (56 l/ inhabitant/day) are losses (leakages, unaccounted for water...). When analyzing by individual water companies, residential water consumption ranges from 75 to over 200 l/ inhabitant/day, and losses from about 10% to 50%.

During peak summer months there is mounting pressure on the local water supply systems, particularly in towns and larger settlements, often resulting in water shortages. In that period the consumption rises from 10 to even 100% in relation to the average one, depending on the settlement in question, and it can be estimated with relatively high probability that peak water consumption exceeds 700.000 m<sup>3</sup>.

Raw water usually does not meet quality standards for drinking water. Irrespective of that, water is not subjected to treatment in most water companies, but is distributed to ultimate consumers after receiving disinfection. Such water does not meet the requirements set by the Serbian Drinking Water Regulations.

Distribution network is for the most part of satisfying density and size. However, the quality of network cannot be considered satisfying. Majority of pipelines are asbestos cement, with an average age of over 30 years. Circumstances prevailing during the last decade of 20<sup>th</sup> century have adversely affected water supply systems, particularly their distribution facilities. Due to the lack of funds, the systems were not maintained properly and as a result, today we have water supply network and distribution facilities in poor, neglected state. Taking into account that depreciation life of a pipeline spans from 30 to 50 years (depending on the material it is constructed from), it is highly likely that about 50% of existing pipelines are «mature» for rehabilitation.

Yet another great disadvantage of distribution systems is the lack of storage capacities, and it often happens that water is pumped from wells directly into the network.

#### *4.1.3 Conducted investigation works and proposed solutions*

The Water Master Plan for Serbia was approved in 2002 by the government of Serbia. It presents a strategy for water supply in Serbia for 2002-2012, including financing needs. To meet increasing demand and to expand coverage, the Master Plan proposes the continuation of the development of regional water supply systems for those regions where the capacities of local sources have been exceeded. It also proposes extensive work on the protection, reclamation and revitalization of groundwater resources, the induction of artificial recharge, and the use of advanced treatment technologies where needed.

In line with above set goals, the Institute for water resources «Jaroslav Černi» have elaborated the study entitled «CONCEPTUAL WATER SUPPLY SOLUTION FOR VOJVODINA», offering a solution for outstanding water supply issues in Vojvodina through formation of regional water supply systems relying on coastal water wells of regional character:

- section Bezdan – Bogojevo (the Danube river)
- section Kovin – Dubovac (Danube)
- left coastal zone downstream from Novi Sad (Danube river)
- section Jamena – Kurjakovac (the Sava river)
- section Jarak – Grabovac (Sava river)
- section Knićanin - Čenta (Danube and Sava rivers)

Apart from the river banks, wider area of Potporanj has been identified as a possible water source area.

In further stage, investigation works were carried out and the study on possible abstraction of water in the area of Mesarska livada and Budžak in the coastal zone of the Danube river near Apatin was produced. The estimated water withdrawal capacity in the investigated area ranged from about 1500 to 1900 l/s.

Similar investigation works are underway in the area of potential groundwater resource Kovin – Dubovac.

Besides these activities at general level, several projects at local level were completed, but mostly not in conformity with the basic concept of regional water supply solution.

The following designs have been made or are under preparation for the area of the Western Bačka district, being the subject matter of the present study:

- Conceptual design for expanding provision of water from water utility Bezdan to seven settlements, "Akva projekt" Subotica, 1996
- Odžaci
- Technological solution concept for reconstruction and extension of water treatment plant in Sombor, Institute for water resources "Jaroslav Černi" Belgrade, 2004
- General solution for water supply development concept in the municipality of Sombor, "Beoinženjering", Belgrade, under preparation

## **4.2 SCOPE AND OBJECTIVES**

The objective of this part of the study is to identify solution proposal for supplying water the quality of which is according to the applicable standards and directives safe for drinking in the Western Bačka region (Western Bačka district) and the parts of southern, central and eastern Bačka region, to serve as a pilot area for development of comprehensive water supply solution for Vojvodina as a whole. Special attention is devoted to smaller settlements in which water supply issues are the most serious.

Pilot area with approximately 370293 inhabitants includes following municipalities:

Western Bačka:

- municipality of Sombor with 16 settlements and 99.391 inhabitants,
- municipality of Apatin with 5 settlements and 34.025 inhabitants,
- municipality of Odžaci with 9 settlements and 36.532 inhabitants,
- municipality of Kula with 7 settlements and 49.496 inhabitants

Southern, Central and Eastern Bačka and a part of Banat:

- municipality of Bač with 6 settlements and 17.062 inhabitants
- municipality of Vrbas with 7 settlements and 46.417 inhabitants
- municipality of Srbobran with 3 settlements and 18.088 inhabitants
- municipality of Bečej with 5 settlements and 41.866 inhabitants
- municipality of Novi Bečej with 4 settlements and 27.416 inhabitants

### **4.3 Methodology**

The study is based on the data on water supply situation in the Western Bačka region together with the municipalities situated eastwards up to the Tisza river and southwards up to the municipality of Bač, the data from the census of 2002 and demographic forecasts on population growth, development plans for the region in question, as well as experiences regarding water consumption standards from the developed Western European countries and the developing countries undergoing transition process at a much faster pace than Serbia and Montenegro.

Methodological approach used in developing water distribution concept is a standard one, adjusted to the area for which the solution is being sought. The water supply solution includes the entire area of concern and relies on two largest potential water resources, located south and north of Apatin. One single water treatment plant is foreseen to which raw water from both water sources will be transported. The principle that basic primary routes should be laid in such a way as to connect the places with highest consumption has been fully observed. Water distribution system itself has been designed as a branch one. Pump stations required for transport of water along the primary routes have been foreseen. Separate reservoirs are not foreseen along the primary routes. Required pressures shall be provided by local pump stations for each individual settlement or smaller group of settlements, while equal consumption shall be maintained by means of elevated tanks – water towers. The whole system shall be sized to the peak day demands, for regular flow regime, that is with reservoirs of storage capacity required for daily equalization of consumption.

The study elaborates three basic solution scenarios:

- a. Macro regional scenario, relying on macro regional groundwater source Bezdán-Bogojevo, as a single system for entire region
- b. Separate scenario relying on existing solutions with existing groundwater resources and with application of suitable water treatment technological processes
- c. Micro regional scenario relying on existing or new groundwater resources of sufficient yield, with satisfying quality or the application of suitable water treatment technological processes

### **4.4 WATER DEMAND ESTIMATE**

The water requirements are calculated in Table 4.1., based on the following assumptions:



#### 4.4.1 Population number

Population number is taken from the census of population and housing for year 2002. The census provides number of residents, as well as the number of those temporary living outside their place of residence. The sum of these two numbers is taken as the final, projected population number. Zero population growth has been assumed, although the results of demographic studies indicate even more pronounced negative demographic trend in the coming 20 years, i.e. the decline in the population number in Vojvodina.

#### 4.4.2 Other consumers

The census also provides the number of livestock and poultry per municipalities. The resulting number has been distributed among the settlements so that the villages are assigned twice as much coefficient than the towns, that is, the municipality seats.

It has been assumed that public water use accounts for 20% in the town and municipality seats and 10% in villages, of total residential i.e. domestic water use.

Average losses in the amount of 20% are also included in total water use.

#### 4.4.3 Consumption standards

The underlying assumption is that specific residential water consumption differs depending on the settlement size:

- |                                                   |                |             |
|---------------------------------------------------|----------------|-------------|
| a. Settlements with over 20.000 inhabitants ..... | 150 l/inh.day  | $K_d = 1.6$ |
| b. Settlements from 10.000 to 20.000 inh. ....    | 140 l/ inh.day | = 1.7       |
| c. Settlements from 5.000 to 10.000 inh.....      | 130 l/ inh.day | = 1.8       |
| d. Settlements with less than 5.000 inh. ....     | 120 l/ inh.day | = 1.9       |

l/inh day – liters per inhabitants per day

$K_d$  = peak day factor

(day with maximum demand in the year)

Daily peaks (non-uniformity in consumption during a day) is not taken into account. It is assumed that during the peak day, the system shall operate continuously at the maximum day demand level throughout all 24 hours.

The calculation is made separately for each municipality and each settlement within given municipality. The entire area is divided in the part inside the Western Bačka district (A) and the part outside of the Western Bačka district (B – expansion southwards and eastwards).

It is calculated that water demands in the peak day amounts to 123.457 m<sup>3</sup>, i.e. 1428,9 l/s, or 333 l/inh.day per capita. This quantity has been taken as the basis for sizing water supply and distribution facilities.

Average water demands are lower and amount to 76.072 m<sup>3</sup>/day or 880,5 l/s, or 205 l/inh. day per capita.

These values are considered realistic. They are within the framework of values used in EU countries and countries in transition.

#### **4.5 DISTRIBUTION SYSTEM**

#### **4.6 Macro-regional Scenario**

Macro regional scenario, as already explained, represents a solution with one single water source and water treatment process for the entire system. Water source meeting these requirements is located nearby Apatin, and that site has been chosen for the construction of water treatment plant. This water treatment plant is, thus, the entering point into the system.

The location of regional water sources "Mesarske livade" and "Budžak" and the drinking water treatment plant (DWTP) for the area to be covered by present study necessitated the need for developing distribution system in two basic branches:

- a. Eastern branch, stretching from the drinking water treatment plant (DWTP) towards Sombor and farther across Kula, Vrbas, Srbobran and Bečej to Novi Bečej.
- b. Southern branch, from DWTP across Apatin, Prigrevica, Odžaci to Bač.

The town of Apatin will be directly connected to DWTP, as the treatment plant is located in close vicinity of existing facilities (low reservoirs and pump stations) of the Apatin water utility.

Within the treatment plant there is the basic reservoir (BR) with storage capacity of 10.000 m<sup>3</sup>.

Basic pump station (BPS), located adjacent to DWTP, where is BR, consists of three blocks:

- **Eastern block of BPS** is the connection with the eastern branch. Features of the eastern block are:

Water flow  $Q = 1087 \text{ l/s}$ , piezometer high  $H = 40 \text{ m}$ , installed power  $N_{\text{inst}} = 730 \text{ kW}$

- **Southern block of BPS** is the connection with the southern branch. Features of the southern block are:

$Q = 263,3 \text{ l/s}$ ,  $H = 70 \text{ m}$ ,  $N_{\text{inst}} = 310 \text{ kW}$

- **Apatin block of BPS** is the connection with the existing facilities of Apatin water utility  
Features of this block are:

$Q = 78,3 \text{ l/s}$ ,  $H = 10 \text{ m}$ ,  $N_{\text{inst}} = 22 \text{ kW}$

Basic facilities in DWTP, BPS and BR are within the single complex marked as A0 in tables and graphical enclosures.

Greater part of the municipality of Sombor and the entire municipalities of Kula, Vrbas, Srbobran, Bečej and Novi Bečej shall be supplied with drinking water from the eastern branch. The eastern branch comprises:

- 402 km of primary pipelines and pipelines connecting settlements with primary pipelines, diameter 80 to 900mm
- 2 buried reservoirs with storage capacity of  $1000 \text{ m}^3$  each
- 40 water towers with total volume of  $17.750 \text{ m}^3$  (from  $150$  to  $2.500 \text{ m}^3$  each)
- 40 pump stations with total installed power  $3.875 \text{ kW}$  (from  $2$  to  $893 \text{ kW}$  each).

Smaller part of the municipality of Sombor and the entire municipalities of Odžaci and Bač shall be supplied with drinking water from the southern branch. The southern branch comprises:

- 148 km of primary pipelines and pipelines connecting settlements with primary pipelines, diameter 100 to 500mm
- 18 water towers with total volume of  $5050 \text{ m}^3$  (from  $200$  to  $500 \text{ m}^3$  each)
- 19 pump stations with total installed power  $678 \text{ kW}$  (from  $2,6$  to  $109 \text{ kW}$  each).

Elements within distribution system are calculated in Table 4.2., and shown in calculation sketches (Fig. 4.2 and 4.3) and in the map (Fig.4.4.).

The same table includes estimated values for all pipelines and facilities within distribution system (pump stations and reservoirs):

- total.....135.000.000 €
- per average daily requirements.....1093 €/m<sup>3</sup>/day
- per capita.....364 €/inh.

