

Infiltration and Inflow in Connecticut: Data Summary, Cost Benchmarking & Management Trends

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Framework for I/I Management

- **Drivers**
 - High flows
 - Permit violations
 - SSOs, surcharging & backups
- **Monitoring Approach**
 - Periodic/temporary
 - Continuous
- **Other Considerations**
 - Future permit requirements?
 - Inter-municipal agreements



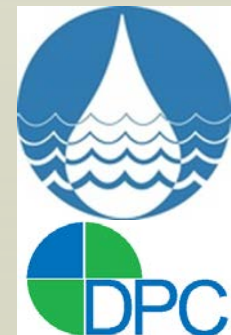
OUTLINE

- Source Data
- Baseline Flow Conditions
- Statewide I/I Summary
- Cost Benchmarking
- Metrics-Based I/I Program Decisions
- Alternative I/I Approaches
- Permitting Trends



Source Data

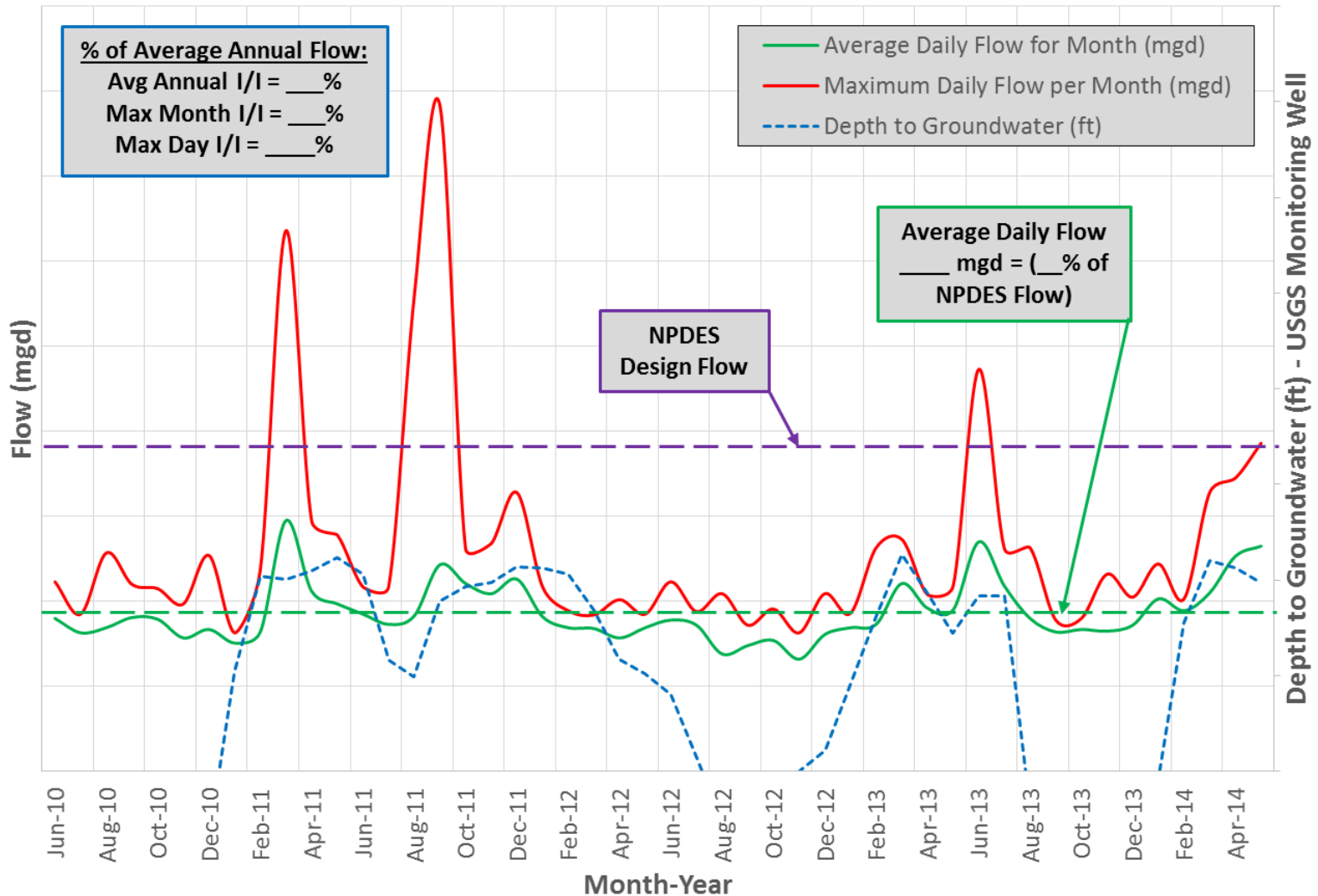
- **EPA Website**
 - www.echo.epa.gov
- **Monthly flow data**
 - Average total daily flow
 - Maximum total daily flow
- **Data Range**
 - June 2010 through May 2014
- **WPCFs**
 - 85 Connecticut WPCFs with NPDES permits



