

Surveillance study on retention facility execution basis plan related to improvement of combined sewer system works

Whole term

2002.2 ~ 2002.10

(Purpose)

The Otsu treatment area consists of four drain regions, from west, Ojiyama, Otsu, Zeze and Seiran with the total space of 1,471ha. Otsu and a part of Zeze drain region (approximately 150ha), the center of the area, is built with combined sewers.

Otsu city established “Exploratory Committee on Combined Sewerage Improvement” for better water environment of Lake Biwa. It developed the Improvement Plan for combined sewers in 1999 including constructing intercepting efflux type reservoir pipes (referred as “reservoir pipes” hereinafter), with the purpose of reducing pollution burden and the number of overflows, as one of the plans. Most of the diverted sewage of Ojiyama and Seiran regions flow to the treatment facility via Yamanaka and Seiran relay pumping stations and then connect with the combined intercepting mains in neighboring Otsu and Zeze regions. Since those two pumping stations are decrepit, urgent cares must be taken to these facilities.

Under such circumstances, this research is to review closure and merge of the pumping stations and, efflux method of diverted sewage of Ojiyama and Seiran regions as well as to consider the way for water diversion in the light of influence of outer water level of Lake Biwa, the destination of effluent, location and shape of the entrance of diverted water. Additionally, improvement of the existing storm outfall room, the previous stage of discharging to reservoir pipes, is also to be considered.

(Result)

1. Consideration of closure and merge of the pumping stations

Comprehensive considerations from the view points of reduction effects of pollution burden and construction cost, advantageous solution is to close Ojiyama and Seiran pumping stations while newly constructing sewers as double sections in the reservoir pipes allowing the water to naturally flow into the treatment facility.

2. Consideration of the water diversion method

Two types of diversions, at intercepting side or effluent side, are considered as a water diversion method into reservoir pipes. Based on the premise that the entrance structure of the diverted water without the influence of outer water, water diversion at the effluent side, requiring less reinforced area of the existing pipes, turned out to be more effective.

3. Consideration of the location and structure of the entrance of diverted water

Based on the result of site investigation, the location is set near the place where effluent pipes and reservoir pipes are crossed. As for the structure, it is generally considered in the light of topographical status of the 11 planned entrance installation points, intercepting the inflow of outer water from Lake Biwa and overflow on the upper stream side. It is found that the effective means for the shape of overflow weir in the entrance of diverted water is a circular overflow type. As for the influx structure to the reservoir pipes, the method in which a drop shaft is connected as horizontal pulling has turned out to be favorable.

4. Consideration of the structure of storm outfall room

The amount of intercepted water in the storm outfall room is estimated to be 1Q with the efflux capacity of the existing intercepting mains, to which the water flows, being into consideration. In this case, as the diameter of the existing intercepting pipes from the storm outfall room is too large for 1Q of intercepted amount, the height of the overflow weir is to be changed and an orifice type is to be employed for controlling the rate of stream flow.

5. Other considerations

With regard to the installation of reservoir pipes, it appears to be necessary to consider measures against the exhaust and odor from the pipes as well as pipe cleaning. Measures against the exhaust have to be discussed especially for the one within the reservoir pipes at the time of sewage inflow in order to prevent the lid of manhole from floating or being scattered. Measures against odor is also required because the sewage putrefies and starts generating odor within the exhaust facility during the period for the filled reservoir pipe to be emptied, usually requiring one day. As for cleaning of the pipes, since assembly of the sludge is inevitable due to the slight gradient of the pipe, 1%, cleaning on a regular basis appears to be essential.

6. Summary

With regard to Otsu, for combined sewers improvement, and Zeze, for installation of reservoir pipes, this research allowed us to identify fundamental matters including closure of the aged Ojiyama and Seiran pumping stations as well as considerations for their execution. Developing accurate structural designs for the reservoir pipes, based on the hydraulic model experiments and the result of this research, is expected to be the next step to take.

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Keywords

Otsu City, Combined sewer system, Storage pipe, Separating manhole