

Executive Summary

This chapter summarizes the *Executive's Recommended Regional Infiltration/Inflow Control Program*. It provides background for the program recommendation and then presents a list of specific recommended actions and the basis for these actions. Subsequent chapters in this report discuss the program recommendation and the data that support it in more detail.

1.1 Background

The King County Wastewater Treatment Division (WTD) serves 34 local wastewater agencies in the regional service area (Figure 1-1). WTD must provide adequate capacity in its system to convey and treat wastewater flows sent by the agencies through their collection systems. With the exception of portions of the City of Seattle that have combined sewers (designed to convey wastewater and stormwater in the same pipes), sewers in the regional wastewater system are designed to convey only wastewater. However, many of these “separated” sewers also convey clean groundwater and stormwater that enter through leaky pipes, improper storm drain connections, and other means. This clean water, called infiltration and inflow (I/I), takes up capacity that could otherwise be used for wastewater alone and generates the need to build added capacity in pipelines, treatment plants, and other facilities. This added capacity results in higher capital and operating costs to the regional system that are born uniformly by all agencies and passed onto ratepayers in each jurisdiction.

Recognizing the need to explore the feasibility of I/I control, the King County Council approved I/I control policies as part of the *Regional Wastewater Services Plan* (RWSP), adopted in 1999 under Ordinance 13680. The policies establish the framework and process for development of a long-term regional I/I control program. In response to the RWSP policies, the County as represented through WTD staff worked in a consensus-based approach with local agencies to conduct a comprehensive 6-year I/I control study. The study began in 2000 and culminates with this Executive's recommendation for a regional I/I control program. The RWSP defined the following study components:

- Define current levels of I/I for each local agency tributary to the regional system.
- Select and construct pilot projects to demonstrate the cost-effectiveness of collection system rehabilitation projects.
- Develop model standards, guidelines, procedures, and policies for use by local agencies to reduce I/I in their systems.

- Identify cost-effective options to remove up to 30 percent of I/I expected to occur in local agency systems during a 20-year peak flow condition.¹
- Develop a long-term regional I/I control plan for review and approval by the King County Council.

During the I/I control study, the County conducted 10 workshops with local agencies and over 75 work sessions with the MWPAAC Engineering and Planning (E&P) Subcommittee.² The County will continue to work collaboratively with local agencies in implementing the regional I/I control program.

1.2 Executive’s Recommended I/I Control Program

The following recommendations make up the Executive’s recommended regional I/I control program. The recommendations represent the consensus reached by the County and local agencies throughout the 6-year program development process. Knowledge gained from flow monitoring, modeling, pilot projects, and a benefit-cost analysis conducted during the I/I control study served as the basis for consensus.

Recommendations are presented for both I/I reduction and long-term I/I control and for program administration and policy. In addition to cost-effectively removing enough I/I from the collection system to delay, reduce, or eliminate some otherwise needed conveyance system improvement (CSI) projects, measures must be in place to maintain I/I reductions long-term and to prevent future increases in I/I throughout the regional system. Long-term I/I control includes policy, administrative, financial, and technical measures that promote an ongoing program of review, maintenance, and repair of the collection and conveyance system.

Recommendation Highlights

King County and the local agencies would select, implement, and evaluate two or three “initial” I/I reduction projects to test the effectiveness of I/I reduction on a larger scale than the pilot projects.

After completion of the initial projects, recommendations would be made to the King County Council regarding long-term I/I reduction and control, including applicable changes to policy or code.

Recommendations for I/I Reduction:

- Identify cost-effective I/I reduction projects on a project-specific basis, rather than on a regional basis or by the need to meet specific I/I reduction targets.
- Select two or three initial I/I reduction projects for implementation from the list of nine cost-effective projects identified in the benefit-cost analysis. King County and MWPAAC (through the E&P Subcommittee) would work cooperatively to select these projects.

¹ Peak flow is the highest combination of base flow and I/I expected to enter a wastewater system during wet weather at a given frequency that treatment and conveyance facilities are designed to accommodate.

² MWPAAC = Metropolitan Water Pollution Abatement Advisory Committee.

