

Study on Narrowing Down Areas with Rainfall-derived Infiltration & Inflow by Using Dr. TCBM

Whole term

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(Purpose)

During wet weather, the sudden increase of infiltration and inflow (I&I) in sanitary sewer pipes has been observed on numerous occasions. When rainfall-derived infiltration and inflow (RDI&I) exceeds the capacity of the current sewerage facilities, the impact of sanitary sewer overflows and reduced treatment performance or even the shutdown of wastewater treatment on public waters becomes a matter of concern. Also, in future, a large number of sewer pipes installed in Japan after the high-growth period is expected to deteriorate further, and it is becoming important to implement measures against RDI&I entering through cracks in sewer pipes and pipe joints damaged due to age.

Until now, an RDI&I investigation was carried out by dividing the treatment area into large districts and measuring sewage flow by district. Areas suspected to have RDI&I are divided into smaller blocks and sewage flow is measured in each block. However, if the treatment area covers several thousand hectares, this method would require significant cost and labor in terms of economics and time, and cause difficulties in carrying out an RDI&I investigation.

The purpose of this study is to explain the method, scope of application, and appropriateness of the technology of narrowing down areas with RDI&I in the treatment area by using numerical analysis technology (Dr.TCBM), instead of flow measurement.

(Results)

1. Investigation method

This numerical analysis technology narrows down the areas requiring RDI&I measures within an area of 500 meters by 500 meters (25 hectares). It utilizes three years of sewage flow volume data (daily report) measured regularly at a wastewater treatment plant or pump station and radar rainfall data provided by a meteorological agency. The impact of RDI&I is defined as the degree of correlation between the patterns of rainfall volume and RDI&I volume to the treatment plant in each 25-hectare section in the target treatment area, and is calculated for each section. The impact of RDI&I is divided into 5 levels from Rank 1 to Rank 5, where an area of Rank 1 has the possibility of high levels of RDI&I. This technology enables the narrowing down of the areas with RDI&I in the treatment area, which 1) raises the efficiency of detailed I&I investigations, and 2) promotes early implementation of RDI&I measures.

2. Scope of application

The scope of application of this technology is the preliminary or basic investigation for taking measures against RDI&I in sanitary sewer systems. It is applied to the narrowing down of areas with RDI&I to a 25-hectare section (500 meters by 500 meters) in a treatment area covering from 500 hectares to 10,000 hectares.

3. Appropriateness

As a method of confirming the validity of the analysis results, a comparative evaluation of the analysis results of Dr. TCBM and the results of flow measurement investigations was carried out based on actual case studies of three local governments. As a result of the comparative evaluation, sections indicated as having Rank 1 impact by analysis were consistent with the sections found to have high levels of RDI&I through actual flow measurement investigation. By and large it indicates that this technology is suitable for narrowing down areas with RDI&I.

Regarding the conditions for application, this technology may be difficult to apply in areas where errors in estimating sewage inflow volume in dry weather occur easily. Attention should be paid when applying to industrial areas where factory operations can have a significant impact on fluctuations in sewage inflow volume in dry weather, as well as areas that are greatly affected by snowmelt and tide levels.

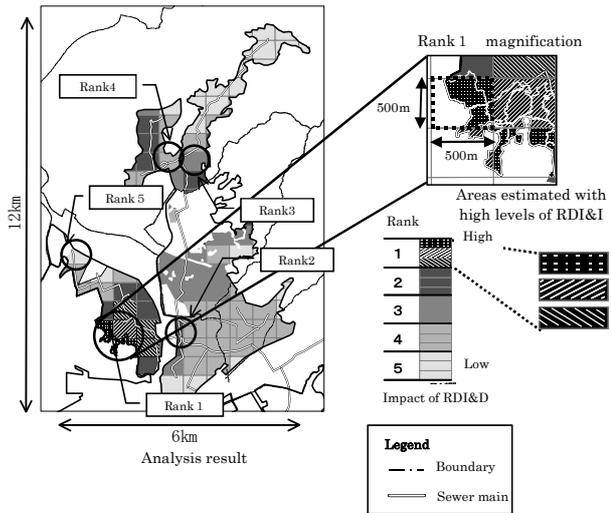


Figure 1. Analysis result (example)

4. Compiling the technical manual

The characteristics, principles, analysis process, data used, and important points of this technology were put together in this technical manual.

Collaborators : Japan Institute of Wastewater Engineering Technology, Yamatake Corporation,
Yachiyo Engineering Co., Ltd.

Researchers : Masayuki Matsuura, Toru Meguro, Hiroichi Mizukawa, Ryoji Maeshima

Key words

Sanitary sewer overflow control, Rainfall-derived infiltration and inflow,
Estimation model of sewage inflow volume