Optimatics
PLAN SMARTER

CASE STUDY: CITY OF OMAHA, NE
LONG-TERM CONTROL PLAN UPDATE & OPTIMIZATION

The City of Omaha, NE utilized Optimatics' Optimizer™ software to support its Long-Term Control Plan update. The Optimizer™ software was used to evaluate over 100,000 distinct alternatives to identify the most cost-effective ways of achieving 85% wet weather volume capture and determine whether alternatives that did not require a deep tunnel existed in addition to the current tunnel-based plan.

KEY POINTS

- Plans incorporated input from the City at each step
- Process helped to define "right-size" no-tunnel and tunnel alternatives
- Significant cost savings were identified compared to the current LTCP approach

CLIENT REFERENCE

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Program Manager
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BACKGROUND + PURPOSE

The City of Omaha, NE is implementing a Long-Term Control Plan (LTCP) in an effort to become compliant with the requirements of the EPA CSO Control Policy. They have made excellent progress toward the capture, elimination, or treatment of at least 85% of the total system-wide volume of combined sewage generated during wet weather in an average year. Omaha's current LTCP includes a broad range of system improvements. However, one of the core elements to the LTCP is a costly Deep Tunnel System (DTS). The experts at Jacobs Engineering led this optimization study with the City, which focused on identifying whether there are more cost-effective means of achieving 85% wet weather volume capture while balancing a range of additional wet-weather management objectives.

OBJECTIVES

The overall objective of the optimization analysis was to provide a comprehensive understanding of the benefits and the cost-effectiveness of a range of strategies to achieve 85% wet-weather volume capture as required in the EPA CSO Control Policy. Specific objectives include:

- Identifying whether no-tunnel alternatives may provide a cost-effective alternative to the LTCP tunnel-based solution
- Evaluating a broad range of alternative components and wet-weather control strategies to define the tradeoffs between cost and CSO volume reduction
- Identifying 3 – 5 high-performing alternatives which merit further evaluation as part of the LTCP update.

APPROACH

Optimization is a structured process for systematically evaluating a wide range of wet-weather improvements, helping the City advance from a broad set of CSO control ideas, to a well-defined set of "high-performing alternatives" that clearly articulate tradeoffs in cost and performance. The City's InfoWorks ICM model was used along with the Optimizer™ software to evaluate the effectiveness of potential solutions.

Working with Jacobs Engineering, numerous workshops and coordination calls were conducted over a year-and-a-half period to document and capture the knowledge of Omaha's wet-weather program team. City staff were involved throughout the optimization study. Optimization results were shared frequently to obtain rapid input and make sure the understanding of team members was fully integrated into the optimization formulation. A high-level flowchart of this process is shown below.

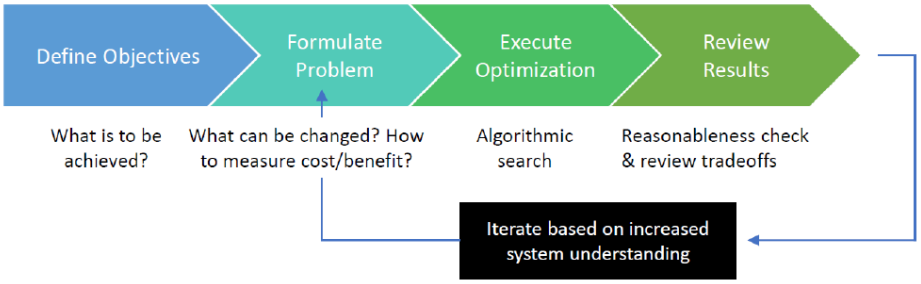

Figure 1: High-level Flowchart of Optimization Process

The optimization was executed numerous times and included over 100,000 model runs. The Optimizer™ software allowed the optimization to utilize multiple objectives to help clearly define tradeoffs between cost and wet-weather capture benefits.

RESULTS

Optimal CSO volume versus lifecycle cost tradeoff curves show trends in most cost-effective solutions by primary technology and whether or not tunnel solutions are included. A group of five high-performing alternatives (HPAs) were defined as the best examples from a range of alternatives for achieving 85% capture. The most cost-effective solution was included as an HPA, but it was recognized that other alternatives may cost more and have other benefits, such as community acceptance, water quality impacts, or contributing to increased system operation during high river level, which merit consideration.

HPAs vary in cost from $263M to $400M and comprise a range of CSO control technologies. The optimization process provides a firm technical foundation for this update and confidence that the solutions being considered represent the most cost-effective strategies for achieving Omaha's CSO control needs.

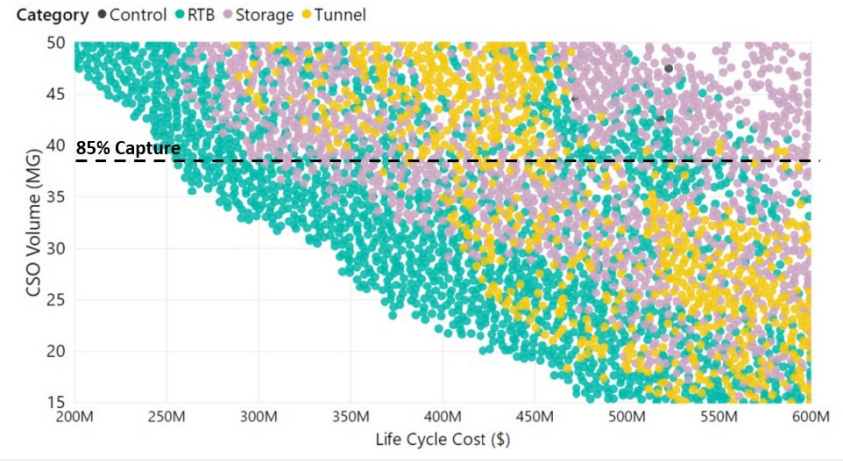

Figure 2: CSO Volume vs. Lifecycle Cost by Primary Technology