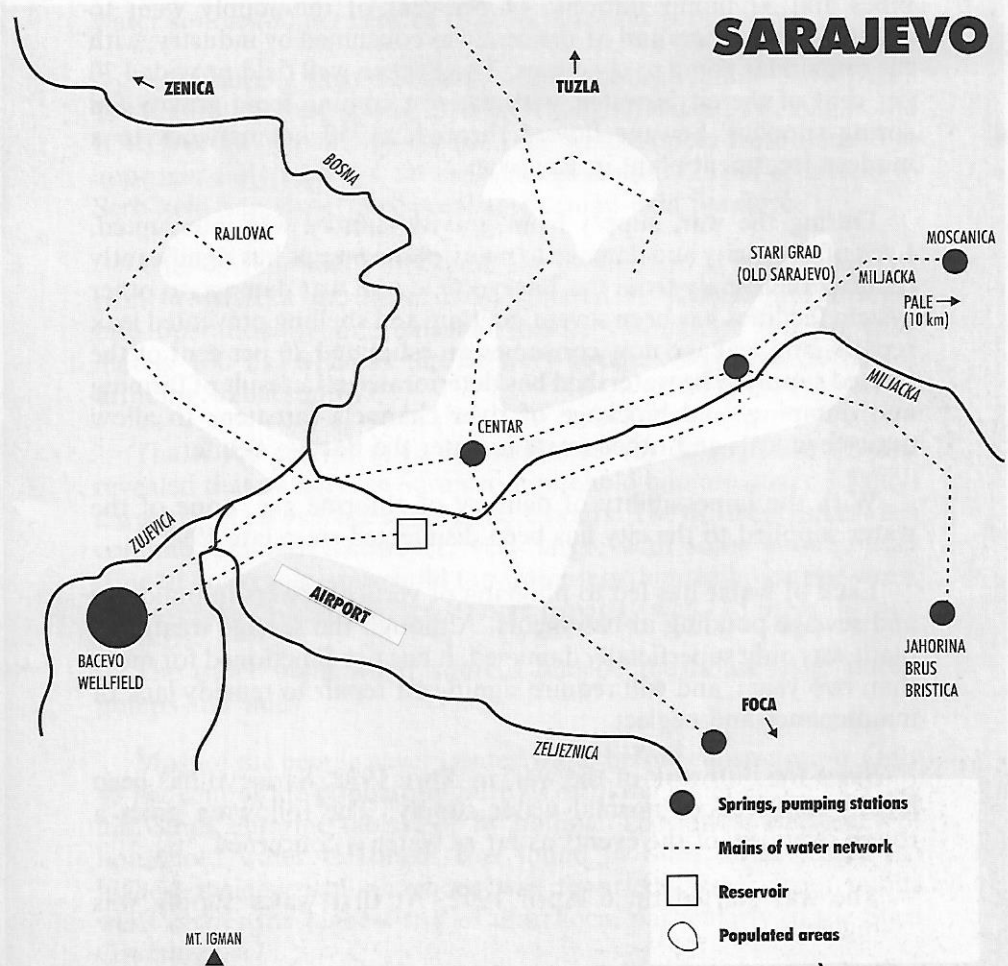


Former Yugoslavia: Water supply in Sarajevo and Srebrenica

SARAJEVO



Sarajevo

Before the war, Sarajevo's water system provided 220,000 m³ of water daily (or 2,000 l/s) through a complex system of 1,500 km of pipes and 37 pump stations; 44 per cent of the supply went to domestic consumers and 31 per cent was consumed by industry, with the remainder going to civic uses. The Bacevo well field provided 70 per cent of the city's water, with the rest coming from gravity-fed spring supplies. Sewage flowed through a 750 km network to a modern treatment plant in Rajlovac.

During the war, supply from gravity sources was interrupted. Lack of electricity and damage to many of the pumps has significantly reduced the supply from the Bacevo field and war damage to other system facilities has been severe. Sniping and shelling prevented leak repairs, and leakage now consumes an estimated 70 per cent of the limited supply. The watershed has deteriorated as a result of farming and dumping, and blockage of river channels threatens to allow toxic chemicals and other waste to enter the Bacevo aquifer.

With the impossibility of delivery of chlorine gas, none of the water supplied to the city has been disinfected since late 1993.

Lack of water has led to plugging of vertical sewers in buildings and sewage ponding in basements. Although the sewage treatment plant was only superficially damaged, it has not functioned for more than two years, and will require significant repair to remedy lack of maintenance and neglect.

Since the outbreak of the war, in April 1992, Sarajevo has been largely deprived of normal water supply. The following gives a rough overview of the events as far as water is concerned.