## **Book IV**

### **DISTRIBUTION SYSTEM CONCEPT**

#### **Annex 4.1 Tables:**

TABLE 4.1. WATER DEMAND IN YEAR 2025 ESTIMATION

TABLE 4.2. ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS

TABLE 4.3. NUMBER AND STRUCTURE OF EMPLOYED PEOPLE

TABLE 4.4. MAKRO REGIONAL SCENARIO SUMMARY PRICE

**Table 4.1. - WATER DEMAND IN YEAR 2025 - ESTIMATION**

|                               | COMMUNITY/<br>Settlement | Population   | Equivalent population number |            | Number of domestic animals |             |              |               | Average daily demand |              |             |             |             |              |              | Max. daily demand |     |              |              |
|-------------------------------|--------------------------|--------------|------------------------------|------------|----------------------------|-------------|--------------|---------------|----------------------|--------------|-------------|-------------|-------------|--------------|--------------|-------------------|-----|--------------|--------------|
|                               |                          |              |                              |            | cattle                     | sheeps      | swines       | poultry       | population           |              | d.ann.      | others      | leakage     | Total        |              | Daily coeff.      |     | Total        |              |
|                               |                          |              | Total                        | %          | 50l/d                      | 5l/d        | 10l/d        | 1l/d          | l/st.d               | m3/d         | m3/d        | m3/d        | m3/d        | m3/d         | l/s          | Cp                | Co  | m3/d         | l/s          |
| 1                             | 2                        | 3            | 4                            | 5          | 6                          | 7           | 8            | 9             | 10                   | 11           | 12          | 13          | 14          | 15           | 15           | 16                | 17  | 18           | 19           |
| <b>A. WEST BAČKA DISTRICT</b> |                          |              |                              |            |                            |             |              |               |                      |              |             |             |             |              |              |                   |     |              |              |
| <b>1</b>                      | <b>APATIN</b>            |              |                              |            |                            |             |              |               |                      |              |             |             |             |              |              |                   |     |              |              |
| 1.1.                          | Apatin (g)               | 20009        | 20009                        | 41,6       | 501                        | 301         | 4313         | 26144         | 150                  | 3001         | 96          | 600         | 739         | 4437         | 51,4         | 1,6               | 1,2 | 6765         | 78,3         |
| 1.2.                          | Kupusina                 | 2458         | 4916                         | 10,2       | 123                        | 74          | 1060         | 6423          | 120                  | 295          | 24          | 29          | 70          | 418          | 4,8          | 1,9               | 1,2 | 749          | 8,7          |
| 1.3.                          | Prigrevica               | 4964         | 9928                         | 20,7       | 249                        | 149         | 2140         | 12972         | 120                  | 596          | 48          | 60          | 141         | 843          | 9,8          | 1,9               | 1,2 | 1512         | 17,5         |
| 1.4.                          | Svilojevo                | 1404         | 2808                         | 5,8        | 70                         | 42          | 605          | 3669          | 120                  | 168          | 13          | 17          | 40          | 239          | 2,8          | 1,9               | 1,2 | 428          | 5,0          |
| 1.5.                          | Sonta                    | 5190         | 10380                        | 21,6       | 260                        | 156         | 2237         | 13563         | 130                  | 675          | 50          | 67          | 158         | 950          | 11,0         | 1,8               | 1,2 | 1626         | 18,8         |
|                               | <b>S Apatin</b>          | <b>34025</b> | <b>48041</b>                 | <b>100</b> | <b>1203</b>                | <b>722</b>  | <b>10355</b> | <b>62772</b>  |                      | <b>4735</b>  | <b>230</b>  | <b>774</b>  | <b>1148</b> | <b>6887</b>  | <b>79,7</b>  |                   |     | <b>11080</b> | <b>128,2</b> |
| <b>2</b>                      | <b>SOMBOR</b>            |              |                              |            |                            |             |              |               |                      |              |             |             |             |              |              |                   |     |              |              |
| 2.1.                          | Sombor (g)               | 52385        | 52385                        | 35,8       | 3053                       | 1964        | 17891        | 94167         | 150                  | 7858         | 436         | 1572        | 1973        | 11838        | 137,0        | 1,6               | 1,2 | 17977        | 208,1        |
| 2.2.                          | A. Šantić                | 2218         | 4436                         | 3,0        | 270                        | 166         | 1515         | 7974          | 120                  | 266          | 109         | 27          | 80          | 482          | 5,6          | 1,9               | 1,2 | 802          | 9,3          |
| 2.3.                          | B. Breg                  | 1429         | 2858                         | 2,0        | 201                        | 107         | 976          | 5138          | 120                  | 171          | 72          | 17          | 52          | 312          | 3,6          | 1,9               | 1,2 | 519          | 6,0          |
| 2.4.                          | B. Monoštor              | 4020         | 8040                         | 5,5        | 480                        | 302         | 2746         | 14453         | 120                  | 482          | 197         | 48          | 146         | 874          | 10,1         | 1,9               | 1,2 | 1454         | 16,8         |
| 2.5.                          | Bezdan                   | 5411         | 10822                        | 7,4        | 645                        | 406         | 3696         | 19454         | 130                  | 703          | 266         | 70          | 208         | 1247         | 14,4         | 1,8               | 1,2 | 2003         | 23,2         |
| 2.6.                          | Gakovo                   | 2257         | 4514                         | 3,1        | 270                        | 169         | 1542         | 8114          | 120                  | 271          | 111         | 27          | 82          | 491          | 5,7          | 1,9               | 1,2 | 816          | 9,4          |
| 2.7.                          | Doroslovo                | 1885         | 3770                         | 2,6        | 227                        | 141         | 1288         | 6777          | 120                  | 226          | 93          | 23          | 68          | 410          | 4,7          | 1,9               | 1,2 | 682          | 7,9          |
| 2.8.                          | Kljajićevo               | 6174         | 12348                        | 8,4        | 733                        | 463         | 4217         | 22197         | 130                  | 803          | 303         | 80          | 237         | 1423         | 16,5         | 1,8               | 1,2 | 2286         | 26,5         |
| 2.9.                          | Kolut                    | 1750         | 3500                         | 2,4        | 218                        | 131         | 1195         | 6292          | 120                  | 210          | 86          | 21          | 63          | 381          | 4,4          | 1,9               | 1,2 | 633          | 7,3          |
| 2.10.                         | Rastina                  | 574          | 1148                         | 0,8        | 87                         | 43          | 392          | 2064          | 120                  | 69           | 29          | 7           | 21          | 126          | 1,5          | 1,9               | 1,2 | 209          | 2,4          |
| 2.11.                         | Ridica                   | 2677         | 5354                         | 3,7        | 314                        | 201         | 1829         | 9624          | 120                  | 321          | 131         | 32          | 97          | 582          | 6,7          | 1,9               | 1,2 | 968          | 11,2         |
| 2.12.                         | Sv. Miletić              | 3235         | 6470                         | 4,4        | 393                        | 243         | 2210         | 11630         | 120                  | 388          | 159         | 39          | 117         | 704          | 8,1          | 1,9               | 1,2 | 1170         | 13,5         |
| 2.13.                         | Stanišić                 | 4934         | 9868                         | 6,7        | 585                        | 370         | 3370         | 17739         | 130                  | 641          | 242         | 64          | 190         | 1137         | 13,2         | 1,9               | 1,2 | 1904         | 22,0         |
| 2.14.                         | Stapar                   | 3817         | 7634                         | 5,2        | 454                        | 286         | 2607         | 13723         | 120                  | 458          | 187         | 46          | 138         | 830          | 9,6          | 1,9               | 1,2 | 1380         | 16,0         |
| 2.15.                         | Telečka                  | 2125         | 4250                         | 2,9        | 262                        | 159         | 1452         | 7640          | 120                  | 255          | 105         | 26          | 77          | 462          | 5,4          | 1,9               | 1,2 | 769          | 8,9          |
| 2.16.                         | Čonoplja                 | 4500         | 9000                         | 6,1        | 532                        | 338         | 3074         | 16178         | 120                  | 540          | 221         | 54          | 163         | 978          | 11,3         | 1,9               | 1,2 | 1627         | 18,8         |
|                               | <b>S Sombor</b>          | <b>99391</b> | <b>146397</b>                | <b>100</b> | <b>8724</b>                | <b>5490</b> | <b>49999</b> | <b>263162</b> |                      | <b>13664</b> | <b>2748</b> | <b>2152</b> | <b>3713</b> | <b>22276</b> | <b>257,8</b> |                   |     | <b>35199</b> | <b>407,4</b> |

|                                                   | COMMUNITY/<br>Settlement | Popula-<br>tion | Equivalent<br>population<br>number |       | Number of domestic annimals |        |        |         | Average daily demand |        |        |         |       |       |              | Max. daily demand |       |       |       |
|---------------------------------------------------|--------------------------|-----------------|------------------------------------|-------|-----------------------------|--------|--------|---------|----------------------|--------|--------|---------|-------|-------|--------------|-------------------|-------|-------|-------|
|                                                   |                          |                 |                                    |       | cattle                      | sheeps | swines | poultry | population           | d.ann. | others | leakage | Total |       | Daily coeff. |                   | Total |       |       |
|                                                   |                          |                 | Total                              | %     | 50l/d                       | 5l/d   | 10l/d  | 1l/d    | l/st.d               | m3/d   | m3/d   | m3/d    | m3/d  | m3/d  | l/s          | Cp                | Co    | m3/d  | l/s   |
| 1                                                 | 2                        | 3               | 4                                  | 5     | 6                           | 7      | 8      | 9       | 10                   | 11     | 12     | 13      | 14    | 15    | 15           | 16                | 17    | 18    | 19    |
| 3                                                 | ODŽACI                   |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
| 3.1.                                              | Odžaci (g)               | 10125           | 10125                              | 16,1  | 535                         | 370    | 2923   | 16262   | 140                  | 1418   | 74     | 284     | 355   | 2130  | 24,7         | 1,7               | 1,2   | 3407  | 39,4  |
| 3.2.                                              | B. Brestovac             | 3570            | 7140                               | 11,3  | 377                         | 261    | 2061   | 11468   | 120                  | 428    | 52     | 43      | 105   | 628   | 7,3          | 1,9               | 1,2   | 1114  | 12,9  |
| 3.3.                                              | B. Gračac                | 2991            | 5982                               | 9,5   | 316                         | 218    | 1727   | 9608    | 120                  | 359    | 44     | 36      | 88    | 526   | 6,1          | 1,9               | 1,2   | 933   | 10,8  |
| 3.4.                                              | Bogojevo                 | 2187            | 4374                               | 6,9   | 231                         | 160    | 1263   | 7025    | 120                  | 262    | 32     | 26      | 64    | 385   | 4,5          | 1,9               | 1,2   | 682   | 7,9   |
| 3.5.                                              | Deronje                  | 2959            | 5918                               | 9,4   | 312                         | 216    | 1708   | 9505    | 120                  | 355    | 43     | 36      | 87    | 521   | 6,0          | 1,9               | 1,2   | 923   | 10,7  |
| 3.6.                                              | Karavukovo               | 5139            | 10278                              | 16,3  | 543                         | 375    | 2967   | 16508   | 130                  | 668    | 75     | 67      | 162   | 972   | 11,3         | 1,8               | 1,2   | 1648  | 19,1  |
| 3.7.                                              | Lalić                    | 1706            | 3412                               | 5,4   | 180                         | 125    | 985    | 5480    | 120                  | 205    | 25     | 20      | 50    | 300   | 3,5          | 1,9               | 1,2   | 532   | 6,2   |
| 3.8.                                              | Ratkovo                  | 4233            | 8466                               | 13,5  | 447                         | 309    | 2444   | 13598   | 120                  | 508    | 62     | 51      | 124   | 745   | 8,6          | 1,9               | 1,2   | 1320  | 15,3  |
| 3.9.                                              | Srpki Miletić            | 3622            | 7244                               | 11,5  | 382                         | 264    | 2091   | 11635   | 120                  | 435    | 53     | 43      | 106   | 637   | 7,4          | 1,9               | 1,2   | 1130  | 13,1  |
|                                                   | S Odžaci                 | 36532           | 62939                              | 100   | 3323                        | 2298   | 18170  | 101089  |                      | 4638   | 460    | 606     | 1141  | 6844  | 79,2         |                   |       | 11689 | 135,3 |
| 4                                                 | KULA                     |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
| 4.1.                                              | Kula (g)                 | 19769           | 19769                              | 28,73 | 629                         | 473    | 3645   | 26155   | 140                  | 2768   | 96     | 554     | 684   | 4101  | 47,5         | 1,7               | 1,2   | 6582  | 76,2  |
| 4.2.                                              | Crvenka (g)              | 10403           | 10403                              | 15,12 | 331                         | 249    | 1918   | 13763   | 140                  | 1456   | 51     | 291     | 360   | 2158  | 25,0         | 1,7               | 1,2   | 3464  | 40,1  |
| 4.3.                                              | Kruščić                  | 2407            | 4814                               | 7,0   | 153                         | 115    | 888    | 6369    | 120                  | 289    | 23     | 29      | 68    | 409   | 4,7          | 1,9               | 1,2   | 734   | 8,5   |
| 4.4.                                              | Lipar                    | 1848            | 3696                               | 5,4   | 118                         | 88     | 681    | 4890    | 120                  | 222    | 18     | 22      | 52    | 314   | 3,6          | 1,9               | 1,2   | 563   | 6,5   |
| 4.5.                                              | N. Crvenka               | 537             | 1074                               | 1,6   | 34                          | 26     | 198    | 1421    | 120                  | 64     | 5      | 6       | 15    | 91    | 1,1          | 1,9               | 1,2   | 164   | 1,9   |
| 4.6.                                              | Ruski Krstur             | 5324            | 10648                              | 15,5  | 339                         | 255    | 1963   | 14088   | 130                  | 692    | 52     | 69      | 163   | 976   | 11,3         | 1,8               | 1,2   | 1669  | 19,3  |
| 4.7.                                              | Sivac                    | 9208            | 18416                              | 26,8  | 586                         | 441    | 3395   | 24365   | 130                  | 1197   | 90     | 120     | 281   | 1688  | 19,5         | 1,8               | 1,2   | 2887  | 33,4  |
|                                                   | S Kula                   | 49496           | 68820                              | 100   | 2188                        | 1647   | 12688  | 91051   |                      | 6688   | 336    | 1091    | 1623  | 9738  | 112,7        |                   |       | 16063 | 185,9 |
|                                                   |                          |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
|                                                   | UKUPNO "A"               | 219444          |                                    |       |                             |        |        |         |                      | 23037  | 3773   | 4623    | 7624  | 45745 | 529,5        |                   |       | 74032 | 856,8 |
|                                                   |                          |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
|                                                   |                          |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
| B. SOUTH, CENTRAL AND OST BAČKA AND PART OF BANAT |                          |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
|                                                   |                          |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
| 5                                                 | BAČ                      |                 |                                    |       |                             |        |        |         |                      |        |        |         |       |       |              |                   |       |       |       |
| 5.1.                                              | Bač (g)                  | 6407            | 6407                               | 23,1  | 246                         | 475    | 2291   | 11846   | 130                  | 833    | 49     | 167     | 210   | 1259  | 14,6         | 1,8               | 1,2   | 2110  | 24,4  |
| 5.2.                                              | B. Novo Selo             | 1297            | 2594                               | 9,4   | 100                         | 192    | 928    | 4796    | 120                  | 156    | 20     | 16      | 38    | 229   | 2,7          | 1,9               | 1,2   | 406   | 4,7   |
| 5.3.                                              | Bođani                   | 1169            | 2338                               | 8,4   | 90                          | 173    | 836    | 4323    | 120                  | 140    | 18     | 14      | 34    | 207   | 2,4          | 1,9               | 1,2   | 366   | 4,2   |
| 5.4.                                              | Vajska                   | 3355            | 6710                               | 24,2  | 258                         | 497    | 2399   | 12407   | 120                  | 403    | 52     | 40      | 99    | 594   | 6,9          | 1,9               | 1,2   | 1050  | 12,2  |
| 5.5.                                              | Plavna                   | 1458            | 2916                               | 10,5  | 112                         | 216    | 1043   | 5392    | 120                  | 175    | 22     | 17      | 43    | 258   | 3,0          | 1,9               | 1,2   | 456   | 5,3   |
| 5.6.                                              | Selenča                  | 3376            | 6752                               | 24,4  | 259                         | 501    | 2414   | 12484   | 120                  | 405    | 52     | 41      | 100   | 597   | 6,9          | 1,9               | 1,2   | 1057  | 12,2  |
|                                                   | S Bač                    | 17062           | 27717                              | 100   | 1064                        | 2055   | 9911   | 51248   |                      | 2112   | 214    | 294     | 524   | 3144  | 36,4         |                   |       | 5446  | 63,0  |

