

## OPERATING STRATEGY OF GROUNDWATER DAM UTILIZING A PRECIPITATION-BASED INDEX

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### Abstract

In Korea, the multi-regional water supply systems have supplied and distributed the water resources sufficiently to the national capital region or the metropolitan areas even under severe drought, but the provincial small cities such as Sockcho, Donghae, Taebaek, Samchuk etc. have been suffered from drought every 2-3 years. Those cities take emergency actions such as the excavation of riverbed, the restriction on water supply, etc. to overcome the drought. The medium- or small-scale developments of water resources, which cover 10-40 thousand m<sup>3</sup>/day, are more feasible than the large-scale developments to solve the shortage of local water resources. Groundwater dam is one of the alternatives to develop more water resources in relatively small watershed and Ssangchun groundwater dam is a good example of the medium-scale water resources development. Groundwater dam, which detains baseflow of watershed and prevent seawater intrusion, is an environmentally good alternative. Sokcho city constructed the Ssangchun groundwater dam in Ssangchun watershed in 1998. After the construction they have suffered some droughts. At that time there were many problems to operate the groundwater dam including excessive drawdown of groundwater level and seawater intrusion. We need the optimized operating rule in order to overcome these problems and use the groundwater dam efficiently in dry season. Most studies on groundwater dams are related to mainly barrier construction and researches on the optimized operating scenarios are rare.

In this study, we collected the basic hydrogeological data in the Ssangchun watershed such as the type and variation trend in precipitation, groundwater level, and the groundwater dam operation data. We compared and analyzed the relationship between precipitation and groundwater levels in terms of both SPI by monthly precipitation and moving average index by daily precipitation. According to the results from SPI application,

there are some problems to determine an operating strategy even though the SPI value for three months is similar to the variation of groundwater level. Properly forecasted groundwater level with easily acquired precipitation data could be a good method for the optimized operation of groundwater dam. We could find that the 90 days moving average index shows best correlation with the groundwater level from the monitoring wells, and we call it G.O.I. (Groundwater Dam Operating Index), which is a precipitation based index. G.O.I. estimated the drought period well. We concluded G.O.I. could be useful for the determination of the operating scenarios of Ssangchun groundwater dam.

This optimizing scenario will be used for developing the groundwater dam and confirming the optimal rule of operating scenario for each dam. However this technique should be verified by a hydrologic model, which integrates surface and subsurface flow. This method will be used as a basic module for the decision support system for operating groundwater dam, which will be the core management technology of subsurface water in the integration of surface-subsurface water system.

*Keywords:* Groundwater dam, SPI, GOI, Operating scenario