

# Collaborative research on infiltrating water during rain in Kakogawa upper reaches purification center (Hyogo Prefecture)

Year of Research

2012 • 2013

Implementation of anti-inundation measures

## (Purpose)

In the soil pipeline of a separate sewage system, due to a sudden increase in the infiltrating water during rain, the inflow may exceed the allowances of the facility capability, thus posing the risk of an overflow stream from the soil pipeline, or a decline or complete halt of functioning of the treatment facility. In such a case, what is needed first is identification of the rainwater infiltration locations. But, such an investigation requires both cost and time.

Case-based modeling technology is a technique of broadly identifying the rainwater infiltration locations so as to enable the selection of locations to perform a detailed investigation, through a desk study, by statistically analyzing the relationship between the past ubiquitous rainfall and inflow to the treatment facility.

The objective of this research is to use the case-based modeling technique to narrow down and investigate the rainwater infiltration locations in the Kakogawa upper reaches treatment zone.

## (Results)

### (1) Improvement in analysis accuracy

In this research, the analysis accuracy is improved by adopting the following two techniques:

- 1) Correcting the pipe storage of the sewage inflow volume

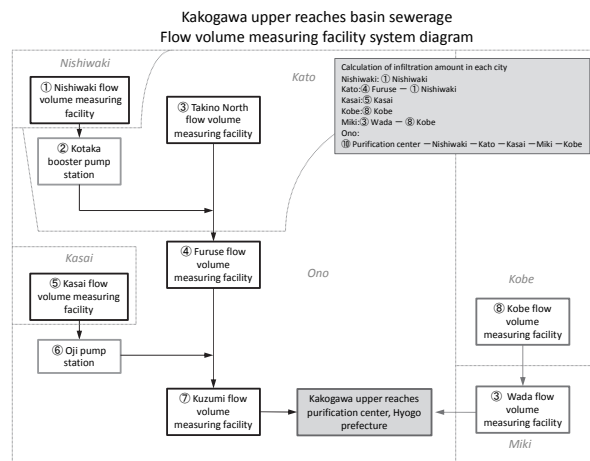
Sewage inflow volume reflecting the pipe storage amount was adopted.

- 2) Separating the drainage systems

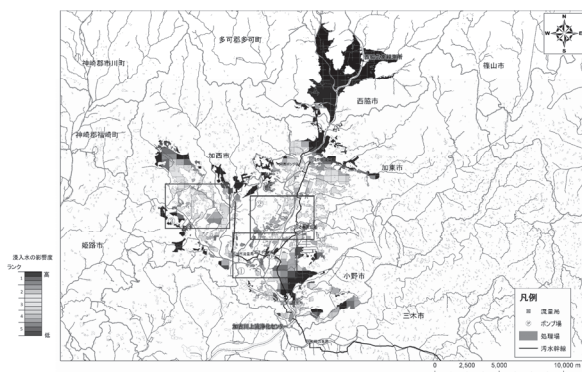
As shown in **Fig. 1**, there is an inflow from two systems to the Kakogawa upper reaches purification center. Therefore, the regions where water infiltration occurs during rains are narrowed down by separating the analysis regions.

### (2) Analysis result

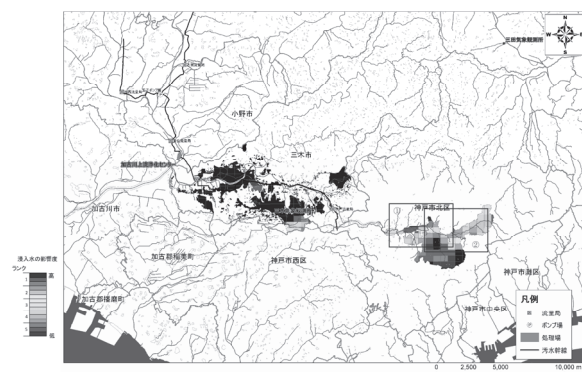
The analysis maps of the Nishiwaki trunk system and Kobe trunk system are shown in **Fig. 2** and **Fig. 3**.



**Fig. 1. Infiltration system at Kakogawa upper reaches treatment zone**



**Fig. 2. Analysis map (Nishiwaki trunk system)**



**Fig. 3. Analysis map (Kobe trunk system)**

1) Nishiwaki trunk system

“Old houses” and “Industrial parks” were the regions with the highest impact.

“Old houses” are regions where the sewage pipe is laid after the construction of the house, and therefore, there is a possibility of infiltration due to a wrong connection of the rain water pipe inside the house, or infiltration from pipes and drains, and collecting sewers with poor water tightness.

Infiltration into “Industrial parks” is expected to occur due to a wrong connection of the rain water pipe, or infiltration from pipes and drains, and collecting sewers with poor water tightness.

2) Kobe trunk system

The region with the highest impact was mainly centered around the “foot of mountains”.

The perpendicular “base between mountains” is a zone where the rainwater falling in mountainous regions accumulates easily, and therefore, when there is infiltration due to a wrong connection of the rain water pipe, or infiltration from pipes and drains, and collecting sewers with poor water tightness, the impact increases.

In the area, there is a relatively new development area is fully equipped with VP pipe, but the manhole cover open some holes have also been adopted, find the cause in the detailed study of the future is expected.

**(Summary)**

The objective of this investigational research was to effectively extract the possible locations where water infiltration occurs during rains, and as a result, the source areas could be identified. In future, it is necessary to identify the specific source locations through a detailed investigation, and take appropriate measures.

※ Hyogo Prefecture, Japan Institute of Wastewater Engineering and Technology  
Inquiries ; R&D Team 2: Hiroshi Kouchiwa, Makoto Ishikawa, Kimitoshi Sato [03-5228-6598]

Key words

Infiltrating water during rain, anti-inundation measures, infiltrating water identification technique, case-based modeling technology