| 1    | COMMUNITY/<br>Settlement | Popula-<br>tion | Equivalent<br>population<br>number |      | Number of domestic annimals |        |        |         | Average daily demand |       |        |        |         |       |       | Max. daily demand |     |        |        |
|------|--------------------------|-----------------|------------------------------------|------|-----------------------------|--------|--------|---------|----------------------|-------|--------|--------|---------|-------|-------|-------------------|-----|--------|--------|
|      |                          |                 |                                    |      | cattle                      | sheeps | swines | poultry | population           |       | d.ann. | others | leakage | Total |       | Daily coeff.      |     | Total  |        |
|      |                          |                 | Total                              | %    | 50l/d                       | 5l/d   | 10l/d  | 1l/d    | l/st.d               | m3/d  | m3/d   | m3/d   | m3/d    | m3/d  | l/s   | Cp                | Co  | m3/d   | l/s    |
| 6    | VRBAS                    | 3               | 4                                  | 5    | 6                           | 7      | 8      | 9       | 10                   | 11    | 12     | 13     | 14      | 15    | 15    | 16                | 17  | 18     | 19     |
| 6.1. | Vrbas (g)                | 26214           | 26214                              | 39,3 | 427                         | 498    | 4157   | 24759   | 150                  | 3932  | 90     | 786    | 962     | 5770  | 66,8  | 1,6               | 1,2 | 8812   | 102,0  |
| 6.2. | B.Dobro Polje            | 3998            | 7996                               | 12,0 | 130                         | 152    | 1268   | 7552    | 120                  | 480   | 28     | 48     | 111     | 666   | 7,7   | 1,9               | 1,2 | 1203   | 13,9   |
| 6.3. | Zmajev                   | 4414            | 8828                               | 13,3 | 144                         | 168    | 1400   | 8338    | 120                  | 530   | 30     | 53     | 123     | 736   | 8,5   | 1,9               | 1,2 | 1328   | 15,4   |
| 6.4. | Kosančić                 | 164             | 328                                | 0,5  | 5                           | 6      | 52     | 310     | 120                  | 20    | 1      | 2      | 5       | 27    | 0,3   | 1,9               | 1,2 | 49     | 0,6    |
| 6.5. | Kucura                   | 4696            | 9392                               | 14,1 | 153                         | 178    | 1489   | 8871    | 120                  | 564   | 32     | 56     | 130     | 783   | 9,1   | 1,9               | 1,2 | 1412   | 16,3   |
| 6.6. | Ravno Selo               | 3524            | 7048                               | 10,6 | 115                         | 134    | 1118   | 6657    | 120                  | 423   | 24     | 42     | 98      | 587   | 6,8   | 1,9               | 1,2 | 1060   | 12,3   |
| 6.7. | Savino Selo              | 3407            | 6814                               | 10,2 | 111                         | 129    | 1081   | 6436    | 120                  | 409   | 23     | 41     | 95      | 568   | 6,6   | 1,9               | 1,2 | 1025   | 11,9   |
|      | S Vrbas                  | 46417           | 66620                              | 100  | 1085                        | 1266   | 10564  | 62922   |                      | 6356  | 229    | 1029   | 1523    | 9137  | 105,8 |                   |     | 14889  | 172,3  |
| 7    | SRBOBRAN                 |                 |                                    |      |                             |        |        |         |                      |       |        |        |         |       |       |                   |     |        |        |
| 7.1. | Srbobran (g)             | 13271           | 13271                              | 57,9 | 603                         | 805    | 3878   | 26478   | 140                  | 1858  | 99     | 372    | 466     | 2795  | 32,3  | 1,7               | 1,2 | 4468   | 51,7   |
| 7.2. | Turića                   | 2595            | 5190                               | 22,7 | 236                         | 315    | 1517   | 10355   | 120                  | 311   | 39     | 31     | 76      | 458   | 5,3   | 1,9               | 1,2 | 811    | 9,4    |
| 7.3. | Nadalj                   | 2222            | 4444                               | 19,4 | 202                         | 269    | 1299   | 8867    | 120                  | 267   | 33     | 27     | 65      | 392   | 4,5   | 1,9               | 1,2 | 694    | 8,0    |
|      | S Srbobran               | 18088           | 22905                              | 100  | 1040                        | 1389   | 6693   | 45700   |                      | 2436  | 172    | 429    | 607     | 3644  | 42,2  |                   |     | 5974   | 69,1   |
| 8    | BEČEJ                    |                 |                                    |      |                             |        |        |         |                      |       |        |        |         |       |       |                   |     |        |        |
| 8.1. | Bečej (g)                | 26325           | 26325                              | 45,9 | 957                         | 2673   | 4610   | 41179   | 150                  | 3949  | 148    | 790    | 977     | 5864  | 67,9  | 1,6               | 1,2 | 8933   | 103,4  |
| 8.2. | B. Gradište              | 5586            | 11172                              | 19,5 | 406                         | 1134   | 1957   | 17476   | 130                  | 726   | 63     | 73     | 172     | 1034  | 12,0  | 1,8               | 1,2 | 1764   | 20,4   |
| 8.3. | B.Petrovo Selo           | 7450            | 14900                              | 26,0 | 541                         | 1513   | 2610   | 23307   | 130                  | 969   | 84     | 97     | 230     | 1379  | 16,0  | 1,8               | 1,2 | 2352   | 27,2   |
| 8.4. | Mileševo                 | 1149            | 2298                               | 4,0  | 84                          | 233    | 402    | 3595    | 120                  | 138   | 13     | 14     | 33      | 198   | 2,3   | 1,9               | 1,2 | 353    | 4,1    |
| 8.5. | Radičević                | 1356            | 2712                               | 4,7  | 99                          | 275    | 475    | 4242    | 120                  | 163   | 15     | 16     | 39      | 233   | 2,7   | 1,9               | 1,2 | 416    | 4,8    |
|      | S Bečej                  | 41866           | 57407                              | 100  | 2086                        | 5828   | 10054  | 89799   |                      | 5944  | 324    | 989    | 1451    | 8709  | 100,8 |                   |     | 13818  | 159,9  |
| 9    | NOVI BEČEJ               |                 |                                    |      |                             |        |        |         |                      |       |        |        |         |       |       |                   |     |        |        |
| 9.1. | Novi Bečej (g)           | 14692           | 14692                              | 36,6 | 2013                        | 3064   | 4714   | 27395   | 140                  | 2057  | 190    | 411    | 532     | 3191  | 36,9  | 1,7               | 1,2 | 5063   | 58,6   |
| 9.2. | Bočar                    | 1934            | 3868                               | 9,6  | 530                         | 807    | 1241   | 7212    | 120                  | 232   | 50     | 23     | 61      | 367   | 4,2   | 1,9               | 1,2 | 635    | 7,3    |
| 9.3. | Kumane                   | 3882            | 7764                               | 19,3 | 1064                        | 1619   | 2491   | 14477   | 120                  | 466   | 101    | 47     | 123     | 736   | 8,5   | 1,9               | 1,2 | 1274   | 14,7   |
| 9.4. | N. Miloševo              | 6908            | 13816                              | 34,4 | 1893                        | 2882   | 4433   | 25762   | 130                  | 898   | 179    | 90     | 233     | 1400  | 16,2  | 1,8               | 1,2 | 2327   | 26,9   |
|      | S Novi Bečej             | 27416           | 40140                              | 100  | 5499                        | 8372   | 12880  | 74846   |                      | 3653  | 520    | 571    | 949     | 5693  | 65,9  |                   |     | 9299   | 107,6  |
|      |                          |                 |                                    |      |                             |        |        |         |                      |       |        |        |         |       |       |                   |     |        |        |
|      | UKUPNO "B"               | 150849          |                                    |      |                             |        |        |         |                      | 20501 | 1459   | 3313   | 5055    | 30327 | 351,0 |                   |     | 49425  | 572,1  |
|      | UKUPNO "A+B"             | 370293          |                                    |      |                             |        |        |         |                      | 43537 | 5232   | 7935   | 76072   | 76072 | 880,5 |                   |     | 123457 | 1428,9 |



|   | COMMUNITY/<br>Settlement | Population | Equivalent population number |   | Number of domestic animals |        |        |         | Average daily demand |      |        |        |         |       |     | Max. daily demand |    |       |     |
|---|--------------------------|------------|------------------------------|---|----------------------------|--------|--------|---------|----------------------|------|--------|--------|---------|-------|-----|-------------------|----|-------|-----|
|   |                          |            |                              |   | cattle                     | sheeps | swines | poultry | population           |      | d.ann. | others | leakage | Total |     | Daily coeff.      |    | Total |     |
|   |                          |            | Total                        | % | 50l/d                      | 5l/d   | 10l/d  | 1l/d    | l/st.d               | m3/d | m3/d   | m3/d   | m3/d    | m3/d  | l/s | Cp                | Co | m3/d  | l/s |
| 1 | 2                        | 3          | 4                            | 5 | 6                          | 7      | 8      | 9       | 10                   | 11   | 12     | 13     | 14      | 15    | 15  | 16                | 17 | 18    | 19  |

# **LEGEND:**

Column (3): Population number by Census 2002

Columns (4), (5): Equivalent population number = Number of population in cities + twofold number of population in villages

Columns (6,7,8 i 9): Number of domestic animals by census 2002

Columns(10), (17): Unique domsrtric water consumption and coefficient of nonuniformity of daily consumption

|                                                     |              |          |
|-----------------------------------------------------|--------------|----------|
| settlements over 20000 stanovnika.....              | 150 l/inh.d, | Cd = 1,6 |
| settlements from 10.000 to 200.000 inhabitants..... | 140 l/inh.d  | Cd = 1,7 |
| settlements from 5.000 to 10.000 inhabitants.....   | 130 l/inh.d  | Cd = 1,8 |
| settlements under 5.000 inhabitants.....            | 120 l/inh.d, | Kd = 1,9 |

Column (13): Others. For cities 20% of population needs. For villages 10% of population needs

Column (14): Leakages. 20% of Sum of (11), (12) i (13) columnes

Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS

| Node | Settlement | Population number                   | Settlement ground level | Water demand in settlement |        | CALCULATION    |      |      |       |       |            |      |       |       |       |     |      |               |      |       |       |
|------|------------|-------------------------------------|-------------------------|----------------------------|--------|----------------|------|------|-------|-------|------------|------|-------|-------|-------|-----|------|---------------|------|-------|-------|
|      |            |                                     |                         |                            |        | MAIN PIPELINES |      |      |       |       | RESERVOIRS |      |       |       |       |     | Head | PUMP STATIONS |      |       |       |
|      |            |                                     |                         |                            |        |                |      |      |       |       |            |      |       |       |       |     |      |               |      |       |       |
|      |            |                                     |                         |                            |        | base           | high | base | high  |       |            |      |       |       |       |     |      |               |      |       |       |
|      |            |                                     | (m)                     | (m3/d)                     | (l/s)  | (l/s)          | (km) | (mm) | (m/s) | (m)   | (m3)       | (m3) | (m3)  | (m3)  | (m3)  | (m) | (m)  | (l/s)         | (m)  | (kW)  | (kW)  |
|      |            | I: OST BRANCH (Apatin - Novi Bečej) |                         |                            |        |                |      |      |       |       |            |      |       |       |       |     |      |               |      |       |       |
| NB1  | Bočar      | 1.934                               | 80                      | 635                        | 7,35   |                |      |      |       |       |            |      | 191   |       | 200   | 40  |      | 7,3           | 10,0 | 1,0   | 2,0   |
| NB2  | N.Miloševo | 6.908                               | 79                      | 2.327                      | 26,93  | 7,30           | 5    | 125  | 0,59  | 15,96 |            |      |       | 698   |       | 600 | 40   |               |      |       |       |
| NB3  | Novi Bečej | 14.692                              | 78                      | 5.063                      | 58,60  | 34,23          | 19   | 250  | 0,70  | 34,10 |            |      |       |       | 600   | 40  |      | 34,1          | 30,0 | 14,3  | 28,6  |
| NB5  | calc. node |                                     |                         |                            | 0,00   | 92,83          | 3    | 300  | 1,31  | 13,83 |            |      |       |       | 1.500 | 45  |      | 92,8          | 30,0 | 39,0  | 58,5  |
| NB4  | Kumane     | 3.882                               | 79                      | 1.274                      | 14,75  |                |      |      |       |       |            |      | 382   |       | 400   | 40  |      | 14,7          | 25,0 | 5,1   | 10,3  |
| NB5  | calc. node |                                     |                         | 0                          | 0,00   | 14,70          | 12   | 200  | 0,47  | 13,76 |            |      |       |       |       |     |      |               |      |       |       |
| B5   | Bečej      |                                     | 81                      |                            |        | 107,53         | 13   | 400  | 0,86  | 18,88 |            |      |       |       |       |     |      |               |      |       |       |
|      | ΣNB        | 27.416                              |                         | 9.299                      | 107,63 |                | 52   |      |       |       |            |      |       |       | 2.700 |     |      |               |      |       | 99,4  |
| B1   | B.P.Selo   | 7.450                               | 81                      | 2.352                      | 27,22  |                |      |      |       |       |            |      | 706   |       | 600   | 40  |      | 27,2          | 35,0 | 13,3  | 26,7  |
| B3   | calc. node |                                     |                         |                            | 0,00   | 27,20          | 10   | 200  | 0,87  | 35,30 |            |      |       |       |       |     |      |               |      |       |       |
| B2   | Mileševo   | 1.149                               | 93                      | 353                        | 4,09   |                |      |      |       |       |            |      | 106   |       | 200   | 30  |      |               |      |       |       |
| B3   | calc. node |                                     |                         |                            | 0,00   | 4,10           | 19   | 100  | 0,52  | 63,21 |            |      |       |       |       |     |      | 4,1           | 60,0 | 3,4   | 6,9   |
| B5   | Bečej      |                                     | 81                      |                            |        | 31,30          | 1    | 200  | 1,00  | 4,58  |            |      |       |       |       |     |      |               |      |       |       |
| B4   | B.Gradište | 5.586                               | 80                      | 1.764                      | 20,42  |                |      |      |       |       |            |      | 529   |       | 500   | 40  |      | 20,4          | 15,0 | 4,3   | 8,6   |
| B5   | Bečej      | 26.325                              | 81                      | 8.933                      | 103,39 | 20,40          | 10   | 200  | 0,65  | 20,82 | 2.500      |      | 2.680 |       | 500   | 45  |      | 262,6         | 50,0 | 183,8 | 220,6 |
| B6   | Radičević  | 1.356                               | 81                      | 416                        | 4,81   | 262,62         | 11   | 500  | 1,34  | 27,70 |            |      | 125   |       | 200   | 24  |      |               |      |       |       |
| SR3  | Srbobran   |                                     | 85                      |                            |        | 267,44         | 12   | 500  | 1,36  | 31,26 |            |      |       |       |       |     |      | 267,4         | 60,0 | 224,6 | 269,5 |
|      | Σ B        | 41.866                              |                         | 13.818                     | 159,93 |                | 63   |      |       |       |            |      |       |       | 2.000 |     |      |               |      |       | 532,2 |
| SR1  | Nadalj     | 2.222                               | 81                      | 694                        | 8,03   | 8,00           | 8    | 150  | 0,45  | 12,38 |            |      | 208   |       | 200   | 35  |      |               |      |       |       |
| SR2  | Turija     | 2.595                               | 81                      | 811                        | 9,39   | 17,39          | 8    | 200  | 0,55  | 12,44 |            |      |       |       | 200   | 40  |      |               |      |       |       |
| SR3  | Srbobran   | 13.271                              | 85                      | 4.468                      | 51,71  |                |      |      |       |       |            |      | 1.340 |       | 300   | 45  |      | 69,1          | 50,0 | 48,4  | 72,6  |
|      |            |                                     |                         |                            |        | 336,54         | 11   | 600  | 1,19  | 17,74 |            |      | 0     | 1.000 |       |     |      |               |      |       |       |
| V7   | Vrbas      |                                     | 84                      |                            |        |                |      |      |       |       |            |      |       |       |       |     |      |               |      |       |       |
|      | Σ SR       | 18.088                              |                         | 5.973                      | 69,13  |                | 27   |      |       |       |            |      |       | 1.000 | 700   |     |      |               |      |       | 72,6  |

**Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS**

| Node | Settlement | ESTIMATION OF INVESTMENT COSTS |            |            |           |               |         |            |                                |        |            |  |
|------|------------|--------------------------------|------------|------------|-----------|---------------|---------|------------|--------------------------------|--------|------------|--|
|      |            | Main pipelines                 |            | Reservoirs |           | Pump stations |         | Total      | Per unit of necessary capacity |        | Per capita |  |
|      |            | €/m                            | €          | €/m3       | €         | €/kW          | €       | €          | €/l/s                          | €/m3/d | €/st       |  |
| NB1  | Bočar      |                                |            | 500        | 100.000   | 1.400         | 2.800   |            |                                |        |            |  |
| NB2  | N.Miloševo | 55                             | 275.000    | 500        | 300.000   |               |         |            |                                |        |            |  |
| NB3  | Novi Bečej | 140                            | 2.660.000  | 500        | 750.000   | 1.200         | 34.373  |            |                                |        |            |  |
| NB5  | calc. node | 180                            | 540.000    |            |           | 1.100         | 64.310  |            |                                |        |            |  |
| NB4  | Kumane     |                                |            | 500        | 200.000   | 1.300         | 13.377  |            |                                |        |            |  |
| NB5  | calc. node | 105                            | 1.260.000  |            |           |               |         |            |                                |        |            |  |
| B5   | Bečej      | 260                            | 3.380.000  |            |           |               |         |            |                                |        |            |  |
|      | Σ NB       |                                | 8.115.000  |            | 1.350.000 |               | 114.860 | 9.579.860  | 89.010                         | 1.030  | 349        |  |
| B1   | B.P.Selo   |                                |            | 500        | 300.000   | 1.200         | 31.987  |            |                                |        |            |  |
| B3   | calc. node | 105                            | 1.050.000  |            |           |               |         |            |                                |        |            |  |
| B2   | Milesevo   |                                |            | 500        | 100.000   |               |         |            |                                |        |            |  |
| B3   | calc. node | 40                             | 760.000    |            |           | 1.400         | 9.643   |            |                                |        |            |  |
| B5   | Bečej      | 105                            | 105.000    |            |           |               |         |            |                                |        |            |  |
| B4   | B.Gradište |                                |            | 500        | 250.000   | 1.400         | 11.995  |            |                                |        |            |  |
| B5   | Bečej      | 105                            | 1.050.000  | 500        | 250.000   | 1.000         | 220.584 |            |                                |        |            |  |
| B6   | Radičević  | 360                            | 3.960.000  |            |           |               |         |            |                                |        |            |  |
| SR3  | Srbobran   | 360                            | 4.320.000  | 500        | 100.000   | 1.000         | 269.539 |            |                                |        |            |  |
|      | Σ B        |                                | 11.245.000 |            | 1.000.000 |               | 543.749 | 12.788.749 | 79.964                         | 926    | 305        |  |
| SR1  | Nadalj     |                                |            | 500        | 100.000   |               |         |            |                                |        |            |  |
| SR2  | Turija     | 70                             | 560.000    |            |           |               |         |            |                                |        |            |  |
| SR3  | Srbobran   | 105                            | 840.000    | 500        | 100.000   |               |         |            |                                |        |            |  |
|      |            |                                |            | 500        | 150.000   | 1.100         | 79.811  |            |                                |        |            |  |
|      |            |                                |            | 300        | 300.000   |               |         |            |                                |        |            |  |
| V7   | Vrbas      | 450                            | 4.950.000  |            |           |               |         |            |                                |        |            |  |
|      | Σ SR       |                                | 6.350.000  |            | 650.000   |               | 79.811  | 7.079.811  | 102.410                        | 1.185  | 391        |  |

Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS

| Node | Settlement           | Population number | Settlement ground level | Water demand in settlement |        | CALCULATION    |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |
|------|----------------------|-------------------|-------------------------|----------------------------|--------|----------------|------|------|------|-------|------------|------|-------|-----|-------|-------|------|---------------|---------|-------|--------|
|      |                      |                   |                         |                            |        | MAIN PIPELINES |      |      |      |       | RESERVOIRS |      |       |     |       |       | Head | PUMP STATIONS |         |       |        |
|      |                      |                   |                         |                            |        |                |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |
|      |                      |                   |                         |                            |        | base           | high | base | high |       |            |      |       |     |       |       |      |               |         |       |        |
| (m)  | (m3/d)               | (l/s)             | (l/s)                   | (km)                       | (mm)   | (m/s)          | (m)  | (m3) | (m3) | (m3)  | (m3)       | (m3) | (m)   | (m) | (l/s) | (m)   | (kW) | N needed      | N inst. |       |        |
| V1   | Ravno selo           | 3.524             | 83                      | 1.060                      | 12,27  | 12,30          | 5    | 150  | 0,70 | 16,93 |            |      | 318   |     | 300   | 40    |      | 12,3          | 20,0    | 3,4   | 6,9    |
| V2   | Zmajev               | 4.414             | 81                      | 1.328                      | 15,37  | 27,67          | 5    | 200  | 0,88 | 18,22 |            |      | 398   |     | 400   | 40    |      | 27,7          | 35,0    | 13,6  | 27,1   |
| V3   | B.D.Polje            | 3.998             | 83                      | 1.203                      | 13,92  | 41,59          | 9    | 250  | 0,85 | 23,10 |            |      | 361   |     | 300   | 40    |      | 13,9          | 20,0    | 3,9   | 7,8    |
| V7   | Vrbas                |                   |                         |                            |        |                |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |
| V4   | Kosančić             | 164               | 83                      | 49                         | 0,57   | 0,60           | 6    | 80   | 0,12 | 1,88  |            |      | 15    |     |       |       |      |               |         |       |        |
| V5   | Sav. selo            | 3.407             | 84                      | 1.025                      | 11,86  | 12,46          | 6    | 150  | 0,71 | 20,82 |            |      | 308   |     | 300   | 40    |      |               |         |       |        |
| V6   | Kucura               | 4.696             | 84                      | 1.412                      | 16,34  | 28,81          | 8    | 200  | 0,92 | 31,39 |            |      | 424   |     | 400   | 45    |      | 12,5          | 20,0    | 3,5   | 7,0    |
| V7   | Vrbas                | 26.214            | 84                      | 8.812                      | 101,99 | 508,93         | 11   | 700  | 1,32 | 17,81 |            |      | 2.644 |     | 2.500 | 45    |      | 28,8          | 30,0    | 12,1  | 24,2   |
| K2   | Kula                 |                   | 88                      |                            |        |                |      |      |      |       |            |      |       |     |       |       |      | 172,4         | 25,0    | 60,3  | 72,4   |
|      | Σ V                  | 46.417            |                         | 14.889                     | 172,33 |                | 50   |      |      |       |            |      |       |     | 4.200 |       |      | 508,9         | 35,0    | 249,4 | 299,2  |
|      | Σ NB+Σ SB+ Σ SR+ Σ ∇ |                   |                         |                            |        |                |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |
|      |                      | 133.787           |                         | 43.979                     | 509,02 |                | 192  |      |      |       |            |      |       |     | 1.000 | 9.600 |      |               |         |       | 1148,8 |
| K1   | Lipar                | 1.848             |                         | 563                        | 6,5    | 6,5            | 11   | 125  | 0,53 | 28,4  |            |      | 169   |     | 150   | 35    |      | 6,5           | 90,0    | 8,2   | 16,4   |
| K2   | Kula                 | 19.769            | 88                      | 6.582                      | 76,2   | 591,6          | 8    | 700  | 1,54 | 17,2  | 400        |      | 1.975 |     | 500   | 45    |      | 76,2          | 50,0    | 53,3  | 64,0   |
| K6   | Crvenka              |                   | 85                      |                            |        |                |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |
| K5   | N.Crvenka            | 557               | 109                     | 164                        | 1,9    | 1,9            | 7    | 80   | 0,38 | 17,2  |            |      | 49    |     | 100   | 35    |      | 2,0           | 55,0    | 1,5   | 3,1    |
| K6   | Crvenka              |                   | 85                      |                            |        |                |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |
| K3   | R.Krstur             | 5.324             | 83                      | 1.669                      | 19,3   | 19,3           | 6    | 200  | 0,61 | 11,3  |            |      | 501   |     | 500   | 40    |      |               |         |       |        |
| K4   | Krušćić              | 2.407             | 86                      | 734                        | 8,5    | 27,8           | 9    | 200  | 0,89 | 33,1  |            |      | 220   |     | 200   | 40    |      | 27,8          | 60,0    | 23,4  | 35,0   |
| K6   | Crvenka              | 10.403            | 85                      | 3.464                      | 40,1   | 661,4          | 8    | 800  | 1,32 | 10,9  |            |      | 1.039 |     | 500   | 45    | 108  | 40,1          | 26,0    | 14,6  | 29,2   |
| K7   | Sivac                | 9.208             | 86                      | 2.887                      | 33,4   | 694,8          | 12   | 800  | 1,38 | 17,9  |            |      | 866   |     | 800   | 45    |      | 33,4          | 15,0    | 7,0   | 14,0   |
| S2   | Kljajićevo           |                   | 90                      |                            |        |                |      |      |      |       |            |      |       |     | 700   | 45    |      |               |         |       |        |
| S1   | Telečka              | 2.125             | 118                     | 769                        | 8,9    | 8,9            | 9    | 125  | 0,73 | 41,3  |            |      | 231   |     | 200   | 35    |      | 8,9           | 60,0    | 7,5   | 15,0   |
| S2   | Kljajićevo           | 6.174             | 90                      | 2.286                      | 26,5   | 730,2          | 1    | 800  | 1,45 | 1,6   |            |      | 686   |     | 700   | 45    |      |               |         |       |        |
| S4   | calc. node           |                   |                         |                            | 0      |                |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |
| S3   | Conoplja             | 4.500             | 90                      | 1.627                      | 18,8   | 18,8           | 4    | 200  | 0,60 | 7,2   |            | 350  | 488   |     | 150   | 36    |      |               |         |       |        |
| S4   | calc. node           |                   |                         |                            | 0      | 749,0          | 12   | 800  | 1,49 | 20,6  |            |      |       |     |       |       |      | 749,0         | 71,0    | 744,5 | 893,4  |
| S15  | Sombor               |                   | 88                      |                            |        |                |      |      |      |       |            |      |       |     |       |       |      |               |         |       |        |

**Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS**

| Node | Settlement           | ESTIMATION OF INVESTMENT COSTS |            |            |           |               |           |            |                                |        |            |  |
|------|----------------------|--------------------------------|------------|------------|-----------|---------------|-----------|------------|--------------------------------|--------|------------|--|
|      |                      | Main pipelines                 |            | Reservoirs |           | Pump stations |           | Total      | Per unit of necessary capacity |        | Per capita |  |
|      |                      | €/m                            | €          | €/m3       | €         | €/kW          | €         | €          | €/l/s                          | €/m3/d | €/st       |  |
| V1   | Ravno selo           |                                |            | 500        | 150.000   | 1.400         | 9.643     |            |                                |        |            |  |
|      |                      | 70                             | 350.000    |            |           |               |           |            |                                |        |            |  |
| V2   | Zmajevo              |                                |            | 500        | 200.000   |               |           |            |                                |        |            |  |
|      |                      | 105                            | 525.000    |            |           | 1.200         | 32.575    |            |                                |        |            |  |
| V3   | B.D.Polje            |                                |            | 500        | 150.000   | 1.400         | 10.898    |            |                                |        |            |  |
|      |                      | 140                            | 1.260.000  |            |           |               |           |            |                                |        |            |  |
| V7   | Vrbas                |                                |            |            |           |               |           |            |                                |        |            |  |
| V4   | Kosančić             |                                |            |            |           |               |           |            |                                |        |            |  |
|      |                      | 30                             | 180.000    |            |           |               |           |            |                                |        |            |  |
| V5   | Sav. selo            |                                |            | 500        | 150.000   |               |           |            |                                |        |            |  |
|      |                      | 70                             | 420.000    |            |           | 1.400         | 9.800     |            |                                |        |            |  |
| V6   | Kucura               |                                |            | 500        | 200.000   |               |           |            |                                |        |            |  |
|      |                      | 105                            | 840.000    |            |           | 1.200         | 29.030    |            |                                |        |            |  |
| V7   | Vrbas                |                                |            | 500        | 1.250.000 | 1.100         | 79.649    |            |                                |        |            |  |
|      |                      | 560                            | 6.160.000  |            |           | 1.000         | 299.233   |            |                                |        |            |  |
| K2   | Kula                 |                                |            |            |           |               |           |            |                                |        |            |  |
|      | Σ V                  |                                | 9.735.000  |            | 2.100.000 |               | 470.828   | 12.305.828 | 71.410                         | 827    | 265        |  |
|      |                      |                                |            |            |           |               |           |            |                                |        |            |  |
|      | Σ NB+Σ SB+ Σ SR+ Σ ▽ |                                |            |            |           |               |           |            |                                |        |            |  |
|      |                      |                                | 35.445.000 |            | 5.100.000 |               | 1.209.248 | 41.754.248 | 82.029                         | 949    | 312        |  |
|      |                      |                                |            |            |           |               |           |            |                                |        |            |  |
| K1   | Lipar                |                                |            | 500        | 75.000    |               |           |            |                                |        |            |  |
|      |                      | 55                             | 605.000    |            |           | 1.300         | 21.294    |            |                                |        |            |  |
| K2   | Kula                 |                                |            | 500        | 250.000   | 1.100         | 70.409    |            |                                |        |            |  |
|      |                      |                                |            | 300        | 300.000   |               |           |            |                                |        |            |  |
|      |                      | 560                            | 4.480.000  |            |           |               |           |            |                                |        |            |  |
| K6   | Crvenka              |                                |            |            |           |               |           |            |                                |        |            |  |
| K5   | N.Crvenka            |                                |            | 500        | 50.000    |               |           |            |                                |        |            |  |
|      |                      | 30                             | 210.000    |            |           | 1.400         | 4.312     |            |                                |        |            |  |
| K6   | Crvenka              |                                |            |            |           |               |           |            |                                |        |            |  |
| K3   | R.Krstur             |                                |            | 500        | 250.000   |               |           |            |                                |        |            |  |
|      |                      | 105                            | 630.000    |            |           |               |           |            |                                |        |            |  |
| K4   | Kruščić              |                                |            | 500        | 100.000   |               |           |            |                                |        |            |  |
|      |                      | 105                            | 945.000    |            |           | 1.200         | 42.034    |            |                                |        |            |  |
| K6   | Crvenka              |                                |            | 500        | 250.000   | 1.200         | 35.031    |            |                                |        |            |  |
|      |                      | 670                            | 5.360.000  |            |           |               |           |            |                                |        |            |  |
| K7   | Sivac                |                                |            | 500        | 400.000   | 1.300         | 18.236    |            |                                |        |            |  |
|      |                      | 670                            | 8.040.000  |            |           |               |           |            |                                |        |            |  |
| S2   | Kljajićevo           |                                |            | 500        | 350.000   |               |           |            |                                |        |            |  |
| S1   | Telecka              |                                |            | 500        | 100.000   |               |           |            |                                |        |            |  |
|      |                      | 55                             | 495.000    |            |           | 1.300         | 19.438    |            |                                |        |            |  |
| S2   | Kljajićevo           |                                |            | 500        | 350.000   |               |           |            |                                |        |            |  |
|      |                      | 670                            | 670.000    |            |           |               |           |            |                                |        |            |  |
| S4   | calc. node           |                                |            |            |           |               |           |            |                                |        |            |  |
| S3   | Conoplja             |                                |            | 500        | 75.000    |               |           |            |                                |        |            |  |
|      |                      | 105                            | 420.000    |            |           |               |           |            |                                |        |            |  |
| S4   | calc. node           |                                |            |            |           |               |           |            |                                |        |            |  |
|      |                      | 670                            | 8.040.000  |            |           | 900           | 804.066   |            |                                |        |            |  |
| S15  | Sombor               |                                |            |            |           |               |           |            |                                |        |            |  |

Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS

| Node | Settlement | Population number | Settlement ground level | Water demand in settlement |        | CALCULATION    |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
|------|------------|-------------------|-------------------------|----------------------------|--------|----------------|----------|-----------------|-----------------|----------------|----------------|------|---------------|-------------------------|--------|-----|--------|---------------|-------|----------|---------|
|      |            |                   |                         |                            |        | MAIN PIPELINES |          |                 |                 |                | RESERVOIRS     |      |               |                         |        |     | Head   | PUMP STATIONS |       |          |         |
|      |            |                   |                         |                            |        | Discharge Q    | Length L | Pipe diameter D | Flow velocity V | Loss of head h | Existig volume |      | Needed volume | Planed volume and hight |        |     |        | Qp            | Hp    | N needed | N inst. |
|      |            |                   |                         |                            |        |                |          |                 |                 |                | base           | high |               | base                    | high   |     |        |               |       |          |         |
|      |            | (m)               | (m3/d)                  | (l/s)                      | (l/s)  | (km)           | (mm)     | (m/s)           | (m)             | (m3)           | (m3)           | (m3) | (m3)          | (m3)                    | (m)    | (m) | (l/s)  | (m)           | (kW)  | (kW)     |         |
| S5   | Bački Breg | 1.429             | 96                      | 519                        | 6,0    |                |          |                 |                 |                |                |      | 156           |                         | 150    | 35  |        |               |       |          |         |
|      |            |                   |                         |                            |        | 6,0            | 5        | 125             | 0,49            | 11,2           |                |      |               |                         |        |     | 6,0    | 45,0          | 3,8   | 7,6      |         |
| S6   | Kolut      | 1.750             | 88                      | 633                        | 7,3    |                |          |                 |                 |                |                |      | 190           |                         | 200    | 40  |        | 7,3           | 30,0  | 3,1      | 6,1     |
|      |            |                   |                         |                            |        | 13,3           | 5        | 150             | 0,75            | 19,6           |                |      |               |                         |        |     |        |               |       |          |         |
| S7   | Bezdan     | 5.411             | 88                      | 2.003                      | 23,2   |                |          |                 |                 |                |                | 500  | 601           |                         |        |     |        | 23,2          | 25,0  | 8,1      | 16,2    |
|      |            |                   |                         |                            |        | 36,5           | 7        | 250             | 0,74            | 14,1           |                |      |               |                         |        |     |        |               |       |          |         |
| S8   | B.Monoštor | 4.020             | 87                      | 1.454                      | 16,8   |                |          |                 |                 |                |                |      | 436           |                         | 500    | 45  |        |               |       |          |         |
|      |            |                   |                         |                            |        | 53,3           | 15       | 300             | 0,75            | 24,8           |                |      |               |                         |        |     |        |               |       |          |         |
| S15  | Sombor     |                   | 88                      |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     | 53,3   | 71,0          | 53,0  | 63,6     |         |
| S9   | Rastina    | 574               | 91                      | 209                        | 2,4    |                |          |                 |                 |                |                |      | 63            |                         | 100    | 35  |        | 2,4           | 24,0  | 0,8      | 1,6     |
|      |            |                   |                         |                            |        | 2,4            | 8        | 100             | 0,31            | 10,1           |                |      |               |                         |        |     |        |               |       |          |         |
| S10  | Gakovo     | 2.257             | 90                      | 816                        | 9,4    |                |          |                 |                 |                |                |      | 245           |                         | 200    | 40  |        | 11,8          | 30,0  | 5,0      | 9,9     |
|      |            |                   |                         |                            |        | 11,8           | 16       | 150             | 0,67            | 50,6           |                |      |               |                         |        |     | 11,8   | 71,0          | 11,7  | 23,5     |         |
| S15  | Sombor     |                   | 88                      |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
| S11  | Ridica     | 2.677             | 98                      | 968                        | 11,2   |                |          |                 |                 |                |                |      | 290           |                         | 300    | 40  |        |               |       |          |         |
|      |            |                   |                         |                            |        | 11,2           | 9        | 150             | 0,63            | 25,7           |                |      |               |                         |        |     | 11,2   | 20,0          | 3,1   | 6,3      |         |
| S12  | Stanišić   | 4.934             | 99                      | 1.904                      | 22,0   |                |          |                 |                 |                |                |      | 571           |                         | 500    | 45  |        | 33,2          | 30,0  | 13,9     | 27,9    |
|      |            |                   |                         |                            |        | 33,2           | 10       | 250             | 0,68            | 17,0           |                |      |               |                         |        |     |        |               |       |          |         |
| S14  | Sv.Miletić |                   | 93                      |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
| S13  | A.Santić   | 2.218             | 121                     | 802                        | 9,3    |                |          |                 |                 |                |                |      | 241           |                         | 200    | 40  |        |               |       |          |         |
|      |            |                   |                         |                            |        | 9,3            | 13       | 150             | 0,53            | 26,4           |                |      |               |                         |        |     | 9,3    | 45,0          | 5,9   | 11,7     |         |
| S14  | Sv.Miletić | 3.235             | 93                      | 1.170                      | 13,5   |                |          |                 |                 |                |                |      | 351           |                         | 300    | 40  |        |               |       |          |         |
|      |            |                   |                         |                            |        | 56,1           | 12       | 300             | 0,79            | 21,7           |                |      |               |                         |        |     | 56,1   | 71,0          | 55,8  | 66,9     |         |
| S15  | Sombor     | 52.385            | 88                      | 17.977                     | 208,1  |                |          |                 |                 |                | 4.500          |      | 5.393         |                         | 1.000  | 50  | 208,1  | 55,0          | 160,2 | 192,3    |         |
|      |            |                   |                         |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     | 300,0  | 55,0          | 231,0 | 277,2    |         |
|      |            |                   |                         |                            |        | 1078,3         | 11       | 900             | 1,69            | 20,7           |                |      |               |                         |        |     |        |               |       |          |         |
| A2   | calc. node |                   |                         |                            | 0      |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
| A1   | Kupusina   | 2.458             | 86                      | 749                        | 8,7    |                |          |                 |                 |                | 170            |      | 225           |                         | 200    | 35  |        | 8,7           | 25,0  | 3,0      | 6,1     |
|      |            |                   |                         |                            |        | 8,7            | 3        | 125             | 0,71            | 13,2           |                |      |               |                         |        |     |        |               |       |          |         |
| A2   | calc. node |                   |                         |                            | 0      |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
|      |            |                   |                         |                            | 0,0    | 1087,0         | 7        | 900             | 1,71            | 13,4           |                |      |               |                         |        |     | 1087,0 | 40,0          | 608,7 | 730,5    |         |
| A0   | PPV        |                   |                         |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
| A3   | Apatin     | 20.009            | 85                      | 6.765                      | 78,3   |                |          |                 |                 |                | 2.500          | 500  | 2.030         |                         |        |     |        | 78,3          | 45,0  | 49,3     | 74,0    |
|      |            |                   |                         |                            |        | 78,3           | 2        | 300             | 1,11            | 6,7            |                |      |               |                         |        |     | 78,3   | 10,0          | 11,0  | 21,9     |         |
| A0   | PPV        |                   |                         |                            | 0      |                |          |                 |                 |                |                |      |               | 10.000                  |        |     | 150,0  | 45,0          | 94,5  | 113,4    |         |
|      |            |                   |                         |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
|      | Σ WBD-1    | 165.652           |                         | 56.714                     | 656,4  |                | 210      |                 |                 |                |                |      |               | 11.000                  | 8.150  |     |        |               |       | 2726,7   |         |
| I    | OST BRANCH | 299.439           |                         | 100.693                    | 1165,4 |                | 402      |                 |                 |                |                |      |               | 12.000                  | 17.750 |     |        |               |       | 3875,6   |         |
|      |            |                   |                         |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |
|      |            |                   |                         |                            |        |                |          |                 |                 |                |                |      |               |                         |        |     |        |               |       |          |         |

**Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS**

| Node | Settlement | ESTIMATION OF INVESTMENT COSTS |            |            |            |               |           |             |                                |        |            |  |
|------|------------|--------------------------------|------------|------------|------------|---------------|-----------|-------------|--------------------------------|--------|------------|--|
|      |            | Main pipelines                 |            | Reservoirs |            | Pump stations |           | Total       | Per unit of necessary capacity |        | Per capita |  |
|      |            | €/m                            | €          | €/m3       | €          | €/kW          | €         | €           | €/l/s                          | €/m3/d | €/st       |  |
| S5   | Bački Breg |                                |            | 500        | 75.000     |               |           |             |                                |        |            |  |
|      |            | 55                             | 275.000    |            |            | 1.400         | 10.584    |             |                                |        |            |  |
| S6   | Kolut      |                                |            | 500        | 100.000    | 1.400         | 8.585     |             |                                |        |            |  |
|      |            | 70                             | 350.000    |            |            |               |           |             |                                |        |            |  |
| S7   | Bezdan     |                                |            |            |            | 1.300         | 21.112    |             |                                |        |            |  |
|      |            | 140                            | 980.000    |            |            |               |           |             |                                |        |            |  |
| S8   | B.Monoštor |                                |            | 500        | 250.000    |               |           |             |                                |        |            |  |
|      |            | 180                            | 2.700.000  |            |            | 1.100         | 69.934    |             |                                |        |            |  |
| S15  | Sombor     |                                |            |            |            |               |           |             |                                |        |            |  |
| S9   | Rastina    |                                |            | 500        | 50.000     | 2.000         | 3.226     |             |                                |        |            |  |
|      |            | 40                             | 320.000    |            |            |               |           |             |                                |        |            |  |
| S10  | Gakovo     |                                |            | 500        | 100.000    | 1.400         | 13.877    |             |                                |        |            |  |
|      |            | 70                             | 1.120.000  |            |            | 1.200         | 28.150    |             |                                |        |            |  |
| S15  | Sombor     |                                |            |            |            |               |           |             |                                |        |            |  |
| S11  | Ridica     |                                |            | 500        | 150.000    |               |           |             |                                |        |            |  |
|      |            | 70                             | 630.000    |            |            | 1.400         | 8.781     |             |                                |        |            |  |
| S12  | Stanišić   |                                |            | 500        | 250.000    |               |           |             |                                |        |            |  |
|      |            | 140                            | 1.400.000  |            |            | 1.200         | 33.466    |             |                                |        |            |  |
| S14  | Sv.Miletić |                                |            |            |            |               |           |             |                                |        |            |  |
| S13  | A.Santić   |                                |            | 500        | 100.000    |               |           |             |                                |        |            |  |
|      |            | 70                             | 910.000    |            |            | 1.300         | 15.233    |             |                                |        |            |  |
| S14  | Sv.Miletić |                                |            | 500        | 150.000    |               |           |             |                                |        |            |  |
|      |            | 180                            | 2.160.000  |            |            | 1.100         | 73.608    |             |                                |        |            |  |
| S15  | Sombor     |                                |            | 500        | 500.000    | 1.000         | 192.284   |             |                                |        |            |  |
|      |            |                                |            |            |            | 1.000         | 277.200   |             |                                |        |            |  |
| A2   | calc. node | 780                            | 8.580.000  |            |            |               |           |             |                                |        |            |  |
| A1   | Kupusina   |                                |            | 500        | 100.000    | 1.400         | 8.526     |             |                                |        |            |  |
|      |            | 55                             | 165.000    |            |            |               |           |             |                                |        |            |  |
| A2   | calc. node |                                |            |            |            |               |           |             |                                |        |            |  |
|      |            | 780                            | 5.460.000  |            |            | 900           | 657.418   |             |                                |        |            |  |
| A0   | PPV        |                                |            |            |            |               |           |             |                                |        |            |  |
| A3   | Apatin     |                                |            |            |            | 1.100         | 81.393    |             |                                |        |            |  |
|      |            | 780                            | 1.560.000  |            |            | 1.200         | 26.309    |             |                                |        |            |  |
| A0   | PPV        |                                |            | 300        | 3.000.000  | 1.000         | 113.400   |             |                                |        |            |  |
|      |            |                                |            |            |            |               |           |             |                                |        |            |  |
|      | Σ WBD-1    |                                | 56.505.000 |            | 7.375.000  |               | 2.657.905 | 66.537.905  | 101.366                        | 1.173  | 402        |  |
| I    | OST BRANCH |                                | 91.950.000 |            | 12.475.000 |               | 3.867.152 | 108.292.152 | 92.920                         | 1.075  |            |  |
|      |            |                                |            |            |            |               |           |             |                                |        |            |  |
|      |            |                                |            |            |            |               |           |             |                                |        |            |  |

Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS

| Node | Settlement  | Population number               | Settlement ground level<br>(m) | Water demand in settlement<br>(m3/d) (l/s) |      | CALCULATION          |                  |                         |                          |                       |                |              |                       |                         |              |             |             |               |                  |                 |  |
|------|-------------|---------------------------------|--------------------------------|--------------------------------------------|------|----------------------|------------------|-------------------------|--------------------------|-----------------------|----------------|--------------|-----------------------|-------------------------|--------------|-------------|-------------|---------------|------------------|-----------------|--|
|      |             |                                 |                                |                                            |      | MAIN PIPELINES       |                  |                         |                          |                       | RESERVOIRS     |              |                       |                         |              |             | Head<br>(m) | PUMP STATIONS |                  |                 |  |
|      |             |                                 |                                |                                            |      | Discharge Q<br>(l/s) | Length L<br>(km) | Pipe diameter D<br>(mm) | Flow velocity V<br>(m/s) | Loss of head h<br>(m) | Existig volume |              | Needed volume<br>(m3) | Planed volume and hight |              |             |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      |                      |                  |                         |                          |                       | base<br>(m3)   | high<br>(m3) |                       | base<br>(m3)            | high<br>(m3) | Qp<br>(l/s) |             | Hp<br>(m)     | N needed<br>(kW) | N inst.<br>(kW) |  |
|      |             |                                 |                                |                                            |      |                      |                  |                         |                          |                       |                |              |                       |                         |              |             |             |               |                  |                 |  |
|      |             | II: SOUTH BRANCH (Apatin - Bač) |                                |                                            |      |                      |                  |                         |                          |                       |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC1  | B.Novo Selo | 1297                            | 81                             | 406                                        | 4,7  |                      |                  |                         |                          |                       |                |              | 122                   | 200                     | 35           | 116         |             |               |                  |                 |  |
| BC3  | calc. node  |                                 |                                |                                            | 0    | 4,7                  | 9                | 100                     | 0,60                     | 38,4                  |                |              |                       |                         |              | 154,1       |             |               |                  |                 |  |
| BC2  | Plavna      | 1458                            | 83                             | 456                                        | 5,3  |                      |                  |                         |                          |                       |                |              | 137                   | 200                     | 35           | 118         |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 5,3                  | 6                | 100                     | 0,67                     | 31,9                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC3  | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              | 154,1       | 10,0        | 50,0          | 7,0              | 14,0            |  |
|      |             |                                 |                                |                                            |      | 10                   | 5                | 125                     | 0,81                     | 28,4                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC6  | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              | 122,5       |             |               |                  |                 |  |
| BC4  | Bođani      | 1169                            | 85                             | 366                                        | 4,2  |                      |                  |                         |                          |                       |                |              | 110                   | 200                     | 35           | 120         | 4,2         | 22,0          | 1,3              | 2,6             |  |
|      |             |                                 |                                |                                            |      | 4,2                  | 3                | 100                     | 0,53                     | 10,4                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC5  | Vajska      | 3355                            | 84                             | 1050                                       | 12,2 |                      |                  |                         |                          |                       |                |              | 315                   | 300                     | 40           | 124         | 12,2        | 15,0          | 2,6              | 5,1             |  |
|      |             |                                 |                                |                                            |      | 16,4                 | 9                | 200                     | 0,52                     | 12,5                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC6  | calc. node  |                                 |                                |                                            | 0,0  |                      |                  |                         |                          |                       |                |              |                       |                         |              | 122,5       |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 26,4                 | 1                | 200                     | 0,84                     | 3,3                   |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC7  | Bač         | 6407                            | 84                             | 2110                                       | 24,4 |                      |                  |                         |                          |                       |                |              | 633                   | 500                     | 40           | 125         |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 50,8                 | 1                | 250                     | 1,03                     | 3,7                   |                |              |                       |                         |              |             | 50,8        | 15,0          | 10,7             | 21,3            |  |
| BC9  | calc. node  |                                 |                                |                                            | 0,0  |                      |                  |                         |                          |                       |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC8  | Selenča     | 3376                            | 86                             | 1057                                       | 12,2 |                      |                  |                         |                          |                       |                |              | 317                   | 300                     | 40           | 126         | 12,2        | 28,0          | 4,8              | 9,6             |  |
|      |             |                                 |                                |                                            |      | 12,2                 | 4                | 150                     | 0,69                     | 13,3                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| BC9  | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              | 114,5       |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 63,0                 | 7                | 300                     | 0,89                     | 15,7                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O1   | Deronje     |                                 |                                |                                            |      |                      |                  |                         |                          |                       |                |              |                       |                         |              | 130,2       |             |               |                  |                 |  |
|      | Σ BC        | 17062                           |                                | 5445                                       | 63,0 |                      | 45               |                         |                          |                       |                |              |                       | 1.700                   |              |             |             |               |                  | 52,6            |  |
|      |             |                                 |                                |                                            |      |                      |                  |                         |                          |                       |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O1   | Deronje     | 2959                            | 85                             | 923                                        | 10,7 |                      |                  |                         |                          |                       | 45             |              | 277                   | 250                     | 40           | 130,2       | 10,7        | 20,0          | 3,0              | 6,0             |  |
|      |             |                                 |                                |                                            |      | 73,7                 | 6                | 300                     | 1,04                     | 18,0                  |                |              |                       |                         |              | 148,2       |             |               |                  |                 |  |
| O5   | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O2   | Ratkovo     | 4233                            | 86                             | 1320                                       | 15,3 |                      |                  |                         |                          |                       | 160            |              | 396                   | 400                     | 40           |             | 15,3        | 45,0          | 9,6              | 19,3            |  |
|      |             |                                 |                                |                                            |      | 15,3                 | 7                | 150                     | 0,87                     | 35,4                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O4   | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              | 125,1       |             |               |                  |                 |  |
| O3   | Lalić       | 1706                            | 84                             | 532                                        | 6,2  |                      |                  |                         |                          |                       |                |              | 160                   | 200                     | 40           | 124         |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 6,2                  | 9                | 125                     | 0,51                     | 21,3                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O4   | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              | 145,9       |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 21,5                 | 1                | 200                     | 0,68                     | 2,3                   |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O5   | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              | 148,2       |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 95,2                 | 1                | 300                     | 1,35                     | 4,8                   |                |              |                       |                         |              |             | 95,2        | 68,0          | 90,6             | 108,8           |  |
| O7   | Odžaci      |                                 | 85                             |                                            |      |                      |                  |                         |                          |                       |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O6   | Karavukovo  | 5139                            | 86                             | 1648                                       | 19,1 |                      |                  |                         |                          |                       | 30             |              | 494                   | 500                     | 40           | 126         |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 19,1                 | 4                | 200                     | 0,61                     | 7,4                   |                |              |                       |                         |              |             | 19,1        | 45,0          | 12,0             | 24,1            |  |
| O7   | Odžaci      | 10125                           | 85                             | 3407                                       | 39,4 |                      |                  |                         |                          |                       | 890            |              | 1.022                 | 300                     | 40           | 125         | 39,4        | 40,0          | 22,1             | 33,1            |  |
|      |             |                                 |                                |                                            |      | 153,7                | 7                | 400                     | 1,22                     | 19,7                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O9   | calc. node  |                                 |                                |                                            | 0,0  |                      |                  |                         |                          |                       |                |              |                       |                         |              | 108,9       |             |               |                  |                 |  |
| O8   | B.Gračac    | 2991                            | 84                             | 933                                        | 10,8 |                      |                  |                         |                          |                       |                | 200          | 280                   | 100                     | 45           | 129         | 10,8        | 40,0          | 6,0              | 12,1            |  |
|      |             |                                 |                                |                                            |      | 10,8                 | 7                | 150                     | 0,61                     | 18,7                  |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O9   | calc. node  |                                 |                                |                                            | 0    |                      |                  |                         |                          |                       |                |              |                       |                         |              | 108,9       |             |               |                  |                 |  |
|      |             |                                 |                                |                                            |      | 164,5                | 1                | 400                     | 1,31                     | 3,2                   |                |              |                       |                         |              |             |             |               |                  |                 |  |
| O11  | Sr.Miletić  |                                 | 88                             |                                            |      |                      |                  |                         |                          |                       |                |              |                       |                         |              | 128         | 13,1        | 20,0          | 3,7              | 7,3             |  |



**Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS**

| Node | Settlement  | ESTIMATION OF INVESTMENT COSTS |                  |                  |                |               |               |                  |                                |                     |            |  |
|------|-------------|--------------------------------|------------------|------------------|----------------|---------------|---------------|------------------|--------------------------------|---------------------|------------|--|
|      |             | Main pipelines                 |                  | Reservoirs       |                | Pump stations |               | Total            | Per unit of necessary capacity |                     | Per capita |  |
|      |             | €/m                            | €                | €/m <sup>3</sup> | €              | €/kW          | €             | €                | €/l/s                          | €/m <sup>3</sup> /d | €/st       |  |
|      |             |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| BC1  | B.Novo Selo |                                |                  | 500              | 100.000        |               |               |                  |                                |                     |            |  |
|      |             | 40                             | 360.000          |                  |                |               |               |                  |                                |                     |            |  |
| BC3  | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| BC2  | Plavna      |                                |                  | 500              | 100.000        |               |               |                  |                                |                     |            |  |
|      |             | 40                             | 240.000          |                  |                |               |               |                  |                                |                     |            |  |
| BC3  | calc. node  |                                |                  |                  |                | 1.300         | 18.200        |                  |                                |                     |            |  |
|      |             | 55                             | 275.000          |                  |                |               |               |                  |                                |                     |            |  |
| BC6  | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| BC4  | Bođani      |                                |                  | 500              | 100.000        | 2.000         | 5.174         |                  |                                |                     |            |  |
|      |             | 40                             | 120.000          |                  |                |               |               |                  |                                |                     |            |  |
| BC5  | Vajska      |                                |                  | 500              | 150.000        | 1.400         | 7.174         |                  |                                |                     |            |  |
|      |             | 105                            | 945.000          |                  |                |               |               |                  |                                |                     |            |  |
| BC6  | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
|      |             | 105                            | 105.000          |                  |                |               |               |                  |                                |                     |            |  |
| BC7  | Bač         |                                |                  | 500              | 250.000        |               |               |                  |                                |                     |            |  |
|      |             | 140                            | 140.000          |                  |                | 1.200         | 25.603        |                  |                                |                     |            |  |
| BC9  | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| BC8  | Selenča     |                                |                  | 500              | 150.000        | 1.400         | 13.391        |                  |                                |                     |            |  |
|      |             | 70                             | 280.000          |                  |                |               |               |                  |                                |                     |            |  |
| BC9  | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
|      |             | 180                            | 1.260.000        |                  |                |               |               |                  |                                |                     |            |  |
| O1   | Deronje     |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
|      | <b>Σ BC</b> |                                | <b>3.725.000</b> |                  | <b>850.000</b> |               | <b>69.542</b> | <b>4.644.542</b> | <b>73.699</b>                  | <b>853</b>          | <b>272</b> |  |
|      |             |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| O1   | Deronje     |                                |                  | 500              | 125.000        | 1.400         | 8.389         |                  |                                |                     |            |  |
|      |             | 180                            | 1.080.000        |                  |                |               |               |                  |                                |                     |            |  |
| O5   | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| O2   | Ratkovo     |                                |                  | 500              | 200.000        | 1.300         | 25.061        |                  |                                |                     |            |  |
|      |             | 70                             | 490.000          |                  |                |               |               |                  |                                |                     |            |  |
| O4   | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| O3   | Lalić       |                                |                  | 500              | 100.000        |               |               |                  |                                |                     |            |  |
|      |             | 55                             | 495.000          |                  |                |               |               |                  |                                |                     |            |  |
| O4   | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
|      |             | 105                            | 105.000          |                  |                |               |               |                  |                                |                     |            |  |
| O5   | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
|      |             | 180                            | 180.000          |                  |                | 1.100         | 119.632       |                  |                                |                     |            |  |
| O7   | Odžaci      |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| O6   | Karavukovo  |                                |                  | 500              | 250.000        |               |               |                  |                                |                     |            |  |
|      |             | 105                            | 420.000          |                  |                | 1.200         | 28.879        |                  |                                |                     |            |  |
| O7   | Odžaci      |                                |                  | 500              | 150.000        | 1.200         | 39.715        |                  |                                |                     |            |  |
|      |             | 260                            | 1.820.000        |                  |                |               |               |                  |                                |                     |            |  |
| O9   | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
| O8   | B.Gračac    |                                |                  | 500              | 50.000         | 1.300         | 15.725        |                  |                                |                     |            |  |
|      |             | 70                             | 490.000          |                  |                |               |               |                  |                                |                     |            |  |
| O9   | calc. node  |                                |                  |                  |                |               |               |                  |                                |                     |            |  |
|      |             | 260                            | 260.000          |                  |                |               |               |                  |                                |                     |            |  |
| O11  | Sr.Miletić  |                                |                  |                  |                | 1.400         | 10.270        |                  |                                |                     |            |  |

Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS

| Node   | Settlement   | Population number | Settlement ground level | Water demand in settlement |        | CALCULATION    |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|--------|--------------|-------------------|-------------------------|----------------------------|--------|----------------|------|------|-------|------|------------|------|------|--------|--------|-----|-------|---------------|------|-------|---------|-------------|
|        |              |                   |                         |                            |        | MAIN PIPELINES |      |      |       |      | RESERVOIRS |      |      |        |        |     | Head  | PUMP STATIONS |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         | Discharge Q |
|        |              |                   |                         |                            |        | base           | high | base | high  |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   | (m)                     | (m3/d)                     | (l/s)  | (l/s)          | (km) | (mm) | (m/s) | (m)  | (m3)       | (m3) | (m3) | (m3)   | (m3)   | (m) | (m)   | (l/s)         | (m)  | (kW)  | N inst. | (kW)        |
| O10    | Bogojevo     | 2187              | 85                      | 682                        | 7,9    |                |      |      |       |      |            |      | 205  |        | 200    | 40  | 125   |               |      |       |         |             |
| O11    | Sr.Miletić   | 3622              | 88                      | 1130                       | 13,1   | 7,9            | 7    | 125  | 0,64  | 25,8 |            |      | 339  |        | 300    | 40  | 111,2 | 7,9           | 40,0 | 4,4   | 8,8     |             |
| S17    | Doroslovo    | 1885              | 88                      | 682                        | 7,9    | 185,5          | 6    | 500  | 0,94  | 7,9  |            |      |      |        |        |     | 185,5 | 20,0          | 51,9 | 62,3  |         |             |
| S16    | Stapar       |                   | 88                      |                            |        | 193,4          | 7    | 500  | 0,98  | 10,0 |            |      | 205  |        | 200    | 40  | 128   | 7,9           | 30,0 | 3,3   | 6,6     |             |
| O12    | B.Brestovac  | 3570              | 87                      | 1114                       | 12,9   |                |      |      |       |      |            |      |      |        |        |     | 110,7 |               |      |       |         |             |
|        |              |                   |                         |                            |        | 12,9           | 8    | 150  | 0,73  | 29,6 |            |      | 334  |        | 300    | 40  | 127   |               |      |       |         |             |
| S16    | Stapar       | 3817              | 88                      | 1380                       | 16,0   |                |      |      |       |      |            |      |      |        |        |     | 12,9  | 29,6          | 5,3  | 10,7  |         |             |
|        |              |                   |                         |                            |        | 222,2          | 11   | 500  | 1,13  | 20,3 |            |      | 414  |        | 400    | 40  | 128   | 16,0          | 20,0 | 4,5   | 9,0     |             |
| A7     | Prigrevica   | 4964              | 85                      | 1512                       | 17,5   |                |      |      |       |      |            | 500  | 454  |        |        |     | 131   |               |      |       |         |             |
| A6     | calc. node   |                   |                         |                            | 0      | 239,7          | 3    | 500  | 1,22  | 6,4  |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     | 137,4 |               |      |       |         |             |
| A4     | Sonta        | 5190              | 85                      | 1626                       | 18,8   |                |      |      |       |      |            | 500  | 488  |        |        |     | 125   | 18,8          | 15,0 | 3,9   | 7,9     |             |
| A5     | Svilosjevo   | 1404              | 86                      | 428                        | 5,0    | 18,8           | 7    | 200  | 0,60  | 12,6 |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        | 23,8           | 4    | 200  | 0,76  | 11,0 |            |      |      |        | 200    | 35  | 126   |               |      |       |         |             |
| A6     | calc. node   |                   |                         |                            | 0      |                |      |      |       |      |            |      |      |        |        |     | 137,4 |               |      |       |         |             |
|        |              |                   |                         |                            |        | 263,5          | 5    | 500  | 1,34  | 12,7 |            |      |      |        |        |     |       |               |      |       |         |             |
| A3     | Apatin       |                   | 85                      |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        | 263,5          | 2    | 500  | 1,34  | 5,1  |            |      |      |        |        |     |       | 263,5         | 70,0 | 258,2 | 309,9   |             |
| A0     | PPV          |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     | 155   |               |      |       |         |             |
|        | Σ WBD -2     | 53792             |                         | 17317                      | 200,4  |                | 103  |      |       |      |            |      |      |        | 3.350  |     |       |               |      |       | 625,9   |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
| II     | SOUTH BRANCH | 70854             |                         | 22762                      | 263,4  |                | 148  |      |       |      |            |      |      |        | 5.050  |     |       |               |      |       | 678,5   |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        | WBD          | 219444            |                         | 74031                      | 856,8  |                | 313  |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
| I + II |              | 370.293           |                         | 123455                     | 1428,9 |                | 550  |      |       |      |            |      |      | 12.000 | 22.800 |     |       |               |      |       | 4554,0  |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |
|        |              |                   |                         |                            |        |                |      |      |       |      |            |      |      |        |        |     |       |               |      |       |         |             |

**Table 4.2.: ESTIMATION OF DISTRIBUTION SYSTEM ELEMENTS**

| Node   | Settlement   | ESTIMATION OF INVESTMENT COSTS |             |            |            |               |           |             |                                |        |            |  |
|--------|--------------|--------------------------------|-------------|------------|------------|---------------|-----------|-------------|--------------------------------|--------|------------|--|
|        |              | Main pipelines                 |             | Reservoirs |            | Pump stations |           | Total       | Per unit of necessary capacity |        | Per capita |  |
|        |              | €/m                            | €           | €/m3       | €          | €/kW          | €         | €           | €/l/s                          | €/m3/d | €/st       |  |
| O10    | Bogojevo     |                                |             | 500        | 100.000    |               |           |             |                                |        |            |  |
|        |              | 55                             | 385.000     |            |            | 1.400         | 12.387    |             |                                |        |            |  |
| O11    | Sr.Miletić   |                                |             | 500        | 150.000    |               |           |             |                                |        |            |  |
|        |              | 360                            | 2.160.000   |            |            | 1.100         | 68.561    |             |                                |        |            |  |
| S17    | Doroslovo    |                                |             | 500        | 100.000    | 1.400         | 9.290     |             |                                |        |            |  |
|        |              | 360                            | 2.520.000   |            |            |               |           |             |                                |        |            |  |
| S16    | Stapar       |                                |             |            |            |               |           |             |                                |        |            |  |
| O12    | B.Brestovac  |                                |             | 500        | 150.000    |               |           |             |                                |        |            |  |
|        |              | 70                             | 560.000     |            |            | 1.300         | 13.899    |             |                                |        |            |  |
| S16    | Stapar       |                                |             | 500        | 200.000    | 1.400         | 12.544    |             |                                |        |            |  |
|        |              | 360                            | 3.960.000   |            |            |               |           |             |                                |        |            |  |
| A7     | Prigrevica   |                                |             |            |            |               |           |             |                                |        |            |  |
|        |              | 360                            | 1.080.000   |            |            |               |           |             |                                |        |            |  |
| A6     | calc. node   |                                |             |            |            |               |           |             |                                |        |            |  |
| A4     | Sonta        |                                |             |            |            | 1.400         | 11.054    |             |                                |        |            |  |
|        |              | 105                            | 735.000     |            |            |               |           |             |                                |        |            |  |
| A5     | Svilojevo    |                                |             | 500        | 100.000    |               |           |             |                                |        |            |  |
|        |              | 105                            | 420.000     |            |            |               |           |             |                                |        |            |  |
| A6     | calc. node   |                                |             |            |            |               |           |             |                                |        |            |  |
|        |              | 360                            | 1.800.000   |            |            |               |           |             |                                |        |            |  |
| A3     | Apatin       |                                |             |            |            |               |           |             |                                |        |            |  |
|        |              | 360                            | 720.000     |            |            | 900           | 278.888   |             |                                |        |            |  |
| A0     | PPV          |                                |             |            |            |               |           |             |                                |        |            |  |
|        | Σ WBD -2     |                                | 19.680.000  |            | 1.675.000  |               | 654.296   | 22.009.296  | 109.811                        | 1.271  | 409        |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |
| II     | SOUTH BRANCH |                                | 23.405.000  |            | 2.525.000  |               | 723.838   | 26.653.838  | 101.173                        | 1.171  | 376        |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |
|        | WBD          |                                | 76.185.000  |            | 9.050.000  |               | 3.312.201 | 88.547.201  | 103.342                        | 1.196  | 404        |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |
| I + II |              |                                | 115.355.000 |            | 15.000.000 |               | 4.590.990 | 134.945.990 | 94.442                         | 1.093  | 364        |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |
|        |              |                                |             |            |            |               |           |             |                                |        |            |  |