Typical Figure for Each WPCF



_____ WPCF
 Summary of Monthly Flows & Regional Groundwater Conditions
 (June 2010 through May 2014)



CT Statewide Flow Observations

Based on the data available for the 85 WPCFs, what is the average flow, as a percentage of design flow, for the May 2010 through June 2014 time period?

- 35%
- 47%
- 62%
- 79%



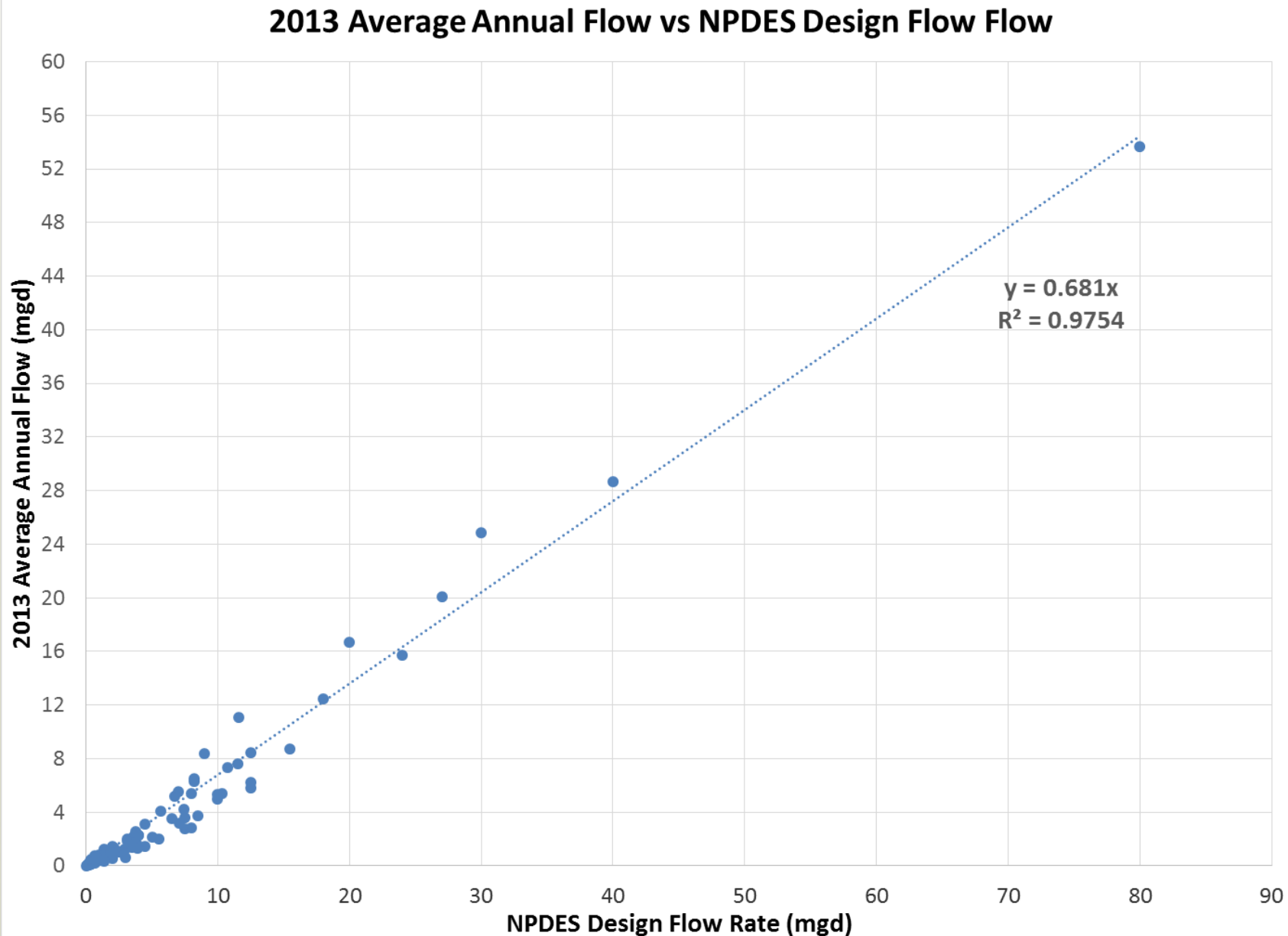
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CT Statewide Flow Observations



