Infiltration and Inflow Regulatory Requirements

May 2017
Bureau of Water Resources
Massachusetts Department of Environmental Protection

Inflow/Infiltration Requirements

- 314 CMR 12.04(2) – Operation, Maintenance, and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers
  - Amendments Promulgated 4/25/2014
- Guidelines for Performing Infiltration/Inflow (I/I) Analyses and Sewer System Evaluation Surveys (SSES)
  - Issued 1993, Revised May 2017

Why Control I/I?

- Sanitary Sewer Overflows (SSOs) that occur in wet weather are largely due to excessive I/I
- From 2006-2016, in northeastern Mass alone:
  - More than 500 million gallons of SSOs discharges
  - 95% of that volume were wet weather SSOs
- In 2016:
  - 330 SSO events statewide - majority were wet weather related

Infiltration

- Groundwater entering sewers, service laterals, or manholes through defects and joints in the system.

Inflow

- Stormwater or surface waters entering the sewer system through drains, catch basins, roof leaders, manhole covers, and flows from sump pumps connected to the sewer.

Regulatory Requirements – 314 CMR 12.04(2)

- Develop and implement an ***ongoing*** I/I program:
  - Identify and eliminate "excessive" Inflow/Infiltration sources
  - Focus on inflow sources
  - Phased Sewer System Evaluation Survey (SSES) consistent with MassDEP Guidance for I/I Analyses and SSES
  - I/I mitigation for new connections for CSO systems and their tributary systems

Regulatory Requirements – 314 CMR 12.04(2)

- **Mitigation requirements** for CSO systems and their tributary systems:
  - 4:1 I/I mitigation requirement for all new connections > 15,000 gpd
  - Sewer authority's responsibility to establish program, including:
    - Design flows (recommend using Title 5 flows)
    - Direct removals or fees

Regulatory Requirements – 314 CMR 12.04(2)

By December 31, 2017, submit **I/I Analysis Report**:

- To address excessive I/I based on MassDEP's *Guidelines for Performing I/I Analyses and Sewer System Evaluation Surveys* (Issued 1993, Updated May 2017)
- Assess the risk for sanitary sewer overflows for the 5-year, 24-hour storm
- Plan and schedule for completing *Sewer System Evaluation Survey (SSES)* for excessive I/I areas
- Presumptive DEP approval 120 days after submittal

Many municipalities well into implementation phase.

Process for Revisions to 1993 I/I Analysis & SSES Guidance

- NEWEA Collection System Committee/Advisory Group meetings (2105-2016)
- Noticed for public comment in 8/24/2016 Environmental Monitor, posted on MassDEP's website
- Comments from municipal groups, consultants

- Final Guidance issued May 2017
  - Response to Comments posted on MassDEP website

Significant Changes to I/I & SSES Guidance

- Prohibition of inflow into sewer system
- Requirement for assessing risk of SSOs from 5-year, 24-hour storm event (previously 1-year, 6-hour storm event)
- Requirement to submit I/I Analysis to MassDEP by 12/31/17

- Changes to guidance consistent with changes to regulations promulgated in April 2014

I/I & SSES Guidance Comments

- Flexibility in developing I/I control approaches
  - *Yes*
- Inflow removal programs difficult
  - *Yes, but most often necessary*
- Number of Meters Required
  - *Some flexibility*
  - *Use all permanent meter data available*
  - *Some use of pump station data*

2017 Guidance - I/I Abatement Programs

- Guidance establishes four step approach:

    1. Infiltration and Inflow Analysis Report – *by 12/31/2017*
    2. Sewer System Evaluation Survey (SSES) – *in accordance with I/I Analysis Report*
    3. Sewer System Rehabilitation
    4. Post-Construction Monitoring

Alternative approaches may be proposed to MassDEP Regional Office.