## Makro Regional Scenario

Table 4.3. NUMBER AND STRUCTURE OF EMPLOYED PEOPLE

Environmental Consultants

|          | MUNICIPALITY / Settlement | Population number | STATE                 |              | Estimated number of connections 2025 | Pop. Number/ conn. number | Annual water demand<br>m3/god | ESTIMATED NUMBER OF EMPLOYERS  |                                       |                                        | PROPOSAL FOR NUMBER AND STRUCTURE OF EMPLOYERS |            |                    |                       |                       |
|----------|---------------------------|-------------------|-----------------------|--------------|--------------------------------------|---------------------------|-------------------------------|--------------------------------|---------------------------------------|----------------------------------------|------------------------------------------------|------------|--------------------|-----------------------|-----------------------|
|          |                           |                   | Number of connections | connection % |                                      |                           |                               | According to population number | According to connect. number (4/1000) | According to water demand(1/100.000m3) | TOTAL                                          | Management | Clerical 20% (10%) | Professional 18% (6%) | Blue Collar 60% (60%) |
| 1        | 2                         | 3                 | 4                     | 5            | 6                                    | 7                         | 8                             |                                |                                       |                                        |                                                |            |                    |                       |                       |
| <b>1</b> | <b>APATIN</b>             |                   |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 1.1.     | Apatin (g)                | 20.009            | np                    | np           | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 1.2.     | Kupusina                  | 2.458             | 855                   | 97           | 885                                  |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 1.3.     | Prigrevica                | 4.964             | np                    | np           | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 1.4.     | Sviljevo                  | 1.404             | np                    | np           | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 1.5.     | Sonta                     | 5.190             | 1.882                 | 93           | 2.032                                |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
|          | <b>S Apatin</b>           | <b>34.025</b>     | <b>10.638</b>         | <b>95</b>    | <b>11.198</b>                        | <b>3,04</b>               | <b>2.513.640</b>              | <b>34</b>                      | <b>44</b>                             | <b>25</b>                              | <b>34</b>                                      |            | <b>3</b>           | <b>2</b>              | <b>20</b>             |
| <b>2</b> | <b>SOMBOR</b>             |                   |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.1.     | Sombor (g)                | 52.385            | 11.040                | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.2.     | A. Šantić                 | 2.218             | 780                   | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.3.     | B. Breg                   | 1.429             | 520                   | 97           | 536                                  |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.4.     | B. Monoštor               | 4.020             | 1.316                 | 97           | 1.351                                |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.5.     | Bezdan                    | 5.411             | 1.780                 | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.6.     | Gakovo                    | 2.257             | n                     | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.7.     | Doroslovo                 | 1.885             | 753                   | n            | 803                                  |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.8.     | Kljajićevo                | 6.174             | n                     | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.9.     | Kolut                     | 1.750             | 575                   | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.10.    | Rastina                   | 574               | n                     | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.11.    | Ridica                    | 2.677             | 906                   | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.12.    | Sv. Miletić               | 3.235             | 1.120                 | 97           | 1.160                                |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.13.    | Stanišić                  | 4.934             | 1.550                 | 99           | 1.560                                |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.14.    | Stapar                    | 3.817             | 1.367                 | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.15.    | Telečka                   | 2.125             | 850                   | 94           | 900                                  |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 2.16.    | Čonoplja                  | 4.500             | n                     | n            | n                                    |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
|          | <b>S Sombor</b>           | <b>99.391</b>     | <b>27.386</b>         | <b>97</b>    | <b>28.233</b>                        | <b>3,52</b>               | <b>8.130.839</b>              | <b>100</b>                     | <b>113</b>                            | <b>81</b>                              | <b>98</b>                                      |            | <b>10</b>          | <b>6</b>              | <b>60</b>             |

## Makro Regional Scenario

Table 4.3. NUMBER AND STRUCTURE OF EMPLOYED PEOPLE

Environmental Consultants

|          | MUNICIPALITY / Settlement | Population number | STATE                 |              | Estimated number of connections 2025 | Pop. Number/ conn. number | Annual water demand<br>m3/god | ESTIMATED NUMBER OF EMPLOYERS  |                                       |                                        | PROPOSAL FOR NUMBER AND STRUCTURE OF EMPLOYERS |            |                    |                       |                       |
|----------|---------------------------|-------------------|-----------------------|--------------|--------------------------------------|---------------------------|-------------------------------|--------------------------------|---------------------------------------|----------------------------------------|------------------------------------------------|------------|--------------------|-----------------------|-----------------------|
|          |                           |                   | Number of connections | connection % |                                      |                           |                               | According to population number | According to connect. number (4/1000) | According to water demand(1/100.000m3) | TOTAL                                          | Management | Clerical 20% (10%) | Professional 18% (6%) | Blue Collar 60% (60%) |
| 1        | 2                         | 3                 | 4                     | 5            | 6                                    | 7                         | 8                             |                                |                                       |                                        |                                                |            |                    |                       |                       |
| <b>3</b> | <b>ODŽACI</b>             |                   |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.1.     | Odžaci (g)                | 10.125            | 2.918                 |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.2.     | B. Brestovac              | 3.570             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.3.     | B. Gračac                 | 2.991             | 900                   |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.4.     | Bogojevo                  | 2.187             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.5.     | Deronje                   | 2.959             | 805                   |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.6.     | Karavukovo                | 5.139             | 1.750                 |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.7.     | Lalić                     | 1.706             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.8.     | Ratkovo                   | 4.233             | 1.348                 |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 3.9.     | Srpki Miletić             | 3.622             | 1.100                 |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
|          | <b>S Odžaci</b>           | <b>36.532</b>     | <b>11.086</b>         | <b>97</b>    | <b>11.429</b>                        | <b>3,20</b>               | <b>2.498.056</b>              | <b>37</b>                      | <b>46</b>                             | <b>25</b>                              | <b>36</b>                                      |            | <b>3</b>           | <b>2</b>              | <b>22</b>             |
| <b>4</b> | <b>KULA</b>               |                   |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 4.1.     | Kula (g)                  | 19.769            | 12.473                | 97           | 12.859                               |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 4.2.     | Crvenka (g)               | 10.403            |                       | 97           |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 4.3.     | Kruščić                   | 2.407             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 4.4.     | Lipar                     | 1.848             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 4.5.     | N. Crvenka                | 537               |                       | 97           |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 4.6.     | Ruski Krstur              | 5.324             | 2.275                 | 98           | 2.321                                |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 4.7.     | Sivac                     | 9.208             |                       | 97           |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
|          | <b>S Kula</b>             | <b>49.496</b>     | <b>15.466</b>         | <b>97</b>    | <b>15.944</b>                        | <b>3,10</b>               | <b>3.554.406</b>              | <b>49</b>                      | <b>64</b>                             | <b>36</b>                              | <b>50</b>                                      |            | <b>5</b>           | <b>3</b>              | <b>30</b>             |
|          | <b>UKUPNO "A"</b>         | <b>219.444</b>    |                       |              | <b>66.804</b>                        | <b>3,28</b>               | <b>16.696.941</b>             | <b>219</b>                     | <b>267</b>                            | <b>167</b>                             | <b>218</b>                                     |            | <b>21</b>          | <b>13</b>             | <b>132</b>            |
| <b>5</b> | <b>BAČ</b>                |                   |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 5.1.     | Bač (g)                   | 6.407             | 4.474                 |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 5.2.     | B. Novo Selo              | 1.297             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 5.3.     | Bođani                    | 1.169             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 5.4.     | Vajska                    | 3.355             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 5.5.     | Plavna                    | 1.458             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
| 5.6.     | Selenča                   | 3.376             |                       |              |                                      |                           |                               |                                |                                       |                                        |                                                |            |                    |                       |                       |
|          | <b>S Bač</b>              | <b>17.062</b>     |                       |              | <b>5.500</b>                         | <b>3,10</b>               | <b>1.147.466</b>              | <b>17</b>                      | <b>22</b>                             | <b>11</b>                              | <b>17</b>                                      |            | <b>2</b>           | <b>1</b>              | <b>10</b>             |

## Makro Regional Scenario

Table 4.3. NUMBER AND STRUCTURE OF EMPLOYED PEOPLE

|      | MUNICIPALITY / Settlement           | Population number | STATE                 |               | Estimated number of connections 2025 | Pop. Number/ conn. number | Annual water demand | ESTIMATED NUMBER OF EMPLOYERS  |                                       |                                        | PROPOSAL FOR NUMBER AND STRUCTURE OF EMPLOYERS |            |                    |                       |                       |  |
|------|-------------------------------------|-------------------|-----------------------|---------------|--------------------------------------|---------------------------|---------------------|--------------------------------|---------------------------------------|----------------------------------------|------------------------------------------------|------------|--------------------|-----------------------|-----------------------|--|
|      |                                     |                   | Number of connections | connecti on % |                                      |                           |                     | According to population number | According to connect. number (4/1000) | According to water demand(1/100.000m3) | TOTAL                                          | Management | Clerical 20% (10%) | Professional 18% (6%) | Blue Collar 60% (60%) |  |
|      |                                     |                   |                       |               |                                      |                           | m3/god              |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 1    | 2                                   | 3                 | 4                     | 5             | 6                                    | 7                         | 8                   |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6    | VRBAS                               |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6.1. | Vrbas (g)                           | 26.214            | 12.392                | 97            | 12.775                               | 3,08                      |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6.2. | B.Dobro Polje                       | 3.998             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6.3. | Zmajev                              | 4.414             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6.4. | Kosančić                            | 164               |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6.5. | Kucura                              | 4.696             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6.6. | Ravno Selo                          | 3.524             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 6.7. | Savino Selo                         | 3.407             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
|      | S Vrbas                             | 46.417            |                       |               | 15.070                               | 3,08                      | 3.335.133           | 46                             | 60                                    | 33                                     | 46                                             |            | 5                  | 3                     | 28                    |  |
| 7    | SRBOBRAN                            |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 7.1. | Srbobran (g)                        | 13.271            |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 7.2. | Turija                              | 2.595             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 7.3. | Nadalj                              | 2.222             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
|      | S Srbobran                          | 18.088            | 7.196                 | 97            | 7.419                                | 2,44                      | 1.330.183           | 18                             | 30                                    | 13                                     | 20                                             |            | 2                  | 1                     | 12                    |  |
| 8    | BEČEJ                               |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 8.1. | Bečej (g)                           | 26.325            | 9.283                 | 83            | 11.184                               | 3,02                      |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 8.2. | B. Gradište                         | 5.586             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 8.3. | B.Petrovo Selo                      | 7.450             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 8.4. | Mileševo                            | 1.149             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 8.5. | Radičević                           | 1.356             |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
|      | S Bečej                             | 41.866            |                       |               | 13.863                               | 3,02                      | 3.178.604           | 42                             | 55                                    | 32                                     | 43                                             |            | 4                  | 2                     | 26                    |  |
| 9    | NOVI BEČEJ                          |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 9.1. | Novi Bečej (g)                      | 14.692            | 5.443                 | 95            | 5.729                                |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 9.2. | Bočar                               | 1.934             | 736                   | 98            | 751                                  |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 9.3. | Kumane                              | 3.882             | 1.402                 | 90            | 1.558                                |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
| 9.4. | N. Miloševo                         | 6.908             | 2.562                 | 100           | 2.562                                |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
|      | S Novi Bečej                        | 27.416            | 10.143                |               | 10.600                               | 2,59                      | 2.077.989           | 27                             | 42                                    | 21                                     | 30                                             |            | 3                  | 2                     | 18                    |  |
|      |                                     |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
|      | UKUPNO "B"                          | 150.849           |                       |               | 52.452                               | 2,88                      | 11.069.375          | 151                            | 210                                   | 111                                    | 157                                            |            | 16                 | 9                     | 94                    |  |
|      |                                     |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
|      | UKUPNO "A+B"                        | 370.293           |                       |               | 119.256                              | 3,11                      | 27.766.316          | 370                            | 477                                   | 278                                    | 375                                            | 7          | 75                 | 67                    | 226                   |  |
|      |                                     |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |
|      | Municipalities                      |                   |                       |               |                                      |                           |                     |                                |                                       |                                        | 285                                            | 0          | 37                 | 22                    | 226                   |  |
|      | Management, DWTP, Technical service |                   |                       |               |                                      |                           |                     |                                |                                       |                                        | 90                                             | 7          | 38                 | 45                    | 0                     |  |
|      |                                     |                   |                       |               |                                      |                           |                     |                                |                                       |                                        |                                                |            |                    |                       |                       |  |

Note: Number of employers is estimated according to criteria and empirical data from many water works in the world.

Source: Water & Wastewater Utilities, Indicators, 2nd. Edition, TWUWS - May 1996

Average salaries (bto.): 1. Management.....1600 € 7mes.