Statewide Estimated I/I Summary

- **Average Annual I/I**
 - Average of 37% of Average Annual Flow (AAF)
 - Median of 35% of AAF
 - Range of 15% to 100% of AAF
- **Maximum Monthly I/I**
 - Average of 112% of AAF (Median of 112%)
 - Range of 50% to 201% of AAF
- **Maximum Daily I/I**
 - Average of 333% of AAF (Median of 324%)
 - Range of 139% to 1070% of AAF



Cost of Services Benchmarking

- **Approach**
 - Connecticut Wastewater Utilities
 - FY13-14 expenses budget
 - Total gallons wastewater treated in a year
- **Unit Cost per 1,000 gallons**
 - Average of \$5.14 (median of \$3.87)
 - Range of \$1.40 to \$32.41
- **Unit Cost per gpd**
 - Average of \$1.88 (median of \$1.41)
 - Range of \$0.51 to \$11.83



Conventional I/I Project Approach

- **Two-Phase I/I Study**
 - Phase 1 I/I Analysis
 - Spring/high groundwater period (8-12 weeks)
 - Temporary, rainfall & groundwater monitoring
 - Phase 2 SSES
 - CCTV, smoke testing, bldg. inspections, etc.
- **Cost Effectiveness Analysis**
 - Done last, target infiltration > 4,000 gpd/idm
- **Success of Program Dependent on Weather/Seasonal Conditions**



Alternative I/I Program Approach

- **Preliminary Cost Effectiveness Analysis**
 - Performed up front
 - Community-specific metrics to drive I/I field work
 - Target only those elements pre-determined to be cost effective
- **Continuous Data Acquisition**
 - WPCF, pump stations, permanent meters
 - Long-term flow, groundwater & rainfall trends
- **Annual Calibration and Adjustment**



Example: Conventional I/I Approach

- 2.0 mgd WPCF with 60 miles of 8-inch sewer (50% clay & 50% PVC pipe)
 - Temporary flow monitoring program (20 meters for 12 weeks)
 - Follow-up MH inspections, flow isolation, target infiltration > 4,000 gpd/idm, develop Phase 2 recommendations
 - Smoke testing, building inspections
 - Cost effectiveness analysis conducted, only 25% of I/I located can be cost-effectively removed



Example: Alternative I/I Approach

- 2.0 mgd WPCF with 60 miles of 8-inch sewer (50% VC & 50% PVC pipe)
 - Review historical flow, GW and rainfall data
 - Summarize wastewater unit costs (\$2.20/gpd)
 - Conduct preliminary cost effectiveness analysis to predetermine cost effective I/I repairs
 - Test and seal 8" pipe at \$10/lf with infiltration rates > 3,000 gpd/idm (unit cost = \$2.20/gpd); assumes 50% removal
 - Perform flow isolation to target VC pipe sections
 - Conduct CCTV inspection of high-value pipes
 - Proceed to CITS rehabilitation work



Take Away Thoughts...

- **Industry Benchmarking**
 - Perspective for stakeholders
 - Reinforces framework for decisions
- **Cost Effectiveness**
 - Define the pathways for success before starting
 - Utilize resources efficiently and effectively
- **Refinement of Program Goals**
 - Annual calibration
 - Periodically confirm baseline and targets



Questions?

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