Joint Study on the Improvement of CSO by the Use of Infiltration Facilities in Chofu City

Year of research	2010	Improvement of combined sewer system

(Purpose)

In Chofu City, reduction of the number of CSO discharges annually on rainy days by infiltrating 41,151 m^3/hr by the use of rainwater infiltration facilities has been proposed in an Urgent CSO Improvement Plan. There are 27 drainage outfalls in the City and target concerning the number of discharge of CSO at outfalls has not been met at 9 outfalls for the time being.

The purpose of this study is to establish an implementation plan conforming to actual situation by setting realistic infiltration capacity of infiltration facilities based on the results of on-site permeability investigation to be carried out.

(Method of study)

An implementation plan for infiltration facilities was prepared in the following manner; 1) review and revision of an infiltration suitability map, 2) implementation of on-site permeability investigation by constant water level method, 3) setting of infiltration capacity, and 4) study on scales of infiltration facilities to achieve target.

(Results)

Based on the conditions of soils, “Musashino Loam” and “Tachikawa Loam” were determined as soils suitable for infiltration, whereas others were determined as soils not suitable for infiltration and classified as “areas requiring further investigation such as those either flat and low, cut or banked”, “ areas undesirable for infiltration such as those either banked, filled or low and deposited”, and “areas unsuitable for infiltration such as cliffs or steep slopes.” On-site permeability investigation at 8 locations in infiltration suitability areas. Results obtained from investigation are summarized in Table-1.

Table-1 Results of on-site permeability investigation

Soil classification	Saturated permeability coefficient k_0[cm/sec]		
	Min.	Average	Max.
Musashino loam 1		1.16×10^{-2}	
Musashino loam 2		2.21×10^{-3}	
Tachikawa loam 1	6.39×10^{-3}	9.46×10^{-3}	1.84×10^{-2}
Tachikawa loam 2	2.79×10^{-3}	1.19×10^{-2}	2.10×10^{-2}
Grand average	2.21×10^{-3}	9.43×10^{-3}	2.10×10^{-2}

Based on on-site investigation, variations of saturated permeability coefficients were observed even for the same types of soils as shown in Table-1 and thus the average values were adopted for this study.

Construction method of modifying existing drainage inlets (street drain inlets) to infiltration facilities as shown in Figure-1 was adopted so that no new excavation in urban areas can be avoided.

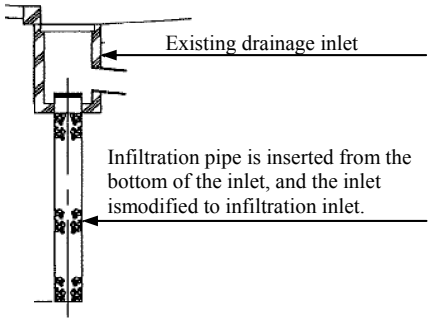

Figure-1 Infiltration facilities by modifying existing drainage inlets

As for the number or scale of infiltration facilities, required number of facilities was determined by identifying the number of infiltration facilities possible to be installed by the use of GIS software for each of drainage districts for 9 target outfalls and then by determining required number of facilities to be installed by the simulation using runoff simulation software.

The methods of incorporating rainfall infiltration capacity in simulation model are; 1) subtracting amount of rainfall equivalent to infiltration capacity from target hyetograph, 2) decreasing runoff coefficient by the value equivalent to infiltration capacity, 3) incorporating infiltration facilities themselves in pipeline model of simulation. Since terminal infiltration capacity is constant independent of rainfall magnitude and in order to shorten the time required for simulation, the first option above was adopted.

Chofu City provides a system for financial assistance to installing residential rainfall infiltration inlets and is promoting the installation of infiltration facilities actively as a part of measures for rainwater runoff control. With due consideration to the above, infiltration facilities as measures for urgent CSO improvement to be developed by city government as well as those by citizens were incorporated in a plan prepared in this study. As a consequence, infiltration capacity possible to be developed in a whole areas of the City depicted in Urgent CSO Improvement Plan amounts to 46,640m^3/hr and target capacity of 41,151m^3/hr could be met.

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Key words	Combined sewer overflow (CSO) improvement, Infiltration, Infiltration suitability map, Runoff simulation