2. Clerical.... 900 € / mes.

3. Professional.....1400 € / mes.

4. Blue collar..... 700 € / mes.

Relation between personal and operational costs: 1:1,5 (0,4:0,6)

Rate of amortization: 1. Pipelines.....3,3 do 8% per year

2. Pump stations - construction.....1,5 % per year

3. Water treatment plants .....4 % per year

4. Hydro and electro mechanical equipment.....8 % per year

monthly per worker

yearly per worker

monthly total

yearly total

|                |                |                  |                  |                  |
|----------------|----------------|------------------|------------------|------------------|
| <b>1.600</b>   | <b>900</b>     | <b>1.400</b>     | <b>700</b>       | <b>4.600</b>     |
| <b>19.200</b>  | <b>10.800</b>  | <b>16.800</b>    | <b>8.400</b>     | <b>55.200</b>    |
| <b>11.200</b>  | <b>67.500</b>  | <b>93.800</b>    | <b>158.200</b>   | <b>330.700</b>   |
| <b>134.400</b> | <b>810.000</b> | <b>1.125.600</b> | <b>1.898.400</b> | <b>3.968.400</b> |

Table 4.4. Makro Regional Scenario Summary price

#### GROUNDWATER SOURCE

| INVESTMENT COSTS |                                | SUMMARY PRICE (EUR) |                  |                   |
|------------------|--------------------------------|---------------------|------------------|-------------------|
|                  |                                | BUDZAK              | M. LIVADE        | Budzak+M.Livade   |
| A                | Water supply wells&piezometers | 2.302.500           | 1.842.000        | 4.144.500         |
| B                | Water mains                    | 1.700.000           | 1.360.000        | 3.060.000         |
| C                | Main pipeline                  |                     | 2.827.500        | 2.827.500         |
| D                | Access Roads                   | 275.000             | 220.000          | 495.000           |
| E                | Security Fence                 | 60.000              | 48.000           | 108.000           |
| F                | Electrical works               | 1.090.000           | 914.000          | 2.004.000         |
| G                | Acquisition of land            | 250.000             | 250.000          | 500.000           |
| <b>TOTAL</b>     |                                | <b>5.677.500</b>    | <b>7.461.500</b> | <b>13.139.000</b> |

| OPERATION & MAINTENANCE COSTS |  | SUMMARY PRICE (EUR) |                |                 |
|-------------------------------|--|---------------------|----------------|-----------------|
| price per year                |  | BUDZAK              | M.LIVADE       | Budzak+M.Livade |
| <b>TOTAL</b>                  |  | <b>489.774</b>      | <b>327.076</b> | <b>816.850</b>  |

#### TREATMENT PLANT

| INVESTMENT COSTS |                                           | SUMMARY PRICE (EUR) |  |                   |
|------------------|-------------------------------------------|---------------------|--|-------------------|
| A                | Aeration                                  |                     |  | 500.000           |
| B                | Sand filtration                           |                     |  | 1.200.000         |
| C                | Ozon                                      |                     |  | 700.000           |
| D                | GAU-filtration                            |                     |  | 1.600.000         |
| E                | Arsen removal                             |                     |  | 250.000           |
| F                | Desinfection                              |                     |  | 225.000           |
| G                | Electrical works, filtration media & land |                     |  | 6.397.500         |
| <b>TOTAL</b>     |                                           |                     |  | <b>10.872.500</b> |

| OPERATION & MAINTENANCE COSTS |  | SUMMARY PRICE (EUR) |  |                |
|-------------------------------|--|---------------------|--|----------------|
| price per year                |  |                     |  | BUDZAK         |
| <b>TOTAL</b>                  |  |                     |  | <b>790.925</b> |

#### REGIONAL DISTRIBUTION

| INVESTMENT COSTS |                     | SUMMARY PRICE (EUR) |  |                    |
|------------------|---------------------|---------------------|--|--------------------|
|                  |                     |                     |  | Apatin-N.Becej     |
| A                | Regional pipe lines |                     |  | 113.390.000        |
| B                | Rezevoars           |                     |  | 7.470.000          |
| C                | Pumpne stations     |                     |  | 10.000.000         |
| <b>TOTAL</b>     |                     |                     |  | <b>130.860.000</b> |

| OPERATION&MAINTENANCE COSTS |                     | SUMMARY PRICE (EUR) |  |                  |
|-----------------------------|---------------------|---------------------|--|------------------|
| price per year              |                     |                     |  |                  |
| A                           | Regional pipe lines |                     |  | 5.669.500        |
| B                           | Rezevoars           |                     |  | 112.050          |
| C                           | Pumpne stations     |                     |  | 800.000          |
| <b>TOTAL</b>                |                     |                     |  | <b>6.581.550</b> |

#### EMPLOYEES

| OPERATION&MAINTENANCE COSTS |  | SUMMARY PRICE (EUR) |  |           |
|-----------------------------|--|---------------------|--|-----------|
| price per year              |  |                     |  | 3.968.400 |

|                                              |  |  |  |                    |
|----------------------------------------------|--|--|--|--------------------|
| <b>Investment Costs</b>                      |  |  |  | <b>154.871.500</b> |
| <b>Operation&amp; Maintenance Costs/Year</b> |  |  |  | <b>12.157.725</b>  |

## **Book IV**

### **DISTRIBUTION SYSTEM CONCEPT**

#### **Annex 4.2 Figures:**

FIGURE 4.1. - PILOT REGION

FIGURE 4.2. - CALCULATION SCETCH EAST BRANCH-PART 1 AND 2

FIGURE 4.3. - CALCULATION SCETCH SOUTH BRANCH

FIGURE 4.4. - MAKRO REGIONAL SCENARIO DISTRIBUTION SYSTEM- MAIN  
PIPE LINES



## Fig. 4.1

### PILOT REGION

- West Bačka District
- Bač Municipality
- Central and ost Bačka and  
a Part of Banat

**LEGENDA:**

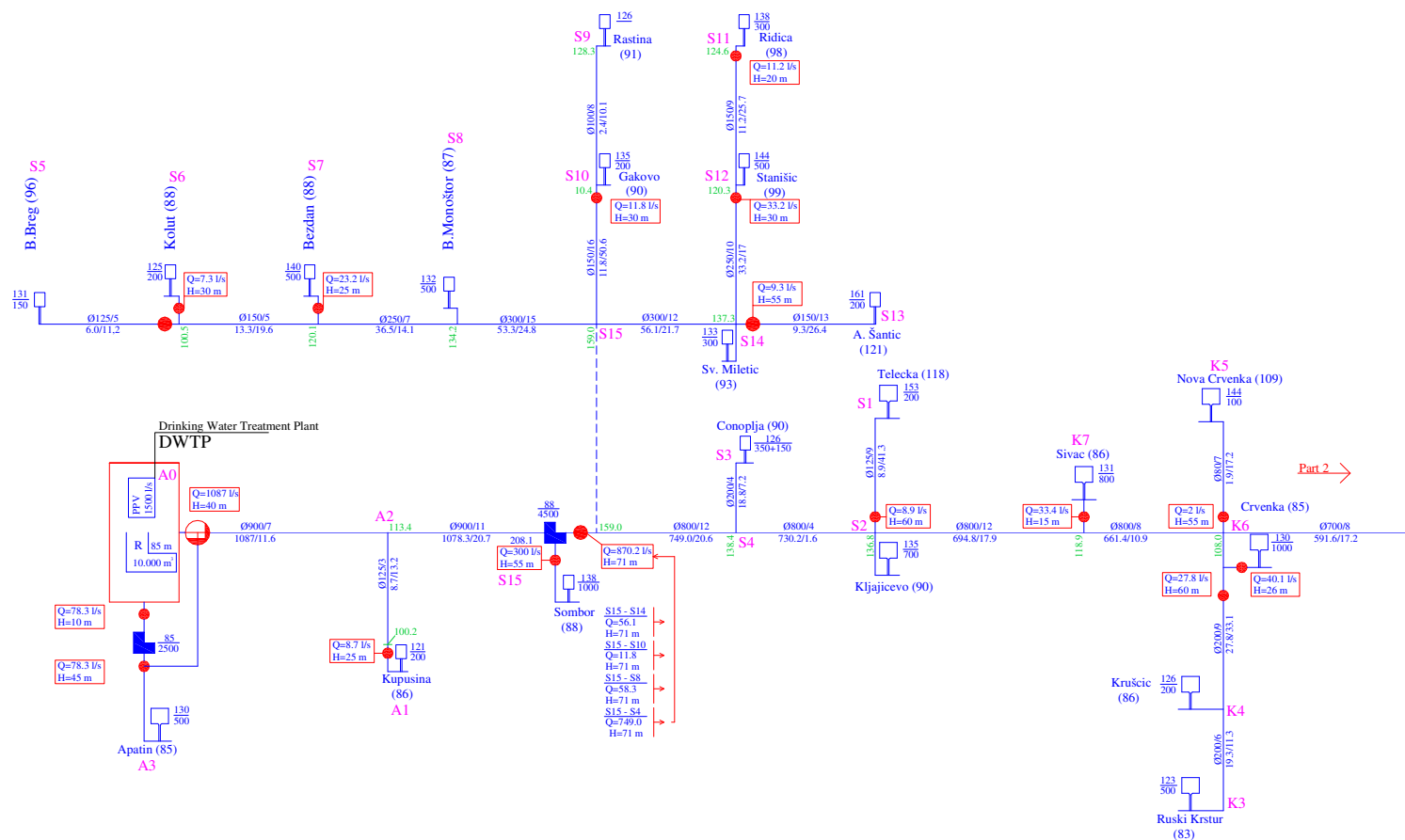


Geografiska kortet

**M@gic M@p**

Fig. 4.1

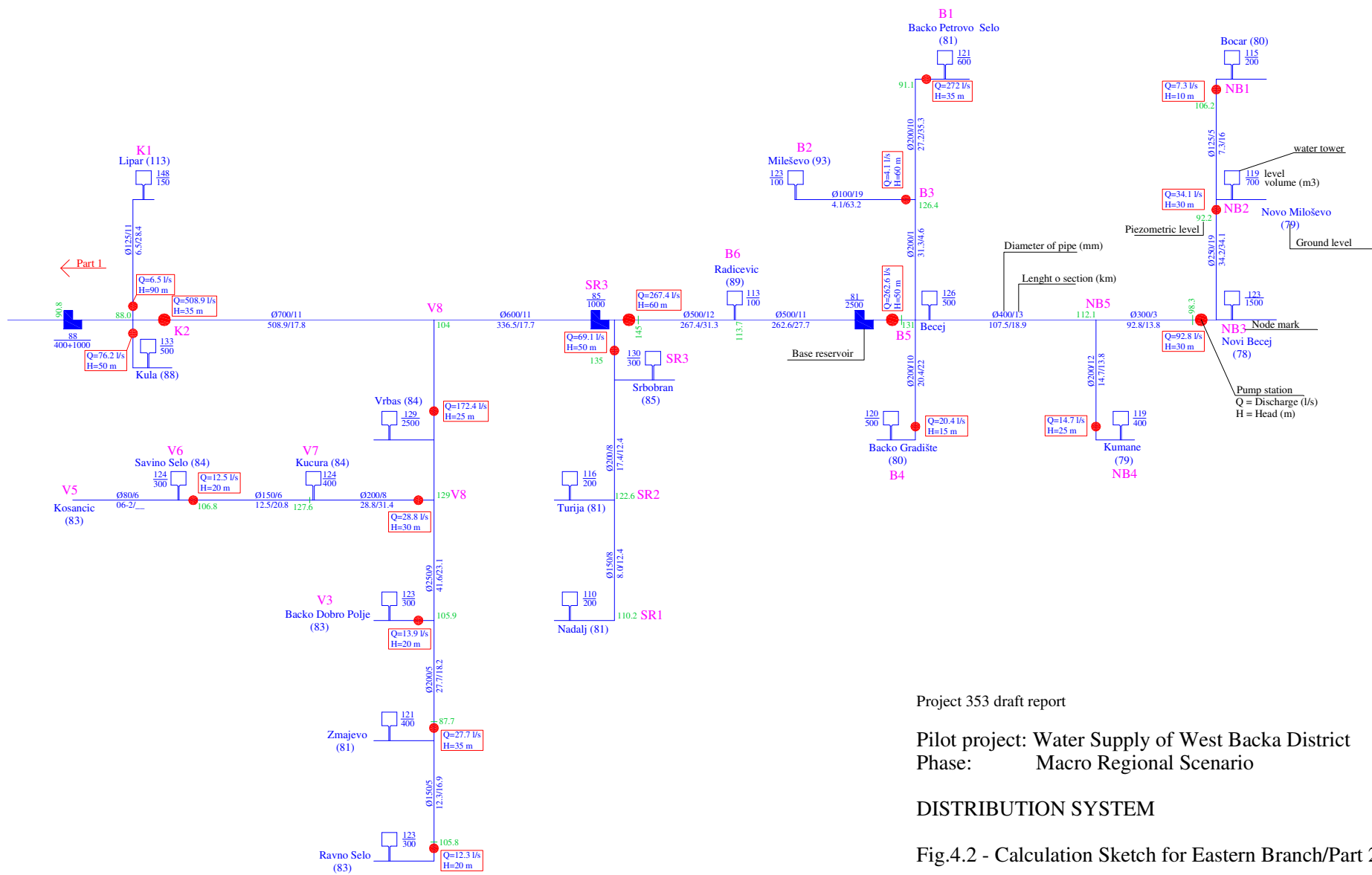




Project 353 draft report

Pilot project: Water Supply of West Backa District  
Phase: Macro Regional Scenario

DISTRIBUTION SYSTEM

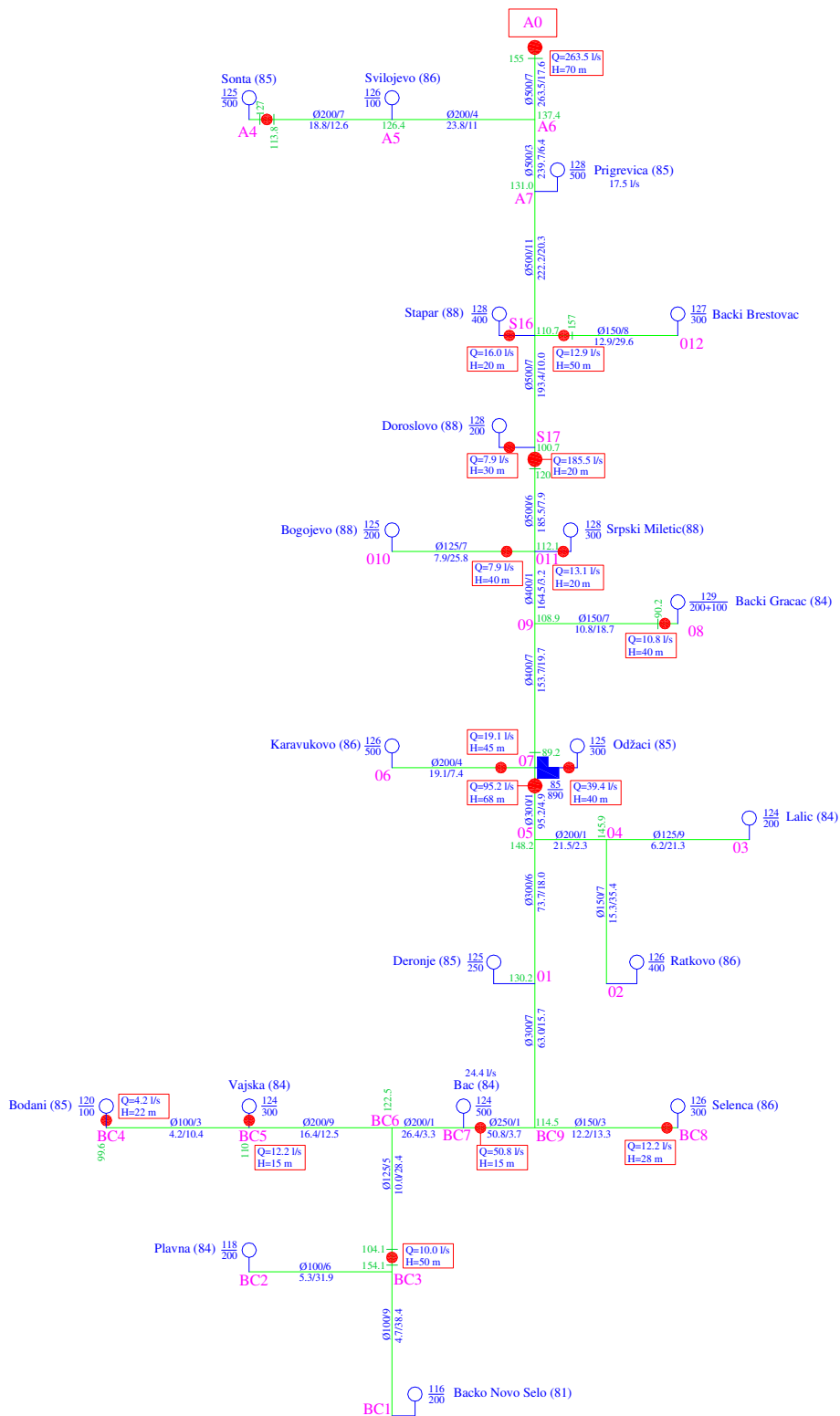


Project 353 draft report

Pilot project: Water Supply of West Backa District  
Phase: Macro Regional Scenario

## DISTRIBUTION SYSTEM

Fig.4.2 - Calculation Sketch for Eastern Branch/Part 2



Project 353 draft report

Pilot project: Water Supply of West Backa District  
Phase: Macro Regional Scenario

DISTRIBUTION SYSTEM

Fig.4.3 - Calculation Sketch for Southern Branch



Project 353 Draft report

Fig. 4.4  
MACRO REGIONAL SCENARIO  
DISTRIBUTION SYSTEM  
- Main pipelines -

