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A COMPLETE STUDY OF THE BED OF THE "TIBETA WATER" RIVER IN THE VILLAGE OF TIBETA IN THE ADJARA REGION TO IDENTIFY THE SOURCE OF E.COLI CONTAMINATION

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Abstract. *Recent studies confirm cattle and goats can contaminate water resources with E.coli, just like humans. It turns out to be cleaned from animal waste as well as from anthropological waste. The current article is about finding the source of this pollution and selecting cleaning options, as part of the Rural Ajara Water Supply and Wastewater Treatment Program, a complete study of the river bed selected for water supply in the village of Tibeta, Keda Municipality, Adjara.*
Keywords: *Waste, contamination, research.*

Introduction

Within the framework of the program, a seasonal investigation of water quality (water sampling for laboratory analysis) was carried out for the sources of the project villages. During the investigation of the source of Tibeta village, water contamination with E. coli bacteria was revealed. Contamination was observed repeatedly during the summer dry period of 2021 and 2022 (see Figure 1). For the first time (27.08.2021), after receiving the laboratory results, sampling was repeated (09.09.2022), but no contamination was detected, which is why the mentioned contamination was assessed as one-time contamination. The second time (11.08.2022) when the results showed water contamination with E. coli bacteria - again in August, it was clear that the water was periodically contaminated (in hot weather conditions).

Therefore, a detailed study of the poor condition of the river was conducted to determine the source of the pollution.

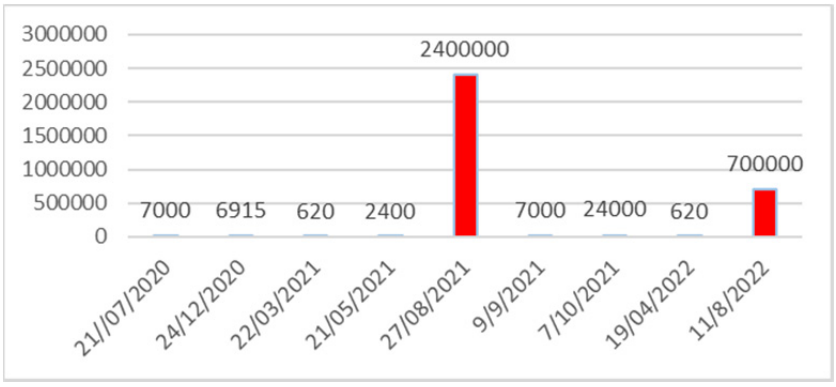

Fig. 1. Schedule of the quantity of E. coli bacteria in water during the year.

The study of the river bed included:

- visual inspection of the entire river bed;
- Water sampling on river tributaries.

The first study was done on 29.08.2022 (Table 1).

Tibeta water originates at an altitude of 1300 meters a.s.l. and flows through a wooded valley with a length of 5.1 km. In the main period of the year, it is fed by underground water. During the rainy season, it is fed by rain and melting snow.

In some sections, it has a substantially deep riverbed and forms a canyon-like valley; there are several not accessible sections in the riverbed.

The mentioned river is the only one in the vicinity and nearby villages (Sabaduri, Kantauri, Abuketa and Tibeta) and is used for irrigation and drinking. There are 4 intake facilities of the irrigation network on the river. The river has 1 right and 3 left tributaries, which are formed from groundwater (Table 2).

The cause of pollution could not be identified by visual inspection. Therefore, the tributaries of the river and existing water intake facilities were considered as possible sources of pollution (the intakes can cause the formation of water pools and boggy territories. Consequently can result in water pollution). During the study of the river, 7 units of bacteriological samples were taken at the following locations (Table 1).

Table 1. Laboratory studies conducted during the initial study.

#	Description	Allowed limit (units/300 ml)	Laboratory analysis (units/300 ml)	Note
1	Water intake of the Tibeta river	10000	9500	Near the allowed limit
2	The left tributary (Tsatskhvnari Ghele) (before connection to the river)	10000	2400	Under the allowed limit
3	The right tributary (Babiakani Ghele) (before connection to the river)	10000	700000	Above the allowed limit
4	The left tributary (without a name) (before connection to the river)	10000	2400	Under the allowed limit
5	Approx 10 meters before the intake structure of the Kantaruri irrigation network	10000	2400	Under the allowed limit
6	Approx 10 meters after the irrigation network intake facility of the Kantaruri	10000	2400	Under the allowed limit
7	The project intake Location (repeated analysis)	10000	7000	Under the allowed limit

Legend: - Main river; - Tributaries; - Pollution by E.coli under the limit; Close to the limit value of pollution E.coli; - Pollution by E.coli above the limit.

Fig. 2. Map of the River bed, tributaries and sampling points for laboratory analysis.

Location N1 - Water intake of the Tibeta river	Location N2 - Tsatskhvnari Ghele
	
Location N3 - Babiakani Ghele	Location N4 - The tributary without a name
	
Location N5 - Before the Kantaruri intake	Location N6 - After the Kantaruri intake
	

Fig. 2. Pictures of simple taking locations.