- The war started on 6 April 1992. At first water supply was regular.
- From June 1992 water supply was frequently cut because of military activities causing damage to the electricity supply.
- Between June 1992 and June 1993, water supply was low and frequently cut.
- From June 1993 until August 1993 there was no water supply at all except from the Brewery, when diesel for the back-up generators was available, and from some 150 hand pumps.

From August 1993 until March 1994, water supply was irregular at a low level (300-600 l/s). UNPROFOR and international relief agencies were allowed to start repair works at Bacevo. They concentrated on the Bacevo wellfield since it is the most important water source (80 per cent of the total pre-war production).

Water supply then started to become more regular. Since April 1994, joint efforts (mainly UNPROFOR, ODA, ECTF, AICF and ICRC) of all involved have raised the water supply from Bacevo to approximately 1,200 l/s. Of the water produced, 25 per cent went to Serb-held Sarajevo, 75 per cent to Bosnian-held Sarajevo.

After several initial problems, the production at two emergency plants (Miljacka and Moscanica) donated by SOROS and brought into operation by International Rescue Committee was approximately 180 l/s, whereas the Brewery produced around 50 l/s for drinking water supply.

The ICRC carried out a household survey during June 1994. It revealed that an average Sarajevo household had tap water 3.5 days a week with an average supply of 5.6 hours. The differences between communities were, however, very large, with some communities (Centar) receiving household tap water less than 16 hours per week. The average in-house water storage capacity was 125 litres.

The other main water sources outside the house were public pumps and wells.

Most of the people never treated water before consumption. Only 48 per cent of the population purifies drinking water either by using individual chlorine tablets or by boiling. The lowest frequency of household water treatment was found in Stari Grad where the highest incidence of diarrhoea was reported. Water from public wells carries the highest risk of diarrhoea, particularly in the Stari Grad area.

Jahorina-Brus-Bistrica gravity line

At the end of August 1993, the British Red Cross started a programme to rehabilitate one of the systems feeding Sarajevo by gravity, the Jahorina-Brus-Bristica system. This system was supplying 10 per cent of the water for Sarajevo prior to the war and had become crucial as it was the only gravity-fed supply into the city.

The system was fed from a number of springs located in the mountain close to Pale, a town about 10 km from Sarajevo, within Serb-held territory.

The water was collected in concrete reservoirs and was then gravitated or pumped to a main storage reservoir where it was chlorinated. From there it gravitated via a 14 km cast-iron main into Sarajevo, passing through a series of break pressure tanks before it reached the city.

The system had first been developed in the 1920s and much of the equipment still dated from that time. The pipes were generally lead-jointed although some still had the original wood packing in the joints and many of them were leaking badly, with some lateral connections completely broken.

Serbian engineers had done their best to keep supplies flowing but they lacked tools, equipment and spare parts, so the leaks could no longer be repaired. As a result only about one third of the normal minimum flow was reaching Sarajevo.

The pumping stations also housed equipment that was as much as 40 or 50 years old. Where possible, pumps had been cannibalized to keep at least one pump running, but they were all at the end of their life and two failed between October and December.

Luckily the works department of Pale municipality boasted several very competent engineers and technicians, including some refugees, willing to work on a system supplying water to "the other side".

A list of essential material and equipment was agreed for the rehabilitation of the Sarajevo system as well as the local system feeding the town of Pale itself, but then the material had to be found. One pump manufacturer was still operating, and a steel pipe manufacturer who had stocks was found.

The ICRC office in Belgrade was able to track down plumbing fittings and various other bits and pieces, but deliveries were made difficult because of the winter weather, fuel shortages and delays at check-points.

Plans had to be changed and updated constantly because of problems with the travel authorization process, blocked without any reason by the Bosnian Serbs.

By the end of December, the amount of water delivered to the main reservoir on the Muslim side had increased from 30 l/s to about 60 l/sec (more than 5,000 m³/day).

The state of the system remained precarious, however, and the system needed constant attention, particularly because much of the pipeline ran through unstable ground.

By the beginning of November, the delivery of water from this gravity line had stopped completely, despite the fact that about 100 l/sec were entering the line at the source.

The ICRC and the German Red Cross organized several meetings between the water boards of the Bosnian and Serbian sides to discuss technical problems. The last meeting was held on Friday 11 November 1994, and concentrated on the repair work to be done at Bacevo.

The infiltration channels for the Bacevo wellfields needed to be cleaned up, and the pumps and transformers also had to be repaired or replaced. Only eight wells were operational at the beginning of November.

The maintenance of the sewerage system was completely neglected and had to be rehabilitated. Several heavy duty vehicles were purchased by the German Red Cross and put at the disposal of the Bosnian and Serbian water boards.

Water losses resulting from leaks were already high (up to 40 per cent) before the war and have increased because of military activities and lack of maintenance. The German Red Cross has carried out a survey and identified priority areas where a programme is going to be initiated with the help of a specialized company.

Two local companies were contracted and are involved in the repair of the cathodic protection of the main pipelines of the city.

Plans to repair the Moscanica water treatment plant had to be delayed for security reasons and problems of access.

All activities were too often compromised by delays in the delivery of equipment, caused by lack or refusal of authorization.

Srebrenica, April-June 1993

The enclave is approximately 20 km x 20 km, with only one entry, the check-point called Yellow Bridge at the end of the Serb town of Bratunac. Both sides of this town are totally destroyed, "ethnically cleansed".

Srebrenica is not far from the front line. It is a small town stretched out 4 km along one main street and surrounded by steep hills. During the first quarter of 1993, UNPROFOR recorded in this "UN safe area" more than 25,000 ceasefire violations, approximately 300 a day, especially near the front line, but from time to time also inside the enclave or next to the town, sometimes against the ICRC.

All the factories at the edge of the town were completely burned down and destroyed. These factories were working with chemicals, for batteries and electroplating.

The town itself was partially destroyed, full of rubbish, with shrapnel holes in every house, no windows and people everywhere. The smell was striking, with burning day and night and all the toilets clogged. In front of every house women were cooking bread on makeshift stoves, as there was no more electricity. For that same reason, there were no more trees on the surrounding hills, or in Sarajevo.

From 5,000 inhabitants before the war, only 700 residents remained, the rest having gone or having been killed during the shelling. The city was completely overcrowded with a population up to 22,000, with a total of more than 45,000 people trapped in the pocket.

The hospital was next to the house where ICRC personnel were accommodated, together with *Médecins sans Frontières* personnel. Every morning at seven o'clock there were more than 200 people waiting for medical care. There was blood everywhere, no water to wash and just a small generator with 20 litres of gasoline to sterilize the surgical instruments.

Everybody was walking around with jerrycans, buckets or cans to collect water from every possible spring.

Early in April, the water coming from the Zeleni Jadar water source, where the water catchment and the treatment plant were located, was cut off. Consequently, there was no more running water in town and not enough water could be delivered to the standpoints connected to small springs. The queues in front of the taps were longer than 50 metres, day and night.

Médecins sans Frontières started to organize distributions of water with an old firemen's truck collecting water from a spring not far from the town; 15 rounds a day, corresponding to the total capacity available, were insufficient to fill the collapsible tanks installed, which were regularly emptied in less than half an hour. A total of 15 springs were protected but this was barely enough as some started to dry up with the arrival of the summer. People could not wash themselves and more than 20 per cent of the population had scabies.

With the help of local workers, the river flowing through Srebrenica was diverted and the water brought into town through a pipeline of about 10 km, where the ICRC and *Médecins sans Frontières* installed 50 public standpoints. The need for water was so great that people started to drill holes in this emergency pipeline.

At the beginning of June 1993, *Médecins sans Frontières* and UNPROFOR were allowed to carry out some cleaning work at the Zeleni Jadar station, which could only be reached by the use of armoured carriers. The station was restarted, but four days later the permission was cancelled.

For more than a month, *Médecins sans Frontières*, the ICRC and UNPROFOR tried to get access to the plant, but were always sent back at the checkpoint or denied authorization.

As the situation became more and more critical, the issue was taken up by General Morillon in his discussions with the Bosnian Serb military leadership. The latter finally provided written authorization to inspect the water installations. But, a couple of days before the humanitarian organizations again gained access, the Bosnian Serbs blew up the plant entirely.

Alternative supplies were explored but where water was available, it had to be pumped, and fuel was scarce.

Finally, Srebrenica's former water treatment plant, which had been abandoned in the late 1970s, was rehabilitated to face the emergency. At present, it provides between 10 and 25 l/sec, depending on the rain. The existence of this station was only discovered a few months after the beginning of the water and sanitation programmes.

Most of the equipment necessary to carry out the work was, however, considered strategic and the necessary clearances to bring it inside the pocket were difficult to obtain. Cement, diesel, sand and tools were blocked at the checkpoint and a lot of time had to be spent to get the necessary authorizations. As an example, the approval for one diesel pump and five gate valves took over 5 months.

The Danish Red Cross, in cooperation with the ICRC, is at present trying to increase the quantity of water available for the people by leakage repair.



▲ Mostar (left bank): water collection point direct from the tanker (A. Feric/ICRC)

Mostar (left bank): water collection point
(J. Nordmann/ICRC)





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Pale/Sarajevo: Jahorina-Bristica-
Brus gravity water supply scheme —
repair of leakages in the pipeline
resulting from earth movements

Pale/Sarajevo: Jahorina-Bristica-
Brus gravity water supply scheme
— assessment of repairs needed