Elements of I/I Analysis

- Inventory of Sewer System
- Flow Monitoring (3/1 – 6/30)
- Manhole inspections (10%)
- Groundwater monitoring (weekly during flow monitoring season, 1 site/subarea)
- Rainfall Monitoring (1 gauge/3-4 mi^2, min 2 gauges)

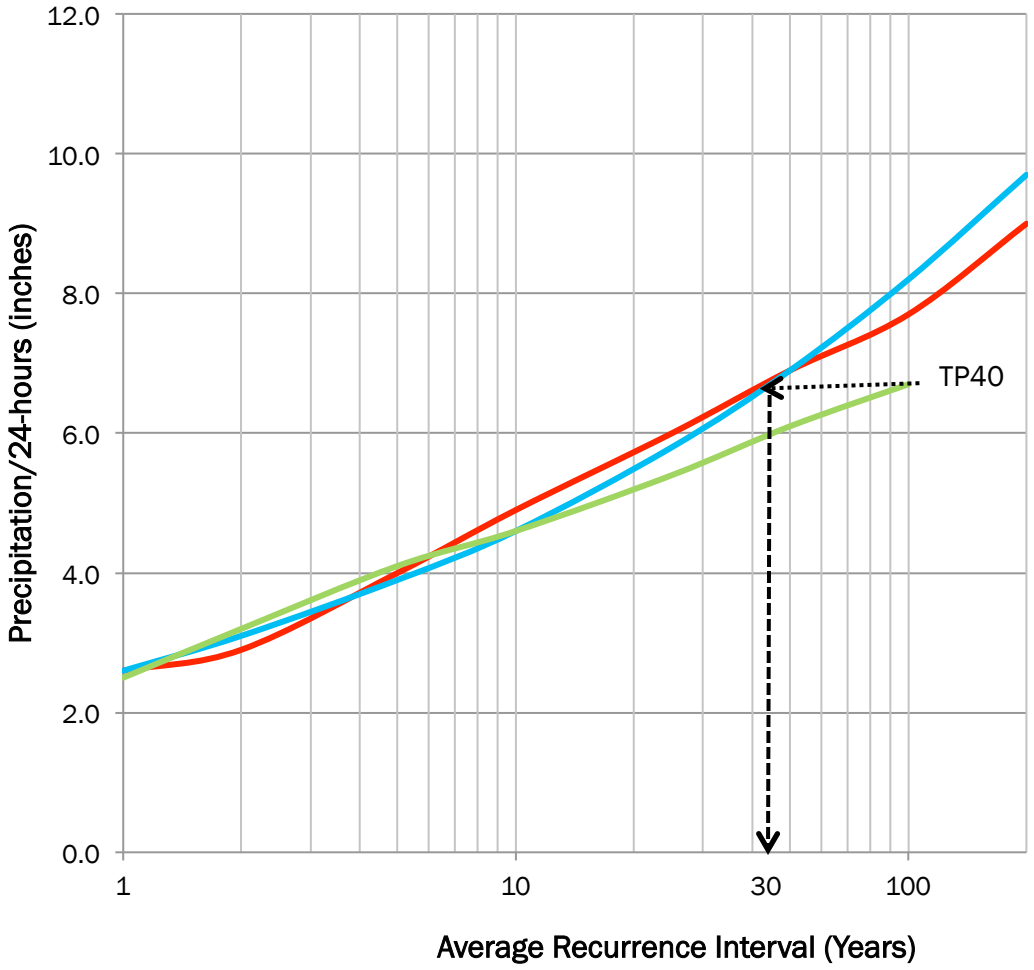
Elements of I/I Analysis

- Flow Data Analysis – categorize flow into three components
  - Sanitary (includes domestic, commercial, institutional, industrial sewage)
  - Infiltration (peak, minimum, and average rates)
  - Inflow (peak inflow rate and total inflow volume, calculations based on size of storm event)

Assessing SSO Risk for Storm Events

- Plan for long-term I/I control must assess risk of SSOs from 5-year, 24-hour storm event
  - Assess capacity of system to convey flows during larger storm events
  - Review wet weather SSO event history vs. storm events
- Statewide average for 5-year, 24 hour event
  - 4.61 inches of rain, peak intensity of 0.73 inch/hour, average intensity of 0.19 inch/hour
  - Based on NOAA Atlas 14, Volume 10
  - Sewer authority can use NOAA Atlas to develop more site-specific storm recurrence interval if desired

