Optimizing Irrigation Network System Design Through Canal Capacity Analysis with Graph Theory

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This study addresses the challenge of efficiently distributing water from a central source to distinct demand points through an irrigation canal system. In this network design, the demand locations serve as network nodes, interconnected by arcs representing the canals to be constructed. The construction cost of each canal is influenced by various factors, including land structure and topography.

The rate of water flow along a canal path from the main source to a specific demand location is constrained by the minimum canal capacity along that route. The primary objective is to identify a subset of canals that can maximize the perunit- time water delivery to each demand location while minimizing construction costs, all while accounting for canal capacity constraints. This problem is tackled within the realm of graph theory, and an associated algorithm has been developed to address it comprehensively.

Keywords: Graph Theory, Irrigation Network, Bottleneck Problem, Optimization