- In the next 3 to 5 years, construct the selected initial projects to test planning assumptions and to gain more information about costs.
- Proceed with work on private property when a project calls for it. Experiences on initial projects would be documented in terms of public involvement activities, private property participation rates, costs, neighborhood impacts, groundwater effects, and special construction issues that arise.
- Fund initial projects through King County wastewater revenue that is dedicated to funding CSI projects in the regional conveyance system. For future I/I reduction projects, options to supplement King County funding may be considered. For example, local agencies could contribute funds to expand the project scope in order to take advantage of construction efficiencies, as was done in some pilot projects, or to move a project into the cost-effective category.
- Conduct pre- and post-project flow monitoring to test the ability of I/I reduction projects to reduce enough flow to delay, downsize, or eliminate the need for CSI projects.
- Reconvene the E&P Subcommittee when initial projects and post-project flow monitoring are completed to evaluate results of projects, adjust planning assumptions if appropriate, and further refine private property protocols or best practices to ensure that successful approaches are carried forward to future work.
- If the initial projects are deemed successful and future I/I reduction is approved, proceed programmatically to apply I/I reduction planning to all CSI project planning. Wherever an I/I reduction project is a cost-effective alternative to the planned CSI project, the County and local agencies would implement the I/I reduction project provided that it is environmentally and logistically feasible.

Recommendations for Long-Term I/I Control:

- Make use of existing local agency regulations to ensure that new development and redevelopment within the regional wastewater service area meet up-to-date construction standards for sewer conveyance lines and connections.
- Apply the standards, guidelines, procedures, and policies in final draft form to the initial I/I reduction projects (included as Appendix A). Once they have been tested on large-scale projects, the standards, guidelines, procedures, and policies would be reviewed and finalized by the local agencies and translated into King County policy in the form of an ordinance.
- Conduct a system flow audit of the regional and local systems every 10 years to track I/I levels. The County and local agencies would conduct the audits and use the information to cooperatively make decisions about how to adjust I/I control measures as may be necessary.
- Do not implement a surcharge on local agencies for flows that exceed targeted I/I reduction levels already established in the King County Code. The County and local agencies found that implementing a surcharge, as contemplated in the King County Code, would be costly to administer and would pose difficulties in verifying violations.

Recommendations for Program Administration and Policy:

- Authorize King County to centrally manage the I/I control program, to develop public information materials for the overall program, and to serve as a central clearinghouse for program inquiries and training.
- Conduct flow monitoring to assess effectiveness of I/I reduction over time.
- After completion of the initial I/I reduction projects, develop recommendations regarding changes to local agency agreements and/or the King County Code.

1.3 Basis for the Recommendations

1.3.1 Process for Identifying Cost-Effective I/I Reduction Projects

A benefit-cost analysis was conducted to determine the optimal I/I reduction available and then to generate a list of cost-effective I/I reduction projects based on regional conveyance needs. The analysis relied on a variety of information collected during the I/I control study:

- **Conveyance system improvement projects.** A regional needs assessment was completed in early 2005 as a part of the I/I control study. The agreement identified CSI projects that would be needed to accommodate peak flows through 2050—the projected date when the regional wastewater service area will be fully built out and all portions of the service area will be connected to the wastewater treatment system.
- **Assumptions regarding sizing, costs, I/I reduction potential, and other planning factors.** Assumptions were developed in coordination with the E&P Subcommittee. They are based on industry standards, experience in operating wastewater systems in the region, and results of the research and I/I pilot projects conducted for the I/I control study. The set of assumptions for I/I reduction rates was intentionally made conservative for the benefit-cost analysis to avoid potential overestimation of benefits or underestimation of costs. A set of initial assumptions that was less conservative and based on direct experiences in the pilot projects was used to conduct a sensitivity analysis to provide the upper end of the range for cost-effectiveness outcomes.
- **Flow data collected during the I/I study and flow predictions based on the data.** Extensive flow monitoring data were used in commercially available hydrologic and hydraulic models to estimate present and future conveyance system capacity needs. These modeled estimates were supported by information regarding local agency wastewater facilities, current and future land uses, population projections, and other modeling assumptions.
- **Results of pilot I/I reduction projects.** Lessons learned from 10 pilot projects about costs and effectiveness of I/I reduction techniques served as an important input to assumptions used in the benefit-cost analysis.

- **Definition of cost-effectiveness of I/I reduction projects.** For the purpose of developing this recommendation, cost-effective projects were defined as those for which the capital savings that result from I/I reduction exceed the costs of constructing the I/I project. When an I/I reduction project delays, downsizes, or eliminates the need for a conveyance facility improvement, the savings achieved (benefit) must be higher than the cost of the I/I reduction project (cost) to arrive at a positive benefit-cost ratio (1 or greater).
- **Alternative methods for applying cost-effectiveness of I/I reduction.** During the I/I control study, three alternatives were developed for evaluating cost-effectiveness: project-specific basis, region-wide basis, and a 30-percent I/I reduction goal. The project-specific basis was identified as the preferred alternative. Considering cost-effectiveness on a project-specific basis focuses I/I reduction where downstream conveyance benefits are the greatest and achieves the greatest possible savings to the region.

Nine cost-effective I/I reduction projects resulted from evaluating cost-effectiveness on a project-specific basis:

- The estimated cost of implementing the nine cost-effective I/I reduction projects is approximately \$73 million.
- The anticipated I/I reduction achievable is estimated at 22 million gallons per day (mgd), or approximately 18 percent of the I/I present in the affected mini basins and approximately 5 percent of the I/I present in the entire regional service area.
- As a result of reducing I/I flows, the capital costs for associated CSI projects could be reduced from approximately \$268 to \$164 million, resulting in a regional CSI savings of nearly \$104 million.
- The net overall savings realized from implementing the nine identified cost-effective I/I reduction projects is estimated at approximately \$31 million.

The benefit-cost analysis for removing 30 percent of the region's total estimated 450 million gallons per day (mgd) of I/I from the regional collection system indicated that the benefit (\$116 million) to cost (\$398 million) ratio for achieving 30-percent I/I reduction would be 0.29, which is considerably below the benefit-cost ratio of greater than 1 that was set for cost-effectiveness. The benefit-cost analysis using the third alternative—evaluating the cost-effectiveness of I/I reduction on a region-wide basis—identified 13 I/I reduction projects with benefit-cost ratios ranging from a high of 3.3 to a low of 0.48. While several projects on the list were not cost-effective, the savings from the other projects were spread out to produce an average benefit-cost ratio of 1.02, essentially a break-even ratio. To pursue this alternative, approximately \$132 million (cost) would be spent on I/I reduction to achieve \$134 million in savings (benefit).

1.3.2 Considerations Related to I/I Reduction and Control

Development of the I/I control program recommendation required extensive research and discussions regarding how to manage I/I when it originates on private property and, whether to implement a surcharge on local agencies for flows that exceed targeted I/I reduction levels contained in the King County Code.

1.3.2.1 Managing I/I on Private Property

Flow monitoring, modeling, and pilot projects found that a majority of I/I originates on private property via defective side sewers or improperly connected storm drains, and that significant I/I flow reduction can be achieved in basins where I/I reduction work is conducted on private property. Four of the ten I/I pilot projects focused repairs on private property and achieved the highest levels of I/I reduction. Pilot project work done on private property was funded by King County with contributions by local agencies. Because there was no cost to the participating property owners, the voluntary participation rate in the pilot projects was 95 percent.

A legal analysis indicated that if I/I reduction could be shown to be cost-effective (that it could be shown to have a public benefit that outweighs the cost), the expenditure of public funds for this purpose would be legally defensible and would not be a violation of the Washington State Constitution provisions on the subject. All of the nine cost-effective I/I reduction projects identified in the benefit-cost analysis would entail work on private property to achieve the projected I/I reductions. In the analysis, these projects were deemed cost-effective inclusive of the costs and potential risks of private property work. It is therefore recommended that the County and local agencies proceed with work on private property for the selected two or three initial projects and that King County fund these projects. If the initial projects demonstrate the feasibility of working on private property on a larger scale than the pilot projects, repairs on private property can be included as part of the overall I/I reduction strategy in the planning and design of capacity-related CSI projects.

1.3.2.2 Whether to Implement an I/I Surcharge

The King County Code provides for the consideration of establishing a surcharge to local agencies that do not meet targeted I/I reduction levels that already exist in the Code. So far, the provisions of the Code regarding target I/I reduction levels, or I/I threshold, have not been enforced because calculation of a surcharge as a means of enforcing the threshold for each local agency is impractical. The Code provisions are complicated, language in agreements with local agencies is not uniform in regard to exemptions for older collection pipes (those built before 1961), and the annual cost to cover equipment and staffing for the continuous flow monitoring that would be required for enforcement would be several million dollars. Moreover, this annual cost would not result in any physical improvement to the regional system and, in years where there are no major storm events, the I/I thresholds would likely not be exceeded by any local agency and no surcharge revenue to defray annual monitoring costs would be generated. It is therefore recommended that no surcharge for excess I/I levels from local agencies be implemented.

1.4 Supporting Documents

Major reports that have contributed to the contents of this recommendation report include the *2000/2001 Wet Weather Flow Monitoring Technical Memorandum*, *2001/2002 Wet Weather Flow Monitoring Technical Memorandum*, *Pilot Project Report*, *Alternatives/Options Report*, *Regional Needs Assessment Report*, and *Benefit-Cost Analysis Report*. These reports and other information produced during the I/I control study can be found on the CD included with this recommendation report and on the I/I program Web site at <http://dnr.metrokc.gov/wtd/i-i>.