Massachusetts - Statewide Average
Change in 100-Year 24-hour Duration Storm (NOAA 14 vs TP40)



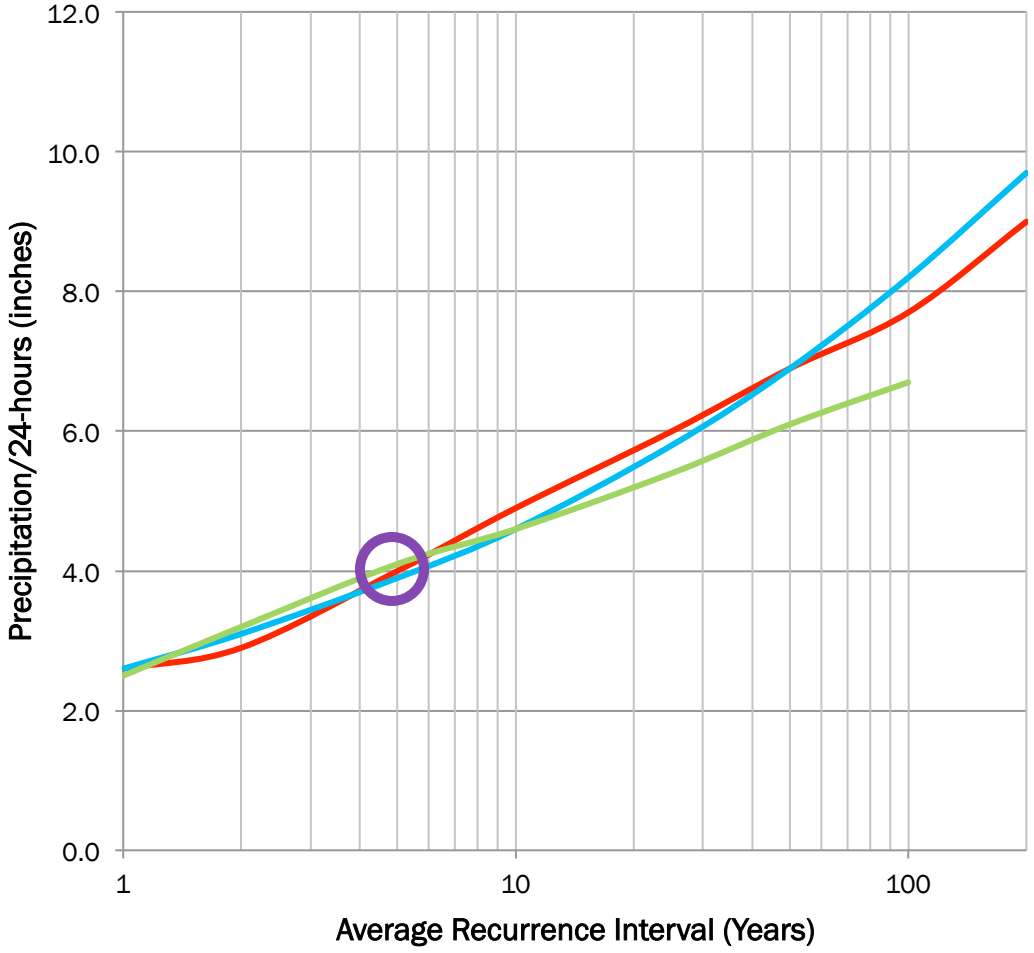
The TP40 (1961) 100-year storm is now approximately a 30-year storm.

NOAA 14 MA STATEWIDE MEAN (1-year PDS, Others AMS)

NRCC MA STATEWIDE MEAN

TP40 BY COUNTY FROM NRCS STORM VALUES IN TR55 MEAN

Massachusetts - Statewide Average
5-Year 24-Hour Duration Storm (NOAA 14 vs TP40)



The 5-year 24-hour storm is approximately the same.

