

Study on Analytical Investigation of Invading Rainwater (Yokohama-City)

Year of Research

2012

Implementation of anti-inundation measures

(Purpose)

In sewage pipe lines of separate sewer system, it may happen that by the rapid increase of invading rainwater, the amount of inflow exceeds the capacity of the sewage treatment facilities, and this may cause an overflow of sewers, malfunction or shutdown of the sewage treatment facilities.

In order to solve these problems, it is necessary to detect the locations from which rainwater may invade first; however, the detailed investigation requires cost and time.

Case-based-modeling technique is a measure to roughly narrow down the locations from which rainwater may invade enough to choose which point to conduct a detailed investigation by a statistical analysis of the relationship between the past localized rain and the amount of water flowed into the plant.

The purpose of this study is to conduct an investigation to narrow down the locations from which rainwater may invade with Case-based-modeling technique targeting the west sewage area of Yokohama City.

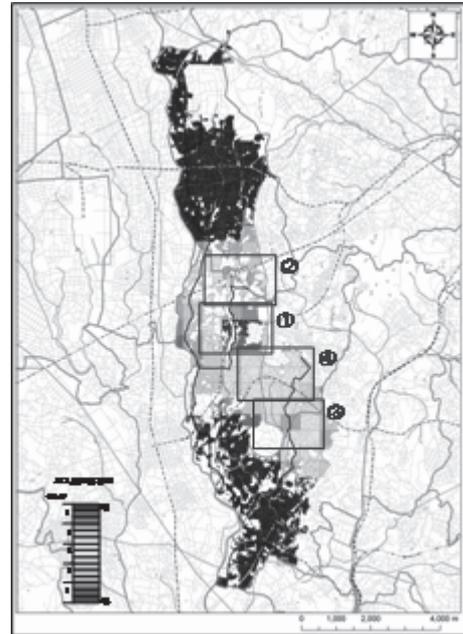


Fig.1 Analysis Map of Rainwater Invasion

(Result)

(1) Confirmation of the Occurrence Area of Invading Rainwater and the Relationship to the Rain Amount

The degree of influences was evaluated –when which area has a lot of rainfall, the inflow into the sewage treatment facility increases – assembling the rainfall data for past three years and using the uneven locality of the rain amount inside the target area. As the evaluation of invading rainwater, the area was classified into five ranks – the most influenced locations are regarded as rank 1; the least are regarded as rank 5 – and drew a map dividing the mentioned ranks into additional 3 colors according to the degree of the influences (Fig. 1). Then, 4 areas which are especially highly influenced by invading rainwater were chosen.

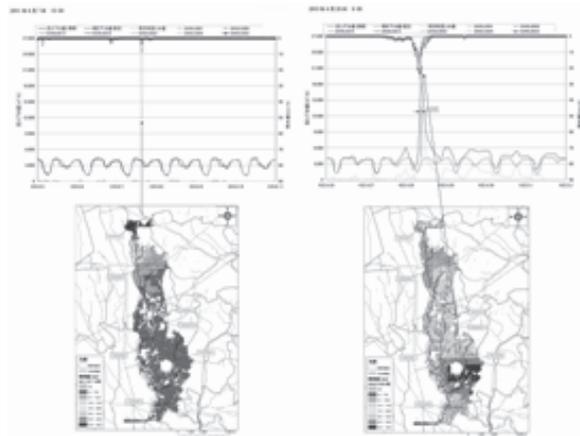


Fig.2 Response of the Inflow into Sewage Treatment Facilities toward Localized Rains

(2) Verification Using Typical Localized Rains

Fig. 2 is the result of the analysis of the influences of typical localized rains on the inflow into the sewage treatment facility. The left side of Fig. 2 shows that the rainfall in the northernmost part did not influence the inflow into the sewage treatment facility. The right of Fig. 2 shows that the rainfall in the central part did influence the inflow. This confirms the validity of the investigation with Case-based-modeling technology.



Fig.3 The Fiscal Year of Construction of Sewage Pipes in the Possible Area ①

(3) Understanding of the Cause of Invading Rainwater.

Fig. 3 is a mapping according to the fiscal year of constructions of sewage pipes in the possible area (① of **Fig. 1**) which is most strongly influenced by invading rainwater. This area includes Izumino-area where the sewage pipe was constructed in the old fiscal year (the fiscal year of 1985 -1987). Furthermore, through the field reconnaissance, points where pierced manhole covers are used were discovered. It is assumed that rain water invaded also from such points.

(Conclusion)

This study aims at the rough grasp of the possible occurrence points of invading rainwater and succeeded to specify the possible points. Therefore, it is said that the purpose has been accomplished. Henceforward, it is necessary to specify the definite points and grasp the cause conducting a detailed investigation.

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Key words	Invading rainwater, measures against rainwater invasion, techniques for detecting locations from which rainwater may invade, case-based modeling technique
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