Results of sampling revealed that the right tributary (location #3, see Figure was contaminated with a high level of E. coli. On September 12th, 2022, there was conducted a detailed investigation of mentioned tributary and only one source of pollution was identified. In that location, the tributary is crossing the road on the place where cattle from villages Sabaduri and Kantauri are drinking water during the hot weather periods (as the local population has explained).

Fig. 3. Identified possible sources of pollution (waste of cows).

Conclusion

The study identified only one possible (above-mentioned) source of contamination (location #3). From this study, we can conclude that the risk of contamination exists every summer and autumn. That's why some activities must be executed to prevent contamination.

There is no possibility to fence the location because it is on the road. After analyzing different possible solutions, the following two were proposed:

Installation of additional chlorination equipment, on the transmission main between the project intake and reservoir. Equipment will work only in periods when the risk of contamination exists. The negative side of this solution is the fact that there is no electricity on site; additional expenses; difficult access road to the site.

Construction of road crossing by pipe (see Figure 5). The solution is not expensive and doesn't need additional maintenance (only a few times per year cleaning from sedimentation). It will protect water from waste and limit the risk of contamination.

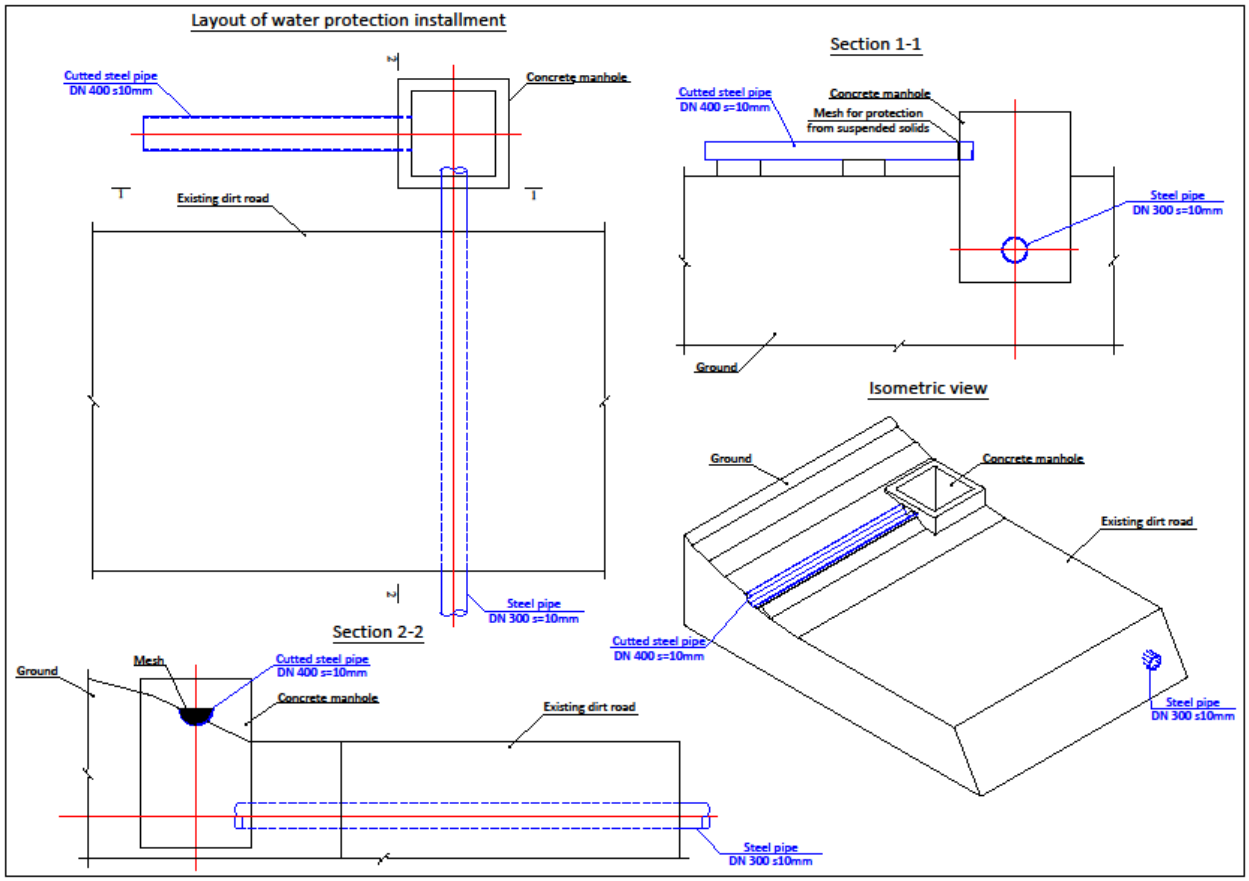

Fig. 4. Scheme of the road crossing.

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