NOAA 14 MA STATEWIDE MEAN (1-year PDS, Others AMS)

NRCC MA STATEWIDE MEAN

TP40 BY COUNTY FROM NRCS STORM VALUES IN TR55 MEAN

I/I Report Recommendations for SSES

- I/I Analysis Report Recommendations for Sewer System Evaluation Survey (SSES):
  - Infiltration: *Prioritize subareas with highest infiltration for further investigation – initially those > 4,000 gpd/idm*
  - Inflow: *Further investigation of subareas comprising 80% of total inflow to system*

Sewer System Evaluation Survey (SSES)

- SSES - More intense I/I investigation to identify specific sources

  Infiltration: *flow isolation, CCTV*

  Inflow: *smoke testing, dye testing, property inspections*

  SSES targets removal of Excessive I/I

SSES - When is I/I Excessive?

- "Excessive" I/I:
  - Contributes/causes SSOs for events up to 5-year storm
  - Infiltration that can be cost-effectively be removed from the sewer system
  - Public and private inflow sources, unless technically infeasible or cost-prohibitive

SSES – Cost Effectiveness Analysis (CEA)

- Typical Fixes: grouting, lining options, spot repairs
- Infiltration Sources:
  - *Costs to transport/treat infiltration vs. removal costs*
- Inflow Sources:
  - *No CEA - remove unless technically infeasible or cost prohibitive*

SSES – What is Cost-Effective?

- CEA hasn't yielded effective I/I removal in some cases:
  - *Possibility of migration of infiltration from rehabilitated defect to another defect if CEA not done on system-wide basis*
  - *Limited design life of some fixes*
  - *Low transport and treatment costs are not an incentive for fixing causes of I/I*
- *Need to look at:*
  - *Design life of fixes*
  - *Infiltration removal assumptions (50% peak infiltration removal assumed)*
  - *Collecting post-construction data*

SSES - Private Inflow Removal

- Local sewer regulations must prohibit connection of inflow sources
- Can have BIG impact, but often avoided:
  - Sump pumps
  - Roof leaders
  - Drains
- Requires property inspections

SSES – When is Inflow Removal Technically Infeasible or Cost-Prohibitive?

- Factors to consider
  - Private inflow causing/contributing to SSOs
  - Costs to utility/property owner for removal
  - Creation of public safety concerns (e.g., flooding, icing)

If frequent SSOs, rigorous private inflow identification/removal will be required.

SSES Report

- SSES Report/Recommendations:
  - List of rehabilitation work
  - I/I estimated to be removed
  - Cost
  - Schedule for design and construction
  - Post Construction Monitoring
    - 12, 18, 24 month warranties

Meeting the 12/31/17 Deadline

- Submit I/I Analysis Report by 12/31/17:
  - *Recent or current*
  - *Dated I/I Analyses with no follow up is not compliant*
  - *Extensions may be granted on case-by-case basis*

Requesting an Extension

- Submit written request to MassDEP Regional Office by 12/31/17
- Must include:
  - Summary of past I/I or sewer system studies/reports
  - Summary of I/I abatement efforts over last 5-10 years
  - Summary of historical wet weather SSO events years
  - Where required, description of program to provide for 4:1 I/I removal
  - Plan and schedule to undertake work to comply with requirements for I/I Analysis
- Sewer authorities that fail to submit any I/I plan or extension request containing the required elements may be subject to enforcement action for failure to meet the deadline.

Funding for I/I Analyses, SSES & Implementation

- State Revolving Fund (SRF) low-interest (2%) loans are available:
  - Available for I/I Analyses and SSES ("Planning" loans)
  - Available for I/I related construction work
  - Competitive process (typically, planning loans are funded)
  - Timing (Annual Cycle):
    - June - DEP initiates the annual procurement
    - August - Proposals due
    - Fall – DEP publishes draft Intended Use Plans (IUPs)
    - January – DEP publishes final IUPs
    - Winter/Spring – Local funding appropriation

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