

Water Management Specifications of the Mill Race

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Landscape-Urban Competition
“Revitalization of the Mill Race in Košice”

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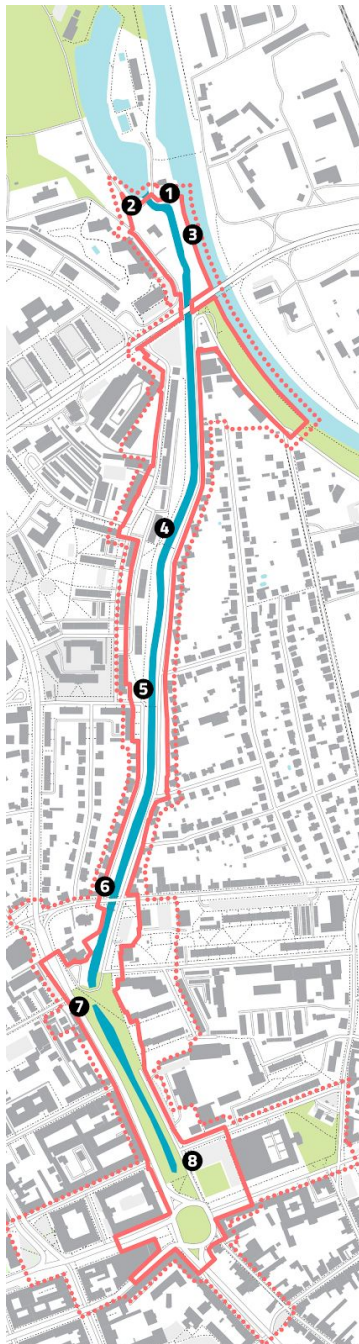
I. Introduction

The Mill Race, including the Ryba Water Reservoir, is the original riverbed through which most of the River Hornád water used to flow in the past, averaging more than 6 m³ per second. With the construction of several water management structures and the modification of the bed, the situation changed as follows:

- Ryba water reservoir was created, which is fed from Hornád and is hydraulically separated from the Mill Race. The water from the reservoir flows into the Čermel' Creek and then into the River Hornád;
- The Mill Race is being fed from a Small Hydroelectric Power Plant and its current flow is only 300 liters per second;
- most of the water drains in today's River Hornád riverbed.

II. Water management facilities

Nowadays, the following water management facilities are part of the Mill Race:



1. **Inlet object** which brings water into the Mill Race
2. **The dam between Ryba Reservoir and the Mill Race** which hydraulically separates the two water works. The head of the dam has an altitude of **209.920** meters above sea level.
3. **Security outlet into the River Hornád**
4. **The weir at Čárského Street** defines the level in the upper section of the watercourse. The head of the weir has an altitude of **209.390** meters above sea level.
5. **The weir at Tomášikova Street** has the character of a temporary demountable structure and currently has no function.
6. **The weir at Slovenskej jednoty Street** raises the water level in the middle part of the Mill Race. At present, it is operated in the mode of reduced water level set by sluices, in order not to flood the bridge along Slovenskej jednoty Street. The head of the weir has an altitude of **209.250** meters above sea level.
7. **The inverted siphon** consists of two U-shaped pipes through which the water flows in the point of damming of the Mill Race riverbed. In the body of the inverted siphon, engineering networks including the heat line can be found. This damming is a key problem in the operation of the Mill Race since it limits the water flow in the riverbed to 250 litres per second.
8. **The outlet object** ensures the drainage of water into the pressure pipeline leading to the Mill Creek which then flows into the River Hornád. The head of the dam of the outlet facility has an altitude of **208.964** meters above sea level.

III. Flow rate

The nominal water flow according to valid Handling Regulations is 300 liters per second.

The maximum capacity of water inflow through the inlet object is 1000 liters per second and can be continuously controlled and also completely closed.

The nominal water flow is currently set at about 250 liters per second and its increase is limited, mainly by the inverted siphon and also by the drain pipe, which is designed at 500 liters per second.

We estimate the optimal flow in the Mill Race that would guarantee optimal conditions for habitat development at 800 to 1000 liters per second. However, a flow of over 500 liters per second will have to be resolved by a new drain pipe along Masarykova Street into the River Hornád or by restoring the original riverbed in Štefánikova Street.

All waterworks must be designed for a flow rate of 1000 liters per second.

