

Research on Plan the Stormwater Pump-station Network System

Year of Research

2006•2007

(Purpose)

The purpose of this research is to suggest technical considerations and planning methods to prepare a network plan by selecting networks for storm water drainage system service level upgrading’, and ‘effective and efficient replacement/renovation of pump-stations’ and examining and evaluating techniques for networking multiple pump stations (PSs) from various perspectives.

(Results)

(1) Overview of pump station network

Figure 1 shows conceptual diagrams of Stormwater Pump Station Networks (SPN). SPN is a technique used to connect existing PSs with a core PS using network pipes and to supplement the capacity of connected drainage areas. A core PS is a PS newly constructed to complement PSs which are to be strengthened and renovated in object drainage areas. These SPN enable upgrading of facilities, and efficient restructuring and renovation. Furthermore it can be expected to improve response to risks of excess rainfall and malfunctions when earthquakes strike.

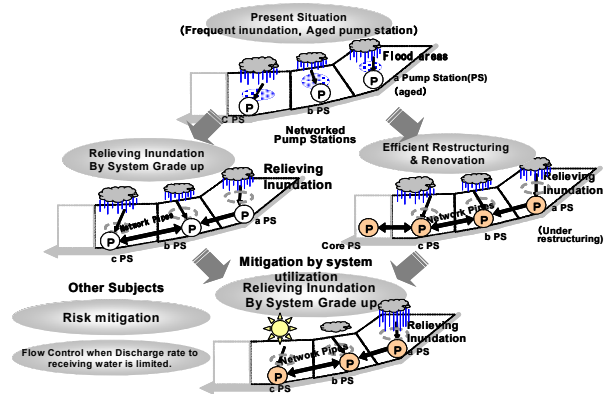


Figure 1 Conceptual diagrams of SPN

(2) SPN planning flow chart

Figure 2 is an SPN planning flow chart. In this plan, the areas are listed considering the state of inundations, degree of deterioration of PSs, quake-proof grade, site conditions, and state of the receiving waters. To begin planning, the required scale of drainage facilities is examined by drafting several network plans according to the planning policy that considers the need for restructuring and construction targets based on damage caused by inundations. Thereafter PS and network pipe construction priority is evaluated, and the construction scales at each step are carefully surveyed, then staged construction plans can be made. To prepare the network draft plans, the effectiveness of a system which responds when drainage functions are stopped by maldistributed excess rainfall and inundation is verified. Based on the verification, network draft plans are fully evaluated and the final plan is chosen.

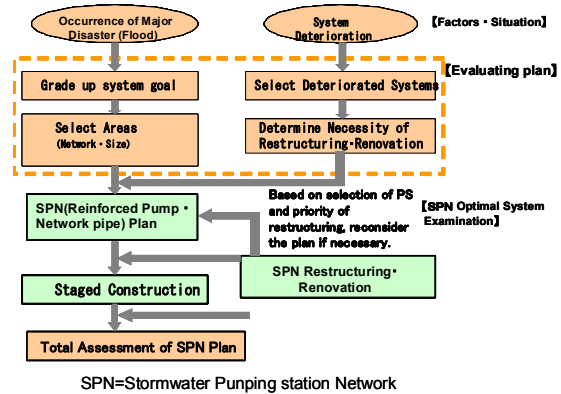


Figure 2 SPN planning Flow chart

SPN=Stormwater Pumping station Network

(3) Case study

Figure 3 shows an example of evaluation of the effectiveness of a network system with three pump stations when excess rainfall occurs. In a case of no network system in L drainage area, inflow to pump A causes overload when excess rainfall occurs and this induces inundation in area H. On the other hand, when a network system is installed, the storage capacity of M and P drainage areas can be effectively utilized, and inundation in area H is mitigated.

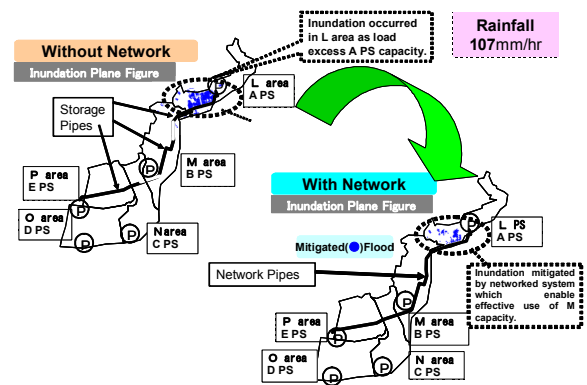


Figure 3 Example of evaluation of the effectiveness of a network system

(4) Plan-making manual

The results of this research of planning method, construction scale, and restructuring renovation of SPN have been compiled in a Plan-making manual “Plan-making Manual of Storm water Pumping Station Network system”.

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Key words

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