

“Keeping Water Out”: A Simple, Innovative Tool to Evaluate Management Scenarios for Reducing Flows to Sewer Systems

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The “Keep the Water Out” Tool

- Provides simple methods to calculate wastewater and stormwater flow in your system
 - Very little data required
- Provides simple methods to calculate wastewater and stormwater reductions in the system
- Includes planning level costs
- Provides default values and methods for estimating various inputs
 - Use of local flow rates, flow reduction information, and cost data is recommended, if available.
- Planning tool that can be used iteratively to evaluate different management scenarios

Keeping Water Out of Sewer Systems

Flow Component	Management Practices	Sewer System
Reduce Storm Water Runoff	Reduce impervious cover, low impact development (LID) including green roofs and pervious pavements	Combined sewer system Separate storm sewer system
Reduce Inflow	Redirect roof leaders from the sewer systems	Combined sewer system Separate storm sewer system
Reduce Infiltration	Sewer rehabilitation techniques (e.g., grouting, lining, manhole repair, etc.)	Combined sewer system Sanitary sewer system
Reduce (Consumptive) Water Use, which in turn reduces flow to the sewer systems	Water conservation techniques (low-flow fixtures and appliances)	Combined sewer system Sanitary sewer system



Keeping Water Out of Sewer Systems Calculator

- **Quantify base sewer flow conditions**
 - Wastewater (residential, commercial, industrial, infiltration)
 - Stormwater
- **Quantify flow reductions associated with the following practices:**
 - Stormwater runoff reduction
 - Inflow control
 - Infiltration control
 - Water conservation
- **Estimate costs associated with flow reductions**

Keeping Water Out of Sewer Systems Calculator

The principal data needs are:

- Sewered service areas in acres (sanitary, separate storm, and combined)
- Wastewater sewer service population (number of people)
- Wastewater volume in gallons/year
- Infiltration to collection system
- Annual rainfall in inches






Calculations - Base Wastewater Flow

- Sum of residential, commercial, industrial flows, plus inflow
- Residential and commercial flows based on per capita use rate multiplied by population numbers
- Industrial flows may be available from pretreatment data
- Infiltration can be entered or calculated based on infiltration percentages



Calculations – Base Storm Water Flow

- Calculated using runoff coefficient multiplied by total sewerage area and annual rainfall
- Runoff coefficient based on imperviousness
- Storm water flows developed for storm and combined systems
 - No need to differentiate between combined and separate storm systems – it's all storm water flows!



Reduce Storm Water Runoff - Calculations

- Similar to calculation of storm water runoff
- Calculated using percentage of runoff retained by LID multiplied by total area of low impact development/re-development and annual rainfall
- Percentage of runoff retained by LID based on published literature

Reduce Inflow - Calculations

- KWO incorporates one management method – disconnect roof drains
- Calculated as roof area disconnected multiplied by annual rainfall
- Roof area may be available from GIS data
- KWO provides participation and cost estimates from cities that have completed programs
 - Can be used for guidance





Reduce Infiltration - Calculations

- Sewer rehabilitation
- Based on percent effectiveness of projects
- KWO provides participation and cost estimates from cities that have completed programs
 - Can be used for guidance

Implement Water Conservation - Calculations

- Flow reduction evaluated as water savings per device installed multiplied by number of devices installed
- Evaluates several devices
 - Low flow toilets
 - Low flow shower heads
 - Low flow washers
- Municipally-sponsored rebate programs
- KWO provides participation and cost estimates from cities that have completed programs
 - Can be used for guidance





Appendices and Examples

- Appendices provide additional information
 - Development of default data
 - Project/program implementation in other municipalities
 - Cost data
- Examples
 - Provide information on how to take typical types of data and enter it into KWO
 - Demonstrate iterative use of KWO to evaluate different scenarios

Future Work

- Improve usability
 - Evaluate parameters to ensure that users can get input data
- Refine “default” values
- Evaluate tool’s niche
- Outreach and user feedback