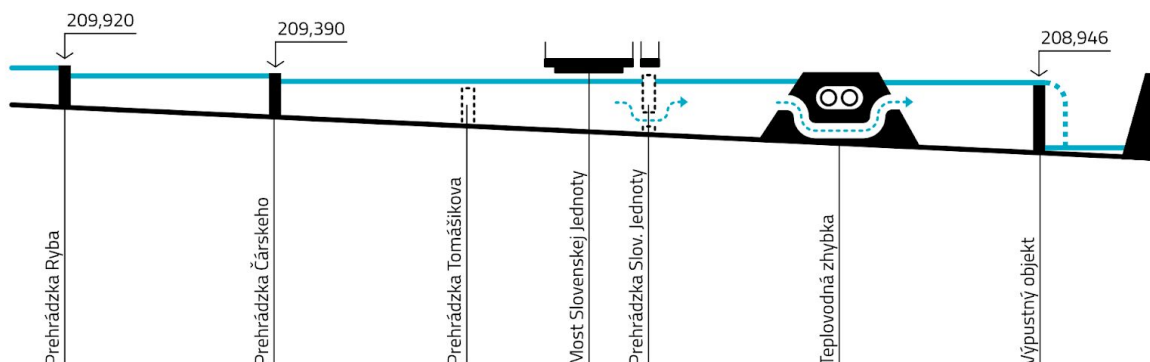
IV. The water levels of the Mill Race

- The water levels of the Mill Race are and will be defined by the weirs within its course and the overflow edge of the discharge object. We anticipate the removal or significant reconstruction of the following water management facilities:
- Weir at Tomášikova Street
- Weir at Slovenskej jednoty Street
- The inverted siphon

Based on these facts, the possible water levels in the individual sections are defined by the following limits:

1. The head of the dam between Ryba Water Reservoir and the Mill Race: 209.920 meters above sea level.
2. The head of the dam on the outlet facility: 208.964 meters above sea level.

In order to make the most of the potential energy of water for oxygenation and overlaying of water, we prefer the highest possible number of weirs with falling water. The optimal level difference in before and after the dam is up to 30 centimeters.



V. Water sources for the Mill Race

At present, water from the River Hornád is supplied to the Mill Race via an inlet object. Other potential sources of water are the Čermel' Creek and water from the Bankov Mine.



Sources of water for the Mill Race.

1. The River Hornád water

Water from the River Hornád is of adequate quality, relatively clean and suitable for the development of aquatic and coastal fauna and flora. However, the River Hornád is polluted several times a year by turbidity, the origin of which is in a left-hand tributary, in the River Svinka. The River Svinka is polluted by sludge floated into its bed during heavy rains, especially in the summer months.

The turbidity coming to the Mill Race is very fine. Our experience from operation over the past years has shown that with a sufficient flow rate of around 250 liters per second, no significant sedimentation occurs. This is mainly due to a sufficiently long section with a slow flow of water before the inflow object that forms an effective sedimentation tank.

Stopping or significantly reducing the inflow of water, for example to 50 liters per second, into the Mill Race at a time when water is turbid in the River Hornád, has led to the rapid onset of negative biological processes, the multiplication of *Cladophora* and cyanobacteria and rotting, the odor of which was annoying around the watercourse.

The turbidity in the Mill Race creates a bad visual impression, at worst.

2. The Čermel' Creek

In the past, the Čermel' Creek (Slovak: *Čermel'ský potok*) used to flow directly into the Mill Race, approximately at the site of today's inverted siphon near Rokoko Hotel. At present, the creek underflows the Mill Race near the inlet object and flows directly into the River Hornád.

Čermel' Creek is a potential source of water for the Mill Race. It has excellent water quality and is rarely turbid, usually at different period than the River Hornád, as its basin is situated in a different area. By damming the creekbed in a suitable place and building a short canal, it would be possible to bring its water to the Mill Race and eliminate the turbidity from the River Hornád.

The official values of the flow parameters of the Čermel' Creek in the section of its outlet into Hornád are not known, our estimate is that the average flow does not exceed 100 liters per second.

3. The Bankov Mine water

From the Bankov Mine (Slovak: *Baňa Bankov*), in which the mining had stopped, water is pumped and piped into the inlet object of the Mill Race. At this point, the above mentioned pipeline leads directly into the River Hornád.

The water from the Bankov Mine has a favorable composition, is turbid-free and of low temperature. Being fed from a high hill, it is likely to flow under pressure and could possibly feed the equipment operated by pressurized water, such as fountains.

The output of this source is 